Contractor Health and Safety Plan

In Situ Stabilization and Solidification Field Pilot Study
Gasco Sediments Project Area
Portland, Oregon

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Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists'
AHA	Activity Hazard Analysis
AQI	Air Quality Index
BMP	Best Management Practices
BODR	Basis of Design Report
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CEO	Chief Executive Officer
CFR	Code of Federal Regulation
CIH	Certified Industrial Hygienist
CHASP	Contractor Health and Safety Plan
COC	Contaminants Of Concern
CO	Carbon Monoxide
COVID-19	Corona Virus 2019
CPR	Cardiopulmonary resuscitation
dB(A)	Decibels A level
DEET	N-Diethyl-m-toluamide
DEQ	Oregon Department of Environmental Quality
EMS	Emergency Medical Service
FPS	Field Project Study
GFCI	Ground Fault Circuit Interrupter
HASP	Project Health and Safety Plan
HEPA	High Efficiency Particulate Air
HIV	Human Immunodeficiency Virus
HPS	Hanta Virus Pulmonary Syndrome
HSC	Health and Safety Coordinator
IDLH	Immediately Dangerous to Life and Health
ISS	In Situ Stabilization
JSEP	Job Safety Enhancement Program
lb	Pound
LEL	Lower Explosive Limit
m	meter
ml	milliliter
mph	Miles per hour
NIOSH	National Institute for Occupational Safety and Health
O_2	Oxygen gas
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PEL	Permissible Exposure Limit
PAR	Preferred Alternative Report
PID	Photo Ionization Detector
PPE	Personal Protective Equipment
RAL	Remedial Action Level
RD	Remedial Design
ROD	Record of Decision

ROPS	Roll Over Protective Structure
SDS	Safety Data Sheets
SHM	Safety and Health Manager
Siltronic	Siltronic Corporation
SOPs	Standard Operating Procedures
SPA	Safe Plan of Action
SSHO	Site Safety and Health Officer
SW	Surface Water
TBD	To Be Determined
TZW	Transition Zone Water
TPH	Total Petroleum Hydrocarbons
TLV	Threshold Limit Value
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA or EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

PLAN IDENTIFICATION

Report Title:	Contractor Health and Safety Plan
Project Title:	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area
Project Location:	Portland, OR
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1.0 INTRODUCTION

Sevenson Environmental Services, Inc. (Sevenson) has prepared this Contractor Health and Safety Plan to define the means and methods for the In Situ Stabilization and Solidification Field Pilot Study at the Gasco Sediments Site Project Area (Project Area), located on the Willamette River adjacent to the NW Natural Gasco and Siltronic Corporation (Siltronic) properties in Portland, Oregon. Refer to Figure 1 - Site Vicinity Map

1.1 Plan Objective

The objective of this Contractor Health and Safety Plan (CHASP) is to define the requirements and designate protocols to be followed during site work, In Situ Stabilization (ISS), mechanical dredging, and sediment processing. The applicability of the CHASP extends to Sevenson personnel and our subcontractors. Work performed under this contract will comply with applicable Federal, State, and Local laws and regulations as well as Sevenson's Corporate Health and Safety Plan (Sevenson, 2022) and NW Natural safety and health requirements. Through careful planning and implementation of site-specific safety protocols, Sevenson will strive for zero accidents and incidents for this project.

1.2 Safety and Health Policy Statement

Sevenson's management is committed to the safety of each and every employee and Site visitor. There is no place at Sevenson for an employee who will not work safely or who will endanger the safety of their fellow workers. It is essential that all managers and supervisors insist on the maximum safety performance and awareness of all employees under their direction by enthusiastically and consistently administering all safety rules and regulations. It is Sevenson's policy to take the necessary actions in engineering, planning, designing, assigning, and supervising work operations, to create a safe worksite. Sevenson will:

- Maintain safe and healthful working conditions.
- Provide and assure the use of all necessary personnel protection equipment to ensure the safety and health of site employees.
- Require that site work be planned to provide a range of protection based on the degree of hazards encountered under actual working conditions.
- Provide site workers with the information and training required to make them fully aware of known and suspected hazards that may be encountered, and of the appropriate methods for protecting themselves, their co-workers, the public, and the environment.
- Protect the public and the environment from adverse effects caused by the work.

1.3 Drug and Alcohol Policy

Sevenson is committed to providing a safe, efficient, and productive work environment for all employees. Using or being under the influence of drugs or alcohol on the job may pose serious safety and health risks. To help ensure a safe and healthful working environment, employees may be asked to provide body substance samples (such as urine, blood, or breath) to determine the illicit or illegal use of drugs and alcohol. Refusal to submit to drug testing may result in disciplinary action, up to and including termination of employment.

Copies of the above drug testing policy (Sevenson's Substance Abuse Program) will be provided to **all Sevenson employees**. Employees will be asked to sign an acknowledgement form indicating

that they have received a copy of the drug testing policy. Questions concerning this policy or its administration should be directed to the Director of Health and Safety at 716-284-0431.

1.4 Project Safety and Health Expectations

The safety and health of workers, the public, and the environment are fundamental responsibility assumed by Sevenson under this contract. Sevenson will:

- Promote project safety with an objective of zero injuries, illnesses, or property damage.
- Promote a zero at risk behavior work environment.
- Manage activities in a proactive way that effectively increases the protection of site workers, the public, and the environment.
- Reduce safety and health risk by identifying and eliminating hazards from site activities.
- Carry out site activities in a manner that complies with all applicable safety, health, and environmental laws and regulations.

1.5 Project Safety and Health Compliance Program

Compliance with the requirements of applicable Federal, State, and local laws will be accomplished through a combination of written programs, employee training, workplace monitoring, and system enforcement. Continued and regular inspections by supervisors and safety personnel, as well as upper management with total involvement in the safety program will produce an atmosphere of voluntary compliance. However, disciplinary action for violations of project requirements will be taken, when necessary.

All site personnel and unescorted visitors[1] at the site will be required to read and verify compliance with the provisions of this CHASP and its specific appendices. In addition, visitors will be expected to comply with relevant Occupational Safety and Health Administration (OSHA) requirements (e.g., training, personal protective equipment, etc.). In the event that a person does not adhere to the provisions of the CHASP, they will be requested to leave the work area. All nonconformance incidents will be recorded in the Daily Safety Report.

The SSHO or Quality Control Manager will conduct impromptu surveillance on a daily basis of all work areas and subcontractor's activities to ensure that safety and health is properly implemented. In addition, any reports from employees concerning unsafe work practices, acts, or conditions will be investigated promptly. Unsafe acts, practices, or conditions will be reported to the affected worker or supervisor at the time of inspection.

The safe and efficient work practices of Sevenson require a spirit of teamwork and cooperation from all employees along with uniform standards of expected behavior. Employees who refuse or fail to follow the standard set forth by this CHASP, Sevenson's Corporate Health and Safety Plan, or regulatory standards, will subject themselves to disciplinary action up to, and including

[1] Unescorted visitors are personnel that are familiar to the project site but are not assigned to the site on a full time basis. Such as Sevenson or NW Natural support team members, delivery personnel (i.e., fuel delivery, backfill material drivers, dumpster pickup) etc.

discharge. In cases not specifically mentioned, employees are expected to use good judgment and refer any questions to their supervisors.

1.6 Project Safety Incentive Program

It is expected that all employees perform their assigned tasks in a safe and healthful manner. Therefore, safe work performance is a key element in an employee's review of their suitability for continued employment.

Workers participating in Sevenson's Job Safety Enhancement Program (JSEP) will be eligible to receive small trinkets (high visibility T-shirts, hats, calendars, better quality safety glasses, etc.) for turning in JSEP observation forms and will be entered into a drawing for a chance to win a higher value item such as a pair of work boots, jacket, Gortex raingear, etc.

1.7 References

During development of this CHASP, consideration was given to current safety and health standards defined by the United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH). Specifically, the following reference sources have been utilized in the development of this CHASP:

- OSHA Regulations: 29 CFR 1910 and 1926.
- USEPA Standard Operating Safety Guides, June 1992.
- NIOSH Pocket Guide to Chemical Hazards, August 2006.
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Chemical Agents, 2022.
- NIOSH/OSHA/USCG/USEPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, DHHS/PHS/CDC/NIOSH, October 1985

In addition to the above-referenced documents, Sevenson has established a comprehensive and realistic Safety, Health, and Environmental Program based on past experience, sound engineering practice, employee training, and enforcement of safety and health regulations to prevent unreasonable safety and health risks. For specific procedures/programs associated with this project, refer to the Sevenson Corporate Health and Safety Plan. A copy of the Sevenson Corporate Health and Safety Plan will be maintained in the Sevenson office trailer.

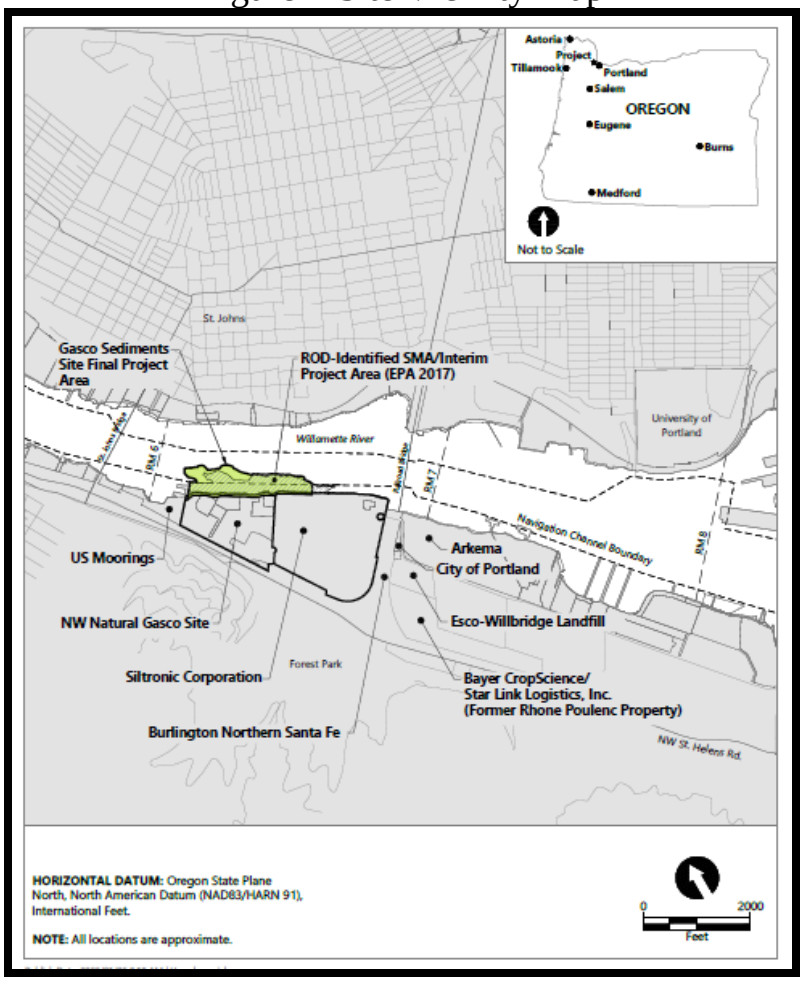
1.8 Health and Safety Plan Revisions

The development and preparation of this CHASP has been based on site-specific information provided to Sevenson. Should any unforeseen hazard become evident during the performance of the work, the Project Manager will bring such hazard to the attention of the Client Representative both verbally and in writing for resolution as soon as possible. In the interim, Sevenson will take necessary actions to maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment. Modifications of any portion or provision of the CHASP will be requested in writing from Client Representative by the Project Manager and authorized in writing. No changes to the CHASP will be allowed until the item has been reviewed and an addendum prepared and approved by Sevenson's Safety and Health Manager.

1.9 Background

NW Natural submitted the Preferred Alternative Report (PAR; Anchor QEA 2022a) to EPA on October 31, 2022, to present a sediment Remedial Design (RD) alternatives analysis and comparison for the Revised Dredge and Cap Design and the preferred Full Dredge and ISS Design. The preferred design includes an integrated deep ISS treatment barrier wall that will only be included if EPA approves the ISS technology in the design for the nearshore area. EPA and the Oregon Department of Environmental Quality (DEQ) commented that they agree with the general approach of ISS treatment at the Project Area with the caveat that site-specific details of the approach will need to be further developed during RD of the Full Dredge and ISS Design. NW Natural intends to submit a revised Basis of Design Report (BODR) that describes the expected elements of the design and associated methods and evaluations. Once the BODR is approved by EPA, supporting evaluations for the Full Dredge and ISS Design will be further developed and presented in design deliverables that will be developed in collaboration with and approved by EPA. NW Natural would like to implement this In Situ Stabilization (ISS) Field Project Study (FPS) as soon as possible to: 1) incorporate more detailed design information earlier in the design process (i.e., in the Interim Design) to support EPA's review and minimize the potential for substantive design changes during development of the Final Design; and 2) inform the means and methods elements of design and ensure Interim and Final Design documents can be produced without delay.

Figure 1-Site Vicinity Map



2.0 PROJECT SCOPE

The objectives of the FPS are intended to inform the design and implementation of full-scale sediment ISS throughout the Project Area. The project scope involves • Debris removal, if needed, timber dolphin removal, multibeam bathymetric surveys, ISS sediment treatment, ISS post-treatment, mechanical swell material removal utilizing a barge-based excavator, dewatering, characterization and stabilization of swell sediments, transloading of amended materials for offsite transportation and disposal to an approved offsite facility.

The Dalles, Oregon, location will be used for ISS FPS support purposes. This facility is located approximately 85 miles east of the Gasco Sediments Site on the Columbia River. It will be used for mobilization, staging equipment, decanting of any overlying water, and offloading swell material to lined or sealed and covered trucks for disposal.

Overwater work activities are restricted to July 1 through October 31 for fish protection considerations. Specific major elements associated with this work include the following:

- Mobilization to the site including installation of temporary facilities, Best Management Practices (BMPs), local notifications, installation of signs and barriers to control access along the waterfront establishing communication protocol with local operations and maritime coordination.
- Protection of existing utilities and structures
- Assemble and mobilize crane, cement grout plant, Bauer drill rig, barges, mechanical swell removal long stick excavator, moonpool, floats, water craft and install turbidity curtains and controls.
- Assure protection of ecological receptors (i.e., fish and invertebrates) and humans from risks associated with contaminated sediment and transition zone water (TZW), and surface water (SW). The primary risk pathways that will be controlled as part of this project
- Demobilization of equipment and temporary facilities including decontamination of marine equipment and trans-loading equipment, removal and disposal of trans-loading support materials, and site restoration.

3.0 ORGANIZATION AND RESPONSIBILITIES

While the Sevenson Safety and Health Department directs and supervises the overall Safety, Health and Environmental Program, the responsibility for Safety and Health extends throughout our organization from top management to every employee. For this reason, it is each person's duty to notify the management personnel if a hazardous condition is identified and to make a "stop work" call if the condition represents an immediate danger to life or health, until the SSHO can make a further determination. The following are the Sevenson project personnel positions and responsibilities for this project. Refer to ***Figure 2 – "Organizational Chart"***.

- Vice President/Program Manager: Michael Crystal VP
- Project Manager: Joe Burke
- Project Superintendent: Taylor Crystal
- Safety and Health Manager: Paul Jung CIH, CSP
- Site Safety and Health Officer: TBD
- Subcontractors: TBD

3.1 Program Manager

The Program Manager directs and manages all aspects of the project in compliance with all contract and technical requirements. The Program Manager will monitor and control all subcontractors to achieve optimal performance and ensure safe, high-quality performance that complies with all contract requirements.

3.2 Project Manager

The Project Manager reports to the Program Manager. His responsibilities include coordinating project activities with the Project Superintendent and serving as the primary liaison with The Client Representative. The Project Manager prepares all correspondence, submittals, and other documentation required for the project; coordinates schedules; and administers the contract. The Project Manager prepares reports and documentation, supervises inspection personnel, and reviews and approves procurement and subcontract activities.

3.3 Project Superintendent

The Project Superintendent supervises and coordinates all construction crew activities relating to site preparation, excavation, dredging, shipping, and restoration. The Project Superintendent has the operational responsibility for the implementation of the CHASP on this project. This includes establishing an attitude of concern for safety matters by initiating prompt corrective action of hazards brought to his attention and ensuring that the project safety and health requirements are initiated and observed by all project personnel.

- The Superintendent plans and requires that all work be performed in compliance with this CHASP, the Sevenson Corporate Health and Safety Plan, NW Natural's safety requirements, and/ all applicable local, state, and federal regulations. He will impress upon all subcontractors' supervisory personnel a sense of responsibility and accountability of each individual to maintain a safe workplace and to work in a safe manner.

3.4 Safety and Health Manager (SHM)

The Safety and Health Manager formulates, administers, and coordinates programs for the company to reduce the risk of loss due to employee injury, regulatory non-compliance, general liability, fire, theft, or damage. The Safety and Health Manager will develop written detailed policies and. The Safety and Health Manager will:

- Be responsible for the development, implementation, and oversight, of the CHASP.
- Visit the site as needed to audit the effectiveness of the CHASP.
- Provide consultation as needed to ensure that the CHASP is fully implemented.
- Coordinate any modifications to the CHASP with the SSHO and The Client Representative.
- Provide continued support for upgrading/downgrading the level of personal protection for project tasks.

3.5 Site Safety and Health Officer (SSHO)

Under the direction of the Safety and Health Manager, the SSHO will be responsible for the implementation of this CHASP and for the daily coordination of safety activities with the Project Superintendent and The Client Representative to ensure that the planned work objectives reflect adequate safety and health considerations. The SSHO will maintain a complete copy of this plan

(and its supplements and addenda) at the site during all field activities and assure that all workers and visitors are familiar with it. He will perform site-specific training and briefing sessions for employee(s) prior to the start of field activities at the site and a briefing session each day before starting work. He will ensure the availability, proper use and maintenance of specified personal protective equipment, decontamination equipment, and other safety and health equipment. He will maintain a high level of safety awareness among team members and communicate pertinent matters to them promptly. The SSHO will:

- Assist and represent the Safety and Health Manager in on-site training and the day-to-day on-site implementation and enforcement of the accepted CHASP.
- Be assigned to the site on a full-time basis for the duration of field activities.
- Have the authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations; and all aspects of the CHASP. This includes, but is not limited to, activity hazard analyses, air monitoring, use of PPE, decontamination site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records. This will be accomplished by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log.
- Stop work activities if unacceptable health or safety conditions exist and take necessary action to re-establish and maintain safe working conditions.
- Consult and coordinate any modifications to the CHASP with the Safety and Health Manager, the Site Superintendent and The Client Representative.
- Conduct accident investigations and prepare accident reports.
- Review results of daily quality control inspections and document safety and health findings in the Daily Safety Inspection Log.
- Coordinate with Site Management and the Safety and Health Manager, recommend corrective actions for identified deficiencies, and oversee the corrective actions.

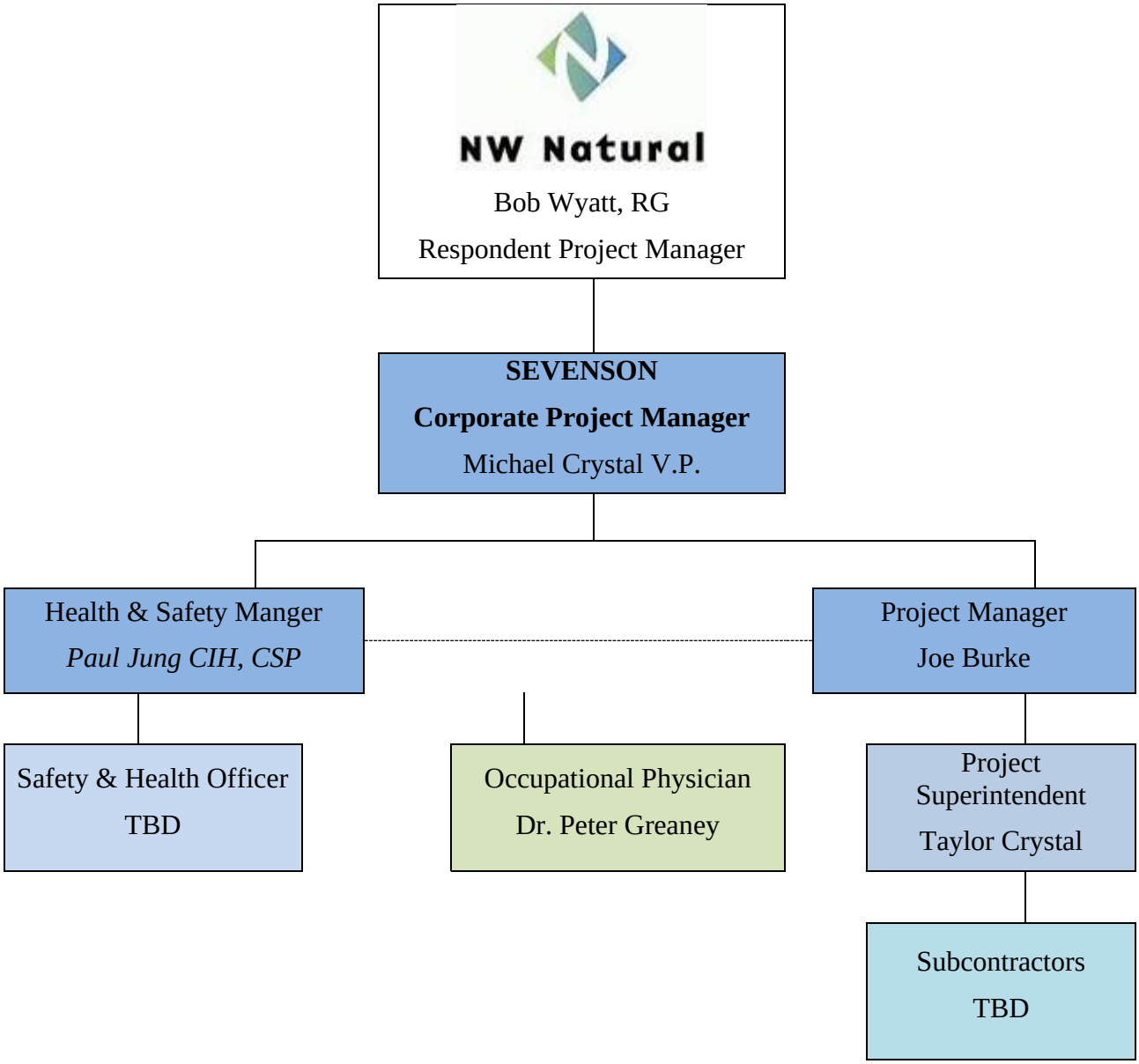
3.6 Subcontractors

Subcontractors utilized during activities at the Site will be provided a copy of the plan prior to commencing work. The SSHO will verify that subcontractor employee training and will monitor and enforce compliance with the established plan and standard operating procedures. As with all site personnel, subcontractors will be briefed on the provisions of this CHASP and attend all daily toolbox safety meetings.

Sevenson will monitor subcontractors' safety performance periodically during the work shift. Subcontractor shall be responsible for and ensure its employees comply with all site safety requirements imposed by contract, law, and those communicated by Sevenson during the performance of the work. Sevenson will observe subcontractors for hazards or unsafe practices that are both readily observable and occur in common work areas. The SSHO will note observed subcontractor work practices on the daily Quality Control Report. If non-compliance or unsafe conditions or practices are observed, the subcontractor safety representative will be notified, and corrective action(s) will be required. The subcontractor will determine and implement necessary controls and corrective actions. If repeat non-compliance/unsafe conditions are observed, the

subcontractor will be required to stop affected work until adequate corrective measures are implemented.

Figure 2
Organizational Chart



4.0 HAZARD/RISK ANALYSIS

Below is a general summary of the risks that this CHASP addresses during dredging and sediment processing/handling at the Site. This is a summary of the major anticipated risks and is not intended to be a complete listing of all potential risks that may be encountered during the project.

1. Working around heavy equipment (struck by, caught in equipment)
2. Exposure to hazards associated with working on or near water (drowning)
3. Materials handling and transfer (ergonomic issues)
4. Heavy lifting (strains, sprains)
5. Biological hazards (plants, animals, insects)
6. Pressure systems (Hydraulic lines, sediment transfer lines)
7. High noise levels
8. Cuts/lacerations (saws, wire rope, etc.)
9. Exposure to temperature extremes (heat stress, cold stress)
10. Severe weather conditions (high winds, precipitation, lightning, tsunamis)
11. Hazards associated with watercraft such as boats, barges, work platforms (falling overboard, collisions with other watercraft and stationary objects)
12. Exposure to chemical contaminates and chemicals brought on site.
13. Crane and rigging for sediment process equipment
14. Drill Rig (ISS work)
15. Grout Plant (ISS work)
16. Swinging of placement of equipment with crane or other heavy equipment
17. Hazards associated with watercraft such as boats and work platforms.
18. Working over, on, or near water
19. Cold water immersion

4.1 Site Tasks and Operations

4.1.1 Activity Hazard Analysis (AHAs)

Sevenson has developed an Activity Hazard Analysis (AHA) for the major phases of the work. A major phase of work is defined as an operation involving a type of activity presenting hazards not experienced in previous operations, or where a new subcontractor or work crew is to perform the specified phase. The analysis will define the activity being performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard. An AHA will also be prepared when new tasks are added; job situations change, or when it becomes necessary to alter safety requirements; refer to ***Appendix A - "Activity Hazard Analysis".*** Work will not proceed on a particular task/work area until the AHA has been reviewed and site personnel understand the hazards and controls of the activity to be performed.

4.1.2 Safe Plan of Action (SPA)

Additionally, Sevenson has a real-time hazard identification program known as the Safe Plan of Action (SPA), which is found in ***Appendix B – "Forms"***. While the AHA is used as a training/auditing tool, the SPA is a planning tool for the work crew to address the details of a work process or activity and any potential changing conditions. The superintendent or foreman as well as the work crew participate in developing the SPA, and this is done before the start of each day's work.

4.1.3 Job Safety Enhancement Program (JSEP)

Sevenson will also implement its JSEP Program which is a behavior-based safety program that requires site workers to make safety observations, ideas for task improvement, or identify specific hazards associated with their task. The JSEP Form will be logged, evaluated by site management, corrective actions developed (if necessary), and assignment of a responsible person to implement the corrective action, and follow up/verification of the corrective action by a second person. JSEP Forms are discussed at morning safety meetings to provide feedback to the workers. The JSEP Form is in **Appendix B - *"Health and Safety Forms".***

4.1.4 Take 2 Program

Sevenson's "Take 2 Program" will also be in effect. A worker before he begins any task is to review how it is to be accomplished, the hazards present, and the safety and health controls that are to be implemented. If there is any question that the specific task cannot be safely accomplished, he is to stop and ask his foreman the proper steps to be followed.

4.2 Hazards

The following potential hazards may be encountered during the work activities at the Site.

4.2.1 Safety/Physical Hazards

Potential safety hazards include working on or near water, electrical, heavy equipment/vehicle traffic, material handling, hand and power tools, noise exposure, slip/trips/falls, heat and cold stress, and falls from elevation. Safety/Physical hazards associated with the project are presented below.

4.2.1.1 Electrical

Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if contacted or severed during site operations. A minimum distance of 10 feet will be present between overhead transmission lines and equipment. This distance will vary according to voltage, the greater the voltage, the greater the clearance between any part of the equipment and the power line; refer to ***Table 1 - Minimum Clearance from Energized Overhead Electrical Lines***. When required, a spotter will be utilized to maintain a safe distance between equipment and overhead wires. The basic rule is, "Don't locate equipment in a position where it can come in contact with overhead power lines." Maintain the required distance from the lines. Overhead electrical power lines will be considered energized unless the person owning such line, or operating officials of the electrical utility supplying the line assures that it is not energized and it has been visibly grounded.

Table 1 Minimum Clearance From Energized Overhead Electrical Lines	
Nominal System Voltage	**Minimum Rated Clearance**
0 to 50 kV	10 Feet (3 m)
51 to 200 kV	15 Feet (4.5 m)
201 to 350 kV	20 Feet (6 m)
351 to 500 kV	25 Feet (7.5 m)
501 to 650 kV	30 Feet (9.1 m)
651 to 800 kV	35 Feet (10.7 m)
801 to 950 kV	40 Feet (12.2 m)
951 to 1100 kV	45 Feet (13.7 m)
Clearance values calculated using: (Initial kV-50kV) x (4 inches/10kV) x(1 foot/12 inches) = increased distance (feet) over 10 feet. Add this value to 10 feet to yield minimum rated clearance	

Table 11-1 USACE EM-385-1-1 (Sept 2008)

There are various means of insulating the wires, as well as barriers and alarms that may be available to reduce the risk of injury to workers, but the use of such devices does not change the requirements of any other applicable standards or laws. In addition, these, and other measures (such as grounding the equipment itself) may not be fully effective and may create a false sense of security. Only the utility company is authorized to de-energize, insulate, or handle distribution or transmission lines. Power drops at the Site are under the control of The Client Representative. In the event power drops at the site need to be isolated or handled, written request must be made to The Client Representative in advance.

Electrical equipment used on-site may also pose a hazard to workers. Whenever possible, Sevenson will use low-voltage equipment with ground-fault interrupters and watertight, corrosion-resistant connecting cables to help minimize this hazard. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. In the event of an electrical storm, all operations will cease for the duration of the storm.

No employee will be permitted to work in the proximity of any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or it has been locked and tagged out. These procedures will be utilized when work has to be performed on energized equipment.

All electrical wiring and equipment will be intrinsically safe for use in potentially explosive environments and atmospheres. Ground-fault circuit interrupters are standard for use at the site.

4.2.1.2 Heavy Equipment/Vehicle Traffic

Considerations for controlling the movement of personnel and equipment in a construction area are vitally important to any project as injuries may occur while working with or adjacent to such equipment. This category includes all operations that utilize moving heavy equipment: dredges, excavators, loaders, dozers, cranes, and trucks. Sevenson will take every precaution necessary to ensure the safety of the residents and the on-site personnel during traffic movement operations.

All workers will adhere to all applicable standards and regulations while operating heavy equipment at the site. Operators will be trained and experienced in the use and maintenance of the equipment they are operating. Equipment will be inspected on a daily basis to identify any worn parts, and/or unsafe conditions. Inspections will be documented using the Equipment Checklist; refer to ***Appendix B – Safety and Health Forms***. Any unsafe equipment will be removed from service until safety defects can be corrected. Equipment operators will not leave their machine unattended while it is running. All equipment will have electronic backup alarms. Each piece of equipment will be equipped with a 1A:10B:C fire extinguisher. No vehicles or equipment will be operated in a careless or unsafe manner. Personnel will wear high visibility reflective vests when working around equipment/vehicles. All personnel will stay a minimum of four feet clear of the operational area of the equipment.

During construction activities, it is often necessary to have a worker direct the operator. In these cases, close communication between the operator and the laborer is of critical importance. One designated person will give signals to the operator of both equipment and vehicles in the work area. Workers should not take any action unless they have made eye contact with the operator and clearly communicated their intentions. In addition, all machines are equipped with back-up alarms, which are checked daily and repaired immediately. Truck traffic will be controlled by a flagger/spotter, as required.

Maintenance and inspection of vehicles and heavy equipment is a vital part of the overall safety program. Sevenson has a fully staffed equipment maintenance shop that handles all preventative and overhaul work for our entire vehicle and equipment fleet. As part of the preventative maintenance, all equipment is checked for properly functioning safety devices (e.g., backup alarms, brakes, lights, fire extinguishers, etc.). Before each piece of equipment leaves the shop it must pass a safety checklist. All rental equipment is subjected to a similar inspection when delivered to the job site. Any piece of rental equipment that fails the inspection must be repaired by the vendor before it is accepted for use. In addition, all equipment is inspected in the field prior to the start of each day's activities. If a superintendent, operator, or safety officer detects a defect, the equipment is taken out of service and a properly qualified mechanic is dispatched from the shop to make the repairs on-site. All heavy equipment used at the site will be equipped with rollover protective structures (ROPS).

4.2.1.3 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. Multiple employees or the use of mechanical lifting devices are required for heavy objects.
- The anticipated path to be taken by the lifter should be considered for the presence of slip, trip, and fall hazards.

- The feet will be placed far enough apart for good balance and stability (typically shoulder width).
- The worker will get as close to the load as possible. The legs will be bent at the knees.
- The back will be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- A worker will never carry a load that cannot be seen over or around.

When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered. When two or more workers are required to handle the same object, workers will coordinate the effort so that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, will face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines will be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves will be used if necessary.
- The hands and object will be free of oil, grease, and water which might prevent a firm grip, and the fingers will be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- The item will be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

Sheet piling will be removed from transportation trailers with either an excavator (rigging), a loader with fork attachment, or crane. Care shall be giving to pinch points and struck by hazards when lifting, moving, and stacking sheets. Tag lines shall be used if rigging is utilized to handle sheets. A spotter shall be used to keep personnel clear of equipment movements if a loader is used.

A crane equipped with a sheet pile driving head will be utilized to drive sheet piling. Ground or floating platform personnel are to stay clear of the fall zone while the crane operator is lifting, moving, threading, and driving sheets. Only the person threading the sheet maybe in the fall zone during threading operations. After the sheet pile has been threaded and lowered to the river bottom, workers may enter the area to support driving operations as needed. NO ONE IS PERMITTED TO STAND DIRECTLY UNDERNEATH THE VIBRATORY HAMMER WHILE ENGAGED IN THE VIBRATORY MODE. The vibratory hammer shall not be engaged while workers are threading or checking the plumb of the sheet.

4.2.1.4 Hand and Power Tools

Hand and power tools are used for various site activities. Procedures for using hand and power tools are as follows:

- Persons using power tools will be trained in their use.
- Ground Fault interrupters will be used on all electrical tools.
- Only tools in good condition will be used.
- Tools will be kept clean.

- Guards and shields will be kept on all tools.
- Air couplings will be secured.
- Non-sparking tools will be used in hazardous areas.
- Proper eye protection is critical when using power tools. At a minimum, safety glasses will be required during site operations. Where appropriate, full-face shields will be utilized in addition to the glasses.

4.2.1.5 Noise Exposure

Noise is generated during construction activities in such operations as transportation of materials and operation of heavy construction equipment. Noise has been defined as unwanted sounds. The human ear can tolerate a certain amount of sound without any harmful effects. Personnel will be provided protection against the effects of hazardous noise exposure whenever sound-pressure levels exceed 85 dB(A) steady-state expressed as a time-weighted average (TWA) or 140 dB(A) impulse.

It is usually safe to assume that if you need to shout to be heard at arm's length, the noise level is at 90 dB (A) or above. Personnel operating or working around dredging and construction equipment will utilize hearing protection. Based on the nature of activities to be performed on site, the use of dredging equipment, heavy equipment, power tools, and other noise producing devices, Sevenson personnel are enrolled in a Hearing Conservation Program that meets the requirements of OSHA regulation 29 CFR 1910.95.

Based upon Sevenson's past experience, it is known that the noise levels emanating from the operation of the heavy equipment often exceed what is allowable for worker exposure. Consequently, equipment operators and personnel working near the equipment are required to wear hearing protection. Sevenson provides hearing protection equipment.

4.2.1.6 Excavation/Trenching Hazards

The hazard associated with excavation is moderate to high. In general, the main hazard encountered during soil excavation is the cave in of excavation sides with possible burial or crushing of workers. Causes of cave in may include (a) absence of shoring, (b) misjudgment of stability, (c) defective shoring, and (d) undercut sides. Other potential hazards include falling during access/egress, while monitoring or dismounting equipment, or stumbling into excavation. An overhead hazard can result from material, tools, rock, and/or soil falling into the excavation. Flammable atmospheres and air quality issues may also be encountered in excavations. Excavations and trenches four feet or greater in depth shall have the air quality checked for oxygen content, flammable/explosive atmosphere, carbon monoxide, and other toxic vapors/gases that may be present with the Multi-Rae Plus or equivalent instrument.

Sevenson will provide adequate shoring or sloping of sides of the excavation. Excavation/trenches will be inspected daily for changing conditions. Excavation/trenches, regardless of the depth or width, will be barricaded. The use of raised berms, caution signs, and caution tape will be instituted to protect personnel on the site. The excavation area will be delineated with caution tape during operations and barricaded/secured with safety fence at the end of each workday. Adequate means of exit, such as ladders, steps, ramps, or other safe means of egress, will be provided and be within 25 feet of lateral travel. At least two means of exit will be provided for personnel working in excavations. Where the width of the excavation exceeds 100 feet, two or more means of exit

will be provided on each side of the excavation. Personnel will not be allowed to enter an excavation or trench until it has been inspected and deemed safe for entry by the Competent Person for excavation and trenching. Excavation spoils will be kept a minimum of three feet from the edge of the excavation at all times.

4.2.1.7 Slip/Trip/Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but all injuries can be prevented by the following prudent practices:

- Spot-check the work area to identify hazards.
- Establish and utilize a pathway, which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads that you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel.
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.

4.2.1.8 Heat Stress

Heat stress may be a hazard for workers wearing protective clothing even if the temperature is moderate. The same protective materials that shield the body from chemical exposure prevent heat and moisture from dissipating. Personal protective clothing can therefore create a hazardous condition. Depending on the ambient temperature and the work being performed, heat stress can occur very rapidly - within as little as 15 minutes.

In its early stages, heat stress can cause discomfort and inattention, resulting in impaired functional abilities that can threaten the safety of both the individual and his co-workers. Personnel will be instructed to recognize the symptoms of the onset of heat stress. The SSHO will periodically check all personnel working in thermal stress areas to ensure that the symptoms are recognized. Frequency of heat stress monitoring and checks for symptoms of heat stress will increase with rises in air temperature, humidity, and the degree of exposure to high temperature areas.

The guidance for workers is specified in the current version of the ACGIH Threshold Limit Values for Heat Stress. If actual clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, changes should be made to the monitoring requirements and work rest period to account for these differences. ***Table 2 – "Frequency of Physiological Monitoring***" provides the suggested frequency of physiological monitoring for fit and acclimatized workers.

Table 2 Frequency of Physiological Monitoring		
Adjusted Temperature Calculation	Normal Work Clothing	Impermeable Clothing
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 - 90.0°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 (22.5 - 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

The following parameters shall be used until workers are acclimated to working in hot weather. Once acclimated these values should be used as a guideline when monitoring workers:

Heart rate - Count the radial pulse as early as possible in the rest period to ensure a more accurate reading. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period at the same length. If, at the end of the following work period, the heart rate still exceeds 110 beats per minute, shorten the work period again by one-third.

Oral Temperature - The utilization of oral temperature applies to the time immediately after the worker leaves the contamination reduction zone. Using a clinical thermometer, take the temperature for three minutes. If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third, without a change to the rest period. If the oral temperature still exceeds 99.6°F (37.6°C) at the end of the following work period, shorten the next work cycle by one-third. Do not permit a worker to perform duties requiring a semi permeable or impermeable garment if the oral temperature exceeds 100.6°F (38.1°C). Ear canal readings are a valid method to monitor the temperature of workers.

The oral temperature shall not exceed 100.4° F. If an employee's pulse rate exceeds the maximum age-adjusted heart rate (0.7(220-AGE)), and/or the oral temperature exceeds 100.4^{o} F, the employee shall be required to stop work and rest at the work site or move to an air-conditioned room after proper decontamination. The affected employee may be allowed to return to work after his/her pulse rate has dropped below 100 beats per minute. The SSHO in consultation with the affected employee, and medical personnel, if necessary, shall determine whether an employee is ready to return to work. Fluids shall be provided and rest breaks will be taken. The frequency of breaks will increase with the temperature. Such things as cooling vests, portable fans, and breaks in air-conditioned areas shall be used if necessary.

When practicable, the most labor-intensive tasks should be carried out during the coolest part of the day. If necessary, a work/rest regimen will be instituted. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, such as, the Wet Bulb Globe Temperature, duration, and type of activities performed.

A worker who becomes irrational or confused or collapses on the job should be considered a heat stroke victim and medical help should be called immediately. Early recognition of symptoms and prompt emergency treatment is the key to aiding someone with heat stroke. While awaiting the ambulance, begin efforts to cool the victim down by performing the following:

- Move the victim to a cooler environment and remove outer clothing.
- Wet the skin with water, and fan vigorously or repeatedly apply cold packs or immerse the victim in a tub of cool (not- ice) water.
- If no water is available, fanning will help promote cooling.

Any individual showing susceptibility to heat stress will be referred to a physician for evaluation. In addition, the use of prescription drugs can also contribute to the effects of heat stress and will be considered during the assignment of work. Cool (50°-60°F) water or a sport drink, such as Gatorade, will be made available to workers and encourage them to drink small amounts frequently, (e.g., one cup every 20 minutes). Ample supplies of liquids will be placed close to the work area.

4.2.1.9 Cold Stress

Cold injury (frostbite and hypothermia) and impaired ability to work are hazards to persons working outdoors in low temperatures at or below freezing. Extreme cold for a short time may cause severe injury to exposed body surfaces (frost nip or frostbite) or result in profound generalized cooling (hypothermia). Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible to frost nip or frostbite.

Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked. The wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. ***Table 3 – Wind Chill Index*** will be consulted when planning for exposure to low temperatures and wind. The wind chill index does not take into account the specific part of the body exposed to cold; the level of activity, which affects body heat production; or the amount of clothing being worn.

When practicable, the most sedentary tasks should be carried out during the warmest part of the day. If necessary, a light-work rotation schedule should be instituted or the work area heated. Heavy work that will cause heavy sweating resulting in wet clothing must also be monitored. The work/rest regimen consists of alternating periods of work and rest. The duration of these alternating periods will depend on the environmental conditions at the job site, (i.e., the Wind Chill Temperature, duration, and type of activities performed).

Table 3 Wind Chill Index													
Wind (mph)	Actual Temperature (°F)												
	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25
	Equivalent Temperature (°F)												
5	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40
10	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47
15	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51
20	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55
25	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58
30	22	16	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60
35	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62
40	20	13	6	-1	-8	-15	-22	-29	-36	-42	-50	-57	-64
Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V0.16) + 0.4275T(V0.16) T = Air Temperature (°F) V = Wind Speed (mph)							***Frostbite occurs in 15 minutes or less***						

Table 4 - Maximum Daily Time Limits for Exposure at Low Temperatures gives the recommended time limits for working in various low temperature ranges.

Table 4 Maximum Daily Time Limits for Exposure at Low Temperatures	
Equivalent Temperature Range (°F)	**Maximum Daily Exposure**
30 to 0	No limit, providing that the person is properly clothed.
0 to -30	Total work time: 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area.
-30 to -70	Two periods of 30 minutes each at least 4 hours apart. Total low temperature work time allowed is 1 hour.
-70 to -100	Maximum permissible work time is 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air, is recommended.

Table 5 - Work/Warm-up Schedule applies to any 4-hour work period with moderate to heavy work activity, warm-up periods of ten (10) minutes in a warm location and an extended break (e.g., lunch) at the end of the 4-hour period in a warm location. For light-to-moderate work (limited physical movement) apply schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind, a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period.

Table 5
Work/Warm-up Schedule

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph wind		15 mph wind		20 mph wind	
^{0}C (approx.)	^{0}F (approx.)	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks	Max Work Period	No. of Breaks
-26^0 to -28^0	-15^0 to -19^0	(Norm. Breaks) 1		(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4
-29^0 to -31^0	-20^0 to -24^0	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32^0 to -34^0	-25^0 to -29^0	75 min	2	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease	
-35^0 to -37^0	-30^0 to -34^0	55 min	3	40 min	4	30 min	5	Non-Emergency Work Should Cease			
-38^0 to -39^0	-35^0 to -39^0	40 min	4	30 min	5	Non-Emergency Work Should Cease					
-40^0 to -42^0	-40^0 to -44^0	30 min	5	Non-Emergency Work Should Cease							
-43^0 & below	-45^0 & below	Non-Emergency Work Should Cease									

To guard against cold injuries, workers should wear appropriate clothing and use warm shelters for removing personal protective equipment. The personnel decontamination trailer will be used as a warm shelter when required. The SSHO may periodically monitor workers' physical conditions, specifically checking for symptoms of frostbite.

4.2.1.10 Oxygen Deficiency

Oxygen deficiency may occur on-site during dredging maintenance operations or below deck entry, due to displacement of oxygen by other gases in these areas. The oxygen content of ambient air is 20.9 percent. Physiological effects of oxygen deficiency are readily apparent when the

oxygen concentration decreases below 16 percent. Oxygen-deficient conditions may be controlled by air monitoring areas for oxygen concentrations using an O_2/LEL/CO Meter. Air monitoring will reduce risks by indicating when action levels have been exceeded. Oxygen levels less than 19.5 percent will result in an immediate evacuation of the area.

Areas not classified as confined spaces (i.e., engine compartments of dredges and support boats) where oxygen deficient atmosphere may be present shall be posted with a yellow and black warning sign. The warning sign shall convey the potential hazard and control (i.e., WARNING – THIS AREA MAY CONTAIN AN OXYGEN DEFICIENT ATMOSPHERE – AIR MONITORING REQUIRED PRIOR TO ENTRY).

4.2.1.11 Fall from Elevation

To prevent falls and injuries when employees work in areas where fall hazards cannot be eliminated by reasonable means, personnel will be required to use a full body harness and shock-absorbing lanyard. Personnel will make maximum use of primary fall protection systems, such as scaffolding and scissors lifts. These systems will be equipped with standard guardrails and safe means of access/egress.

Before any employee attempts to work in an area where a risk of falls exists, they must equip themselves with suitable fall-arresting equipment. Personnel riding on or working from a man lift must secure their safety lanyards to the basket at all times.

The fall protection equipment will be properly fitted and will not restrict the movements of the worker. Full safety harnesses are required for any work performed over six (6) feet in elevation unless work is being performed from a ladder. Work from portable ladders or fixed ladders less than 24 feet in height that are set up and properly used do not require fall protection. However, if fall protection can be properly utilized, it will be.

Self-retractable lanyards (SRL) of the shortest workable length must be attached to a secure point in the vicinity of the work area. The line will be long enough not to restrict the worker's movements, but short enough to prevent tripping over the line and falls beyond the worker's extended reach for self-rescue; in any case, not over six (6) feet.

Sevenson's Fall Protection Program shall be utilized to control fall from heights during the project. A copy of this program is located in *Appendix F* of this Plan.

4.2.1.12 Working On or Near Water

During the course of the project a significant amount of the work will be conducted on or around water. Prior to commencement of any activities on the water, watercraft will be inspected, radio communication with shore personnel will be established, rescue procedures reviewed, and Coast Guard approved personal flotation devices (PFDs) issued to workers. All equipment and operating personnel will meet or exceed U.S. Coast Guard requirements for safety. Prior to performing work on the water, a float plan will be completed and reviewed by boating personnel as well Naval Stability Lists charts completed.

Sevenson will coordinate the Local Notice to Mariners (LNM) with the United States Coast Guard three weeks prior to intrusive marine activities. The LNM is a notice broadcast to subscribers in the area to make them aware of activities that will be performed in the area.

Sevenson will coordinate with the USCG and local commercial operations on a regular basis to coordinate work efforts and prepare in advance for potential moves. Operations will be moved as required to accommodate commercial and other vessel traffic in the waterway.

Communication in the field will be maintained using portable UHF two-way rechargeable radios. Sevenson has an FCC license to operate on several different UHF frequencies. At a minimum, equipment operators and office personnel will carry radios at all times, as well as NW Natural site managers. This will allow NW Natural personnel to communicate directly with the SES team at all times. The radios will be capable of clearly receiving and transmitting radio communications over the project area. Sevenson will also monitor general marine communication on VHF channels 13 and 16. Boat operators will also have UHF radios.

4.2.1.13 Night Work Lighting Requirements

Operations conducted at night need to be properly illuminated. Table 6 defines the minimum lighting requirements for the project.

Table 6
Minimum Illumination Intensities in Foot-Candles

Foot-Candles	Area or Operation
5	General construction area lighting.
3	General construction areas, concrete placement, excavation and waste areas, access ways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and exit ways.
30	First aid stations, infirmaries, and offices.

4.2.1.14 Wildfire Smoke Guidance

Wild fires can produce hazardous smoke and potentially be windblown to project sites. Wildfire smoke is a complex mixture of carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons and other organic chemicals, nitrogen oxides, and trace minerals. The individual compounds present in smoke number in the thousands.

Particulate matter (PM2.5) is the principal pollutant of concern from wildfire smoke for the relatively short-term exposures (hours to weeks). PM2.5 can be inhaled into the deepest recesses of the lung and may be a potential health concern. Another pollutant of concern during smoke events is carbon monoxide, which is a colorless, odorless gas produced by incomplete combustion of wood or other organic materials. Carbon monoxide levels are highest during the smoldering stages of a fire, especially in very close proximity to the fire.

Respirators, such as N95s and other filtering face piece respirators, may provide additional protection to some employees against wildfire smoke. N95 particulate filtering face piece respirators or respiratory protection devices with a higher level of protection are more appropriate for this type of inhalation hazard. Employees whose work assignments require the use of respirators must be included in a respiratory protection program (including training, medical evaluations, and fit testing). However, Sevenson may provide filtering face piece respirators to employees who voluntarily choose to use them to protect themselves against wildfire smoke; in

this situation (voluntarily use) Sevenson is not required to provide a medical evaluation or fit-test. Sevenson will however educate employees on volunteer use of respiratory protection and the limits the particular device(s) may have.

Sevenson policy will be to avoid non-essential field work when the AQI is 101 or greater. The use of controls (N95 masks, or air purifying respirators) during smoky conditions in order to continue with field work will not be implemented when the AQI is greater than 150, unless first approved by the Director of Health and Safety and a Vice President of Operations for Sevenson. For work to continue with an AQI between 101 and 150, justification must be established by project management as to why the work cannot be delayed until conditions improve. You have "Stop Work Authority." *Sevenson's Protection from Wildfire Smoke Plan is in Appendix K.*

4.2.2 Chemical Hazards

Operational chemicals may be brought to the project-site for use in activities supporting the construction activities. These chemicals are used for fuels in operating heavy equipment, glues for welding pipes, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). Safety Data Sheets (SDSs) for operational chemicals are kept on file in the project office trailer. An inventory list of the anticipated operational chemicals (Hazardous Chemical Inventory List) for use at the site will be maintained at the site and updated as new material is received.

After reviewing the environmental sampling results, it has been determined that the primary contaminants of concern are coal tar pitch compounds. A worker protection program and air monitoring program for the chemicals of concern can be found in other sections of this CHASP. Chemical Information Sheets for coal tar pitch can be found in *Appendix C.*

4.2.3 Biological Hazards

There is a potential for encountering biological hazards such as bites from ticks, spiders, rodents, and snakes, and exposure to poison ivy and oak. Biological hazards and controls are presented below.

4.2.3.1 COVID-19

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the SARS-CoV-2 virus. It has spread from China to many other countries around the world, including the United States. Depending on the severity of COVID-19's international impacts, outbreak conditions including those rising to the level of a pandemic can affect all aspects of daily life. Lack of continuity planning can result in a cascade of failures as employers attempt to address challenges of COVID-19 with insufficient resources and workers who might not be adequately trained or understand the risks that may exist under pandemic conditions. Sevenson will continue to monitor the current situation and use all reliable resources as guidance to help identify risk levels in workplace settings and to determine any appropriate or additional control measures to be implemented or as directed by Local, State and Federal Authority. Additional guidance may be needed as COVID-19 outbreak conditions change, or as new information about the virus, its transmission, and impacts, becomes available. The CDC as well as local and State websites provide the latest information about COVID-19 transmission *www.cdc.gov/coronavirus/2019-ncov/about/transmission.html*

4.2.3.2 Needlestick Injuries

A needle stick injury occurs when a carelessly discarded hypodermic needle penetrates your skin, for example, through stepping on a syringe and/or needle that has been discarded at the site. Needle stick injuries transmit infectious diseases, especially blood-borne viruses. Accidental punctures by contaminated needles can inject hazardous fluids into the body through the skin. There is potential for injection of drugs, but injection of infectious fluids, especially blood, is by far the greatest concern. Accidental injection of blood-borne viruses is the major hazard of needle stick injuries, especially the viruses that cause AIDS (the HIV virus), hepatitis B, and hepatitis C.

General Universal Precautions will be observed to prevent contact with hypodermic needles or other potentially infectious materials. Work practice controls will be used to eliminate or minimize employee exposure (i.e. inspect area prior to work). If you are stuck by a discarded needle, immediately report it to the SSHO. Following a report of an exposure incident, the employer will immediately make available to the exposed employee medical evaluation counseling, treatment, and post-exposure prophylaxis, when medically indicated.

4.2.3.3 Ticks

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to affect workers. Ticks are vectors of many different diseases including Lyme disease. They attach to their host's skin and intravenously feed on its blood creating an opportunity for disease transmission. Covering exposed areas of the body and the use of commercially prepared tick repellent, such as N, N-Diethyl-m-toluamide (DEET), help prevent tick bites. Please note that there are some concerns with the use of DEET on skin and associated potential adverse health effects. Periodically during the workday, employees working in tall grass will inspect themselves for the presence of ticks and notify the SSHO of any tick bites as soon as possible. Ticks shall be removed at the mouth with guidance from healthcare service.

4.2.3.4 Rodents and Wildlife

During site operations, animals such as mice and rodents may be encountered. Workers will use discretion and avoid all contact with animals. If these animals are interfering with site operations, or if dead animals are observed, the SSHO should be contacted immediately for assistance and advice.

Hanta virus Pulmonary Syndrome (HPS) is a disease that may be contracted when a person comes into contact with Hanta virus-infected rodents, their nesting materials, droppings, urine, or saliva. HPS may develop when virus particles are inhaled, absorbed through broken skin or the eyes, or when bitten by an infected animal. The majority of HPS cases have been reported in the southwest; however, there is the potential for Hanta virus transmission in most regions with rodent populations. Risk to workers at the site is considered to be low; however, the severity of disease is high. Therefore, field personnel should be aware of the potential for exposure and should avoid coming into contact with rodents or their burrows or dens.

Rabies is an acute, infectious, often fatal viral disease transmitted to humans by the bite of warm-blooded, infected animals. This disease affects the central nervous system of humans. A rabid animal may be recognized by signs of raging, uncontrollable movement and possible foaming near or at the mouth. The best control method is avoidance of animals that could be rabid. If bitten by a potentially rabid animal, contact the SSHO immediately. The animal in question must be

captured or trapped so that it can be tested for rabies. The bitten individual will seek medical attention immediately.

4.2.3.5 Poisonous Plants

Poison ivy, poison oak, and poison sumac are identified by three or five leaves radiating from a single stem. Poison ivy is in the form of a vine while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, which is active in live, dead, and dried parts. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals. Symptoms usually occur 24 to 48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, wash the affected area with a mild soap and water within one-half hour, but do not scrub the area. The best preventative measure for poisonous plants is recognition and avoidance.

4.2.3.6 Snakes

The degree of toxicity resulting from snakebites depends on the potency of the venom, the amount of venom injected, and the size of the person bitten. Poisoning may occur from injection or absorption of venom through cuts or scratches. The most effective way to prevent snakebites is to avoid snakes in the first place. Personnel should avoid walking at night or in high grass and underbrush. Visual inspection of work areas should be performed prior to activities taking place. The use of leather boots and long pants will be required, since more than half of all bites are on the lower part of the leg. No attempts at killing snakes should be made; many people are bitten in such an attempt. Personnel will not put their hands in areas where they cannot be seen.

4.2.3.7 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while project activities occur. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET. Please note that there are some concerns with the use of DEET on skin and associated potential adverse health effects. Treatment for insect bites and bee stings can be effected by the use of commercially prepared ointments. Personnel who are allergic to bee stings will notify the SSHO prior to working on the project.

4.2.3.8 Spiders

Personnel will be alert to the potential for spider bites. Spiders sometimes establish residence in stored clothing and PPE. It is advisable for personnel to inspect clothing and PPE for spiders prior to donning. In Idaho the hobo and black widow spider are of medical concern. Immediate reporting and medical evaluation is necessary if personnel suspect being bitten by Hobo or Black Widow spider. If a spider bite is sustained, personnel will report it to the SSHO.

4.2.3.9 Snapping Turtles

The common snapping turtle is an aggressive, freshwater turtle usually found in ponds, streams, and canals. They will defend themselves if cornered and cut off from the water by striking out with their head, which can reach almost all the way back along the shell. In the water, snapping turtles will always leave instead of attack; however, they may become curious and approach swimmers or boats very closely. If encountered, avoid the turtle and allow it adequate room to escape. If approached, make loud splashing noises.

4.2.4 Water Fowl

Water fowl, particularly geese, can present a hazard during the nesting season. The may charge aggressively to protect nest sites and young against people. Goose attacks on humans have caused serious physical injury, such as broken bones, head injuries and emotional distress. If attacked, maintain direct eye contact and keep your chest and face pointed towards the goose. If the goose acts aggressively, calmly and slowly back away, watching for obstacles. Maintain a neutral demeanor, i.e., do not act hostile or show fear.

Areas where water fowl congregate can be soiled with droppings, creating a slipping hazard. Droppings may also carry disease. Do not feed water fowl.

4.3 Engineering Controls

The use of engineering controls for the protection of personnel is the first means of mitigation. This involves the elimination of hazards and the isolation of the workers from the hazards. Implementation of engineering controls can reduce the need for personal protective equipment by separating the worker from the contaminated material. During sediment processing and stockpiling dust may be generated. The SSHO will be constantly alert to the possibility of unacceptable dust levels.

4.3.1 Dust Control

Handling saturated dredged sediment, dust is not expected to become an issue. However, any dust experienced will be controlled within the work area to protect workers and public health by employing practices in accordance with the CHASP, and local ordinances.

Control measures will be implemented for all operations where dust is likely to be generated. Careful planning and implementation of controls will reduce potential dust concentrations. There are a number of specific construction practices, which will reduce levels of airborne particulates. These include:

- Providing for a water misting spray during material handling activities.
- Applying water using a water truck on upland areas as needed
- Reducing the active work area surface and limiting the number of concurrent operations.

4.3.2 Noise Control

Noise levels will be controlled to meet the applicable OSHA standards for workers as well as for the off-site community. This will be accomplished by the use of mufflers on equipment and planning of operations to comply with local Noise Statutes.

5.0 SAFETY AND HEALTH TRAINING

5.1 HAZWOPER

Prior to arrival on-site, Sevenson will be responsible for certifying that the employees having to access an exclusion zone or contamination reduction zone meet the requirements of pre-assignment training, consistent with OSHA 29 CFR 1910.120(e)(3). Sevenson will provide documentation certifying that each general Site worker has received a minimum of 40 hours of instruction off site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. All personnel must also receive 8 hours of refresher training annually. At no time should anyone be working on-site without the minimum

training requirements. Consistent with OSHA 29 CFR 1926.65(e)(4), individuals designated as Site Supervisors require an additional 8 hours of training. A certificate of Worker/Visitor Acknowledgement will be completed and submitted for each site worker and visitor who will enter the contamination reduction zone, and/or exclusion zone.

5.2 Site-Specific Training

All personnel working at the Site during construction activities will review this CHASP with the SSHO. Personnel will sign an acknowledgment form to document their review and agreement to comply with the provisions of the CHASP. All visitors must sign the visitor's log and wait in the Sevenson field office for a briefing before entering the Site.

The SSHO will be responsible for ensuring Site visitors are trained in the hazard associated with the Site, to explain emergency procedures, and instruct them in the use of protective gear required during the visit.

As a minimum the site-specific training will include:

- Explanation of the overall CHASP.
- Project management and roles.
- Health effects of chemicals used at the Site.
- Physical hazards associated with the project.
- Selection, use, and limitations of available safety equipment and proper procedures for its use.
- Personal hygiene and decontamination for chemicals used at the Site.
- Site rules and regulations.
- Site communication and the “Buddy System”.
- Emergency preparedness procedures.
- Fall Protection Equipment.
- Water Safety.
- Review applicable Sevenson Standard Operating Procedures.
- Site Specific Hazard Communication.

5.3 Periodic Sessions

Periodic training will be provided at least weekly and prior to each change of operation. The training will address safety and health procedures, work practices, any changes to the CHASP, review activity hazard analysis, work task or schedule, and review of safety discrepancies and accidents.

5.4 Safety Meetings

A well-ordered flow of information is essential to a good safety program. Sevenson, through a program of safety meetings at all levels, intends to accomplish the goals of safety awareness, education, and participation.

The SSHO will conduct daily safety meetings with ALL on-site personnel. An opportunity will be provided for employees to voice safety-related concerns. A synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items, and a signed attendance list.

5.5 Hazard Communication Training

OSHA's standard for hazard communication requires that all workers be informed of potentially hazardous materials used in their work area. Sevenson provides employees with information and training on hazardous chemicals at their work site at the time of their initial assignment, annually, and whenever a new chemical is introduced into their work site that could present a potential hazard. Personnel are briefed on the general requirements of the OSHA hazard communication standard and duty-specific hazards by their immediate supervisor before they begin any duties on the work site. Personnel transferred from another site are also briefed on the duty-specific hazards by their immediate supervisor before they begin any duties on the work site.

5.6 First Aid/CPR Training

At least one site personnel will be required to complete first aid and cardiopulmonary resuscitation (CPR) training and receive the appropriate certification. CPR certification is renewed annually; first aid certification is renewed every three years. All first aid/CPR training is American Red Cross-approved or in accordance with OSHA standards. Additionally, First Aid/CPR qualified personnel will have received blood borne pathogen training as required by 29 CFR 1910.1030.

A list of personnel who are qualified and are willing to perform first aid and/or CPR in the event of an injury or illness will be posted with the emergency phone list and map to the hospital. This list will be updated as necessary to reflect qualification expirations, requalification, or as personnel are added or removed from the project. It will be the duty of the SSHO to update and ensure the accuracy of this list within two working days of a qualification or employment status change.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section provides an outline of the PPE and guidelines that will be implemented to minimize chemical, physical, and biological exposures and accidents during construction activities. Where engineering controls and job hazard analyses do not eliminate all job hazards, employees will (where appropriate) wear PPE.

These include items such as, hard hats, face shields, safety goggles, glasses, hearing protection, foot guards, gloves, etc. The SSHO will ensure that equipment selected will meet the following requirements:

- It will be appropriate for the particular hazard.
- It will be maintained in good condition.
- It will be inspected for defects prior to donning or use.
- It will be properly stored when not in use to prevent damage or loss.
- It will be kept clean, fully functional, and sanitary.
- Must meet all applicable ANSI standards.

Personal clothing and jewelry can present additional safety hazards. Supervisors will ensure that workers wear appropriate clothing, which will not interfere with the PPE. All PPE will be selected

in accordance with 29 CFR 1910.132. Sevenson will provide proper PPE to all employees (except prescription safety glasses and safety shoes). All protective clothing will be properly used, stored, selected, and maintained.

6.1 PPE Hazard Assessment

Selection of the appropriate PPE is a complex process, which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, routes of potential exposure to employees (inhalation, skin absorption, ingestion, and eye or skin contact), and the performance of the PPE materials (and clothing seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found that will provide continuous protection from the particular hazardous substance. In these cases, the breakthrough time of the protective material should exceed the work duration.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases, layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits, or equipment.

Personal Protective Equipment alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound work practices.

6.1.1 Head Protection

All personnel will wear a hard hat that meets the requirements and specifications in ANSI Safety Requirements for Industrial Head Protection Z89.1-1969. Exceptions to this requirement are personnel in the site office, rest and eating areas, or in equipment or vehicles equipped with a falling object protection system.

6.1.2 Hand Protection

Leather gloves will be required for all construction type work at the site unless otherwise specified in the SPA. Outer gloves used on the Site for handling contaminated material will be chemical resistant. The appropriate glove will be determined by the SSHO for a specific work task. Chemical resistant gloves will be selected using appropriate chemical degradation guides. Leather or cut resistant (Kevlar) work gloves will be worn when work activities require the handling of sharp and rough-surfaced objects. If sharp or rough surfaced objects are located inside an exclusion zone, leather or cut resistant gloves will be worn over the chemical resistant gloves. Contaminated leather or cut resistant gloves will remain inside the exclusion zone or disposed of prior to leaving the contaminated area.

Always reference the SDS for the chemical or product being used to determine the appropriate hand protection.

6.1.3 Eye/Face Protection

Eye protection will be worn by all personnel. Double eye protection will be required when power-washing equipment. All eye/face protection provided will be ANSI Z87 approved. Face shields

will be required during pressure washing, grinding, and chainsaw activities. Chemical goggles may be required when handling chemicals. Always reference the SDS for the chemical or product being used to determine the appropriate eye and face protection.

6.1.4 Footwear

At least one layer of foot protection will be a steel/composite-toed safety boot. All safety boots will be ASTM F2413 approved. Additional or alternate footwear may be required or authorized by the SSHO.

6.1.5 Respiratory Protection

To control and or minimize the threat of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program will be to prevent atmospheric contamination. This will be accomplished as far as feasible by accepted engineering control measures (for example, dust suppression). When effective engineering controls are not feasible, or while they are being instituted, appropriate respiratory protection will be used. A respiratory protection program will be implemented that is compliant to the requirements of 29 CFR 1910.134, "Respiratory Protection." Respiratory protection equipment will be NIOSH-approved, and respirator use will conform to ANSI Z88.2.

Respirators will be provided when such equipment is necessary to protect the health of the employee. Sevenson will:

- Provide the respirators, which are applicable and suitable for the purpose intended.
- Be responsible for maintaining a written Respiratory Protective Program in accordance with 29 CFR 1910.134. The employee will use the provided respiratory protection in accordance with instructions and training received.
- Respirators will be selected on the basis of hazards to which the worker is exposed.
- The user will be instructed and trained in the proper use of respirators and their limitations.
- Respirators will be regularly cleaned and disinfected.
- Respirators will be stored in a convenient, clean, and sanitary location.
- Respirators used routinely will be inspected during cleaning. Worn or deteriorated parts will be replaced. Respirators for emergency use, such as self-contained devices, will be thoroughly inspected at least once a month and after each use.
- Appropriate surveillance of work area conditions and degree of employee exposure or stress will be maintained.
- There will be regular inspections and evaluations to determine the continued effectiveness of the program.
- Employees will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician will determine whether an individual is physically fit to wear a respirator. The physician's clearance allows the worker to don a respirator and work in conditions of high ambient temperatures. Heat stress will be closely monitored.

Each respirator will be individually assigned and not interchanged between workers without cleaning and sanitizing. The cartridges/filters will be changed daily and at the first sign of end of

service life indications i.e., breakthrough based on contaminant warning properties or if the user experiences excessive breathing resistance. Respirators will be cleaned and stored in an uncontaminated atmosphere after each use. Used cartridges will be disposed in the trash.

All employees working at the Site during construction activities who have the potential of wearing a respirator will be fit-tested to ensure they utilize the proper size respirator. Sevenson will arrange for fit testing. The fit test is conducted according to the manufacturer's suggestions. The test will consist of an odorous vapor qualitative test. As per OSHA regulations, personnel that are unable to pass a fit test will not enter a work area when respiratory protection is required. In addition, facial hair is prohibited from the respirator seal area. Any person with facial hair will not be permitted to enter a work area where respiratory protection is required, regardless of the fit test results. Documentation of the fit testing will be maintained on-site.

Sevenson's Respiratory Protection Program can be referenced in Appendix D.

6.2 Exclusion Zone PPE

6.2.1 Level A

Level A equipment, used as appropriate, is as follows:

- Positive pressure, full face piece, self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA (NIOSH-approved)
- Fully encapsulating suit (Tychem, butyl rubber)
- Outer gloves: neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable over boots.
- Steel-toed safety boots
- Hard hat

6.2.2 Level B

Level B equipment, used as appropriate, is as follows:

- Positive pressure, full face piece, self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA (NIOSH-approved)
- Disposable coverall (Tyvek, Polycoated Tyvek or Saranex)
- Outer gloves: neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable over boots.
- Steel-toed safety boots
- Hard hat

6.2.3 Level C

Level C equipment, used as appropriate, is as follows:

- Full-face, air purifying, cartridge-equipped respirators (NIOSH-approved) utilizing P-100 (HEPA) filters, Organic Vapor (OV) cartridges, or a P100/OV combination cartridge (half-face if approved by SSHO). Cartridges and/or filters must be replaced as needed and, as a minimum, changed daily.
- Disposable coverall (Tyvek or Polycoated Tyvek)

- Outer gloves: leather, cotton, neoprene or nitrile
- Inner gloves: latex or nitrile
- Chemical resistant or disposable over boots
- Steel-toed safety boots
- Hard hat

6.2.4 Modified Level D

Modified Level D equipment, used as appropriate, is as follows:

- Disposable coveralls – Tyvek or Polycoated or equivalent for wet work (equipment decontamination) or as required
- Outer gloves – leather, cotton, nitrile as required
- Inner gloves – nitrile surgical with cotton liner (cotton liner optional)
- Boot covers – Tyvek or equivalent
- Outer boots – rubber or latex disposable
- Safety boots
- Hard hat
- Reflective vests
- Safety glasses – with face shield as required

1. SSHO shall determine the need for upgrade or downgrade of PPE levels based on a conservative interpretation of information provided by air monitoring data and other appropriate information.
2. The SSHO's Daily Safety and Inspection log will list protective ensemble(s) in use for each task.

6.2.5 Level D

Level D equipment, used as appropriate, is as follows:

- Work uniform (Long pants and Shirt)
- Reflective vests
- Hard hat
- Steel-toed safety boots (with disposable over boots, as required)
- Safety glasses
- Cut resistant gloves (as needed)
- PFD (as needed)

Air monitoring using direct-reading instruments and personal air sampling will be performed to determine if an upgrade or downgrade from initial PPE levels is warranted. All decisions on the level of protection will be based upon a conservative interpretation by the SSHO of the information provided by air monitoring results, environmental results, and other appropriate information.

6.3 Initial Levels of Protection

Based upon Sevenson's experience from past projects, the levels of contamination identified in project documents, and the nature of the construction activities to be performed at the site, the initial levels of protection to be used are outlined in ***Table 7, "Initial Levels of Protection***". This

table lists each work task and the initial level of protection. The initial level of protection is defined as that level in which work commences.

Table 7
Initial Levels of Protection

Task	Level
Mobilization	D
Site Preparation	D
Turbidity Curtain Installation	D
ISS/Grout Plant	D Modified (Tyvek)
Mechanical swell removal	D Modified (Tyvek)
Sediment Stabilization	D Modified (Tyvek)
Trans loading	D Modified (Tyvek)
Dewatering Activities	D Modified (Tyvek)
Restoration	D
Demobilization	D

Air monitoring using direct-reading instruments will be performed to determine if an upgrade or downgrade from initial PPE levels is warranted. All decisions on the level of protection will be based upon a conservative interpretation by the SSHO of the information provided by air monitoring results, environmental results, and other appropriate information

7.0 MEDICAL SURVEILLANCE PROGRAM

The Medical Surveillance Program is designed to track the physical condition of employees on a regular basis as well as survey pre-employment or baseline conditions prior to potential exposures. The Medical Surveillance Program is a part of the overall Sevenson Safety and Health program.

7.1 Baseline Medical Monitoring

Each employee must receive a baseline physical, which can be part of an annual medical monitoring program, prior to being permitted to enter the Exclusion Zone or Contamination Reduction Zone. The content of the physical has been determined by Sevenson's Occupational Physician as suggested by NIOSH/OSHA/USCG/EPA's Occupational Safety & Health Guidance

Manual for Hazardous Waste Site Activities. The minimum medical monitoring requirements for work at the Site are as follows:

- Complete medical and work histories
- Physical examination
- Pulmonary function tests (FVC and FEV1)
- Blood chemistry (CBC & SMAC 24)
- Urinalysis with microscopic examination
- Audiometric Testing
- Eye examination and visual acuity
- Chest X-Ray (as directed by the Occupational Physician)
- Electrocardiogram (as directed by the Occupational Physician)
- Other Biological testing as prescribed by the Occupation Physician

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to use either positive- or negative-pressure respiratory protection equipment. Any individual found to have a medical condition, which could directly or indirectly be aggravated by exposure to these site contaminants, will not be employed for the project. Individuals not capable of satisfying the project requirements for wearing respiratory protection equipment will be evaluated on a case-by-case basis based prior to being employed. A copy of the medical examination is provided at the employee's request.

The employees will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites. A certificate of Worker/Visitor Acknowledgement will be completed and submitted for each site worker and visitor who will enter the contamination reduction zone and/or exclusion zone.

7.2 Periodic Monitoring

In addition to a baseline physical, all employees require a physical every 12 months unless the advising physician believes a shorter interval is appropriate. The Occupational Physician has prescribed an adequate medical evaluation, which fulfills OSHA 29 CFR 1910.120 requirements. The pre-assignment medical outlined above is applicable.

All personnel working on the Site that enter an active Exclusion or Contamination Reduction Zone will verify currency (within 12 months) with respect to medical monitoring. Sevenson will obtain a copy of the physician's written opinion detailing the employee's ability to perform hazardous waste site work. The Safety and Health Manager or Occupational Physician will make the determination on additional sampling.

7.3 Exposure/Injury/ Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the occupational health physician to advise the type of test required to accurately monitor for exposure effects.

Any employee, who develops a time loss illness exceeding one working day, or injury during the period of the contract, must be evaluated by the occupational health physician. A written statement indicating the employee’s fitness, signed by the occupational physician must be submitted prior to the employee entering the work site.

7.4 Medical Records

The results of medical testing and full medical records will be maintained in accordance with 29 CFR Part 1910.1020. A copy of the medical certification will be kept on the Site for each person entering the Contamination Reduction Zone and Exclusion Zone.

8.0 AIR MONITORING

Swells to be removed are expected to be generally wet sediment with highly aged and weathered contaminants, and with minimal potential for particulate or gaseous airborne emissions. The primary contaminates of concern are BTEX. Worker exposure to this primary contaminates will be monitored as determined by the SSHO with the use of real time instrumentation and integrated air monitoring equipment and methodologies.

8.1 Occupational Monitoring

8.1.1 BTEX and Naphthalene

Real-time air monitoring for BTEX and naphthalene will be performed at the work area and on the park walkway for the public exposure zone using a Multi RAE photo-ionization detectors (or equivalent) with 10.6 eV PID lamps. Instrument alarms shall be set at the action level described in Table 8. In the event of an action level alarm, the SSHO shall be immediately notified. The SSHO will be responsible for assessing the action level alarm and recommending corrective actions. Readings shall be data logged in 15-minute intervals. Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

8.1.2 Hydrogen Sulfide

During the dredging process and the handling of contaminated sediments there is a potential for hydrogen sulfide generation from anaerobic sources. Hydrogen sulfide monitoring will be conducted periodically during dredging and sediment processing activities until a negative exposure assessment can be made. Hydrogen sulfide monitoring will be conducted with portable gas monitoring equipment. Hydrogen sulfide monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site

8.1.3 O_2, LEL, CO

A Multi-RAE Plus or equivalent Portable Gas Monitor will be utilized to monitor for explosive, oxygen enriched/deficient atmospheres during confined space entries, hot work permit operations, and during sediment processing activities. Monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

8.1.4 Integrated Exposure Monitoring

To determine worker exposure to the various contaminates and to determine the accuracy of the real time air monitoring, worker exposure monitoring using NIOSH and OSHA protocols will be conducted. This monitoring will take place at the beginning of each operation in which there is the

potential for airborne exposure the contaminant of concern. Also, if the particulate and/or vapor real time action limit is exceeded, exposure monitoring will then occur. Two of the potentially highest exposed workers per shift will be sampled during each event.

Sample results will be sent to the SSHO and the SHM for review. Affected employees will be notified of the sample results by the SSHO within five working days of their receipt.

8.2 Perimeter Monitoring

8.2.1 VOCs

Real-time air monitoring for VOCs (BTEX and naphthalene) will be performed during ISS implementation and swell removal using a Mini RAE photo-ionization detectors (or equivalent) equipped with 10.6 eV lamps upwind and downwind of the project area and in the direction of the nearest potential receptor. Instrument alarms shall be set at the action level described in Table 8. Measurements will be data will be transmitted to a cloud server and reviewed by the SSHO throughout the shift. These instruments will be equipped with an action level notification system to alert the SSHO of action level event. If an action level event is reached the SSHO will evaluate the action level event and direct the worker(s) on the appropriate course of action based on Table 8 Operational Action Levels for Perimeter Monitoring. Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

8.2.2 Particulate

Fugitive dust emission monitoring will be performed during ISS implementation and swell removal using a Dust Trak Particulate Monitor upwind and downwind of the project area and in the direction of the nearest potential receptor. Measurements will be data will be transmitted to a cloud server and reviewed by the SSHO throughout the shift. These instruments will be equipped with an action level notification system to alert the SSHO of action level event. If an action level event is reached the SSHO will evaluate the action level event and direct the worker(s) on the appropriate course of action based on Table 8 Operational Action Levels.

Real-time air monitoring equipment calibration will be performed in accordance with the manufacturer's recommendation prior to field use. Calibration information will be recorded on the Daily Air Monitoring Report. Maintenance and calibration procedures for all air monitoring devices will be maintained on site.

8.3 Decision Making for Real Time Data

A decision-making protocol for an upgrade in levels of protection and/or withdrawal of personnel from an area based on atmospheric hazards determined by real time data is outlined in ***Table 8 – "Operational Action Levels".***

Table 8 Operational Action Levels 8-hour TWA					
Air Monitoring Instrument	**Monitoring Location**	**Task**	**Action Level**	**Site Action**	**Reason**
Multi-Rae Plus with 10.6 eV lamp	Work Area	Hot Work Permit	LEL: > 0 % O_2: > 23.0 % VOC: > 1 ppm H_2S: > 10 ppm	Do not perform hot work activities! Ventilate area	Increase risk for fire or explosion
Multi-Rae Plus with 10.6 eV PID lamp	Work Area	ISS Implementa-tion and Swell removal	VOC 1-5 ppm sustained for 5 minutes (non benzene)	Collect benzene colorimetric tube, follow detector tube for benzene below. No respiratory protection required	Below ½ action level.
			> 5 ppm sustained for 5 minutes (non-benzene)	Stop work. Collect colorimetric tube for naphthalene and benzene.	May meet action level of some hydrocarbons.
Multi-Rae Plus	Work Area	ISS Implementa-tion and Swell removal	H_2S: > 10 ppm	Evacuate area, notify SSHO and Health and Safety Manager immediately	50 percent of OSHA PEL. Process needs to be evaluated by Health and Safety Manager
BTEX and Naphthalene (passive badge via NIOSH 1501)	Work Area/ Breathing Zone	ISS Implementa-tion and Swell removal	Benzene >0.5 ppm Ethylbenzene >20 ppm Toluene >20 ppm Xylene > 20 ppm Naphthalene > 10 ppm	Upgrade to Level C or control source of dust emission	Exceeds OSHA PEL
Perimeter Monitoring Action Levels					
Fugitive Dust PM-10 Real Time	Perimeter	ISS Implementa-tion and Swell removal	> 0.150 mg/m^3	Investigate dust generating activities, if caused by site work stop work and implement dust controls	Exceeds NAAQS for fugitive dust emissions
VOCs (PPB Rae with 10.6 eV PID lamp)	Perimeter fence line	ISS Implementa-tion and Swell removal	> 0.040 ppm	Investigate VOC source and caused by work stop and implement vapor controls in work area	Exceeds benzene calculated EPA regional screening level (RSL).*

8.4 Exposure Monitoring

To determine worker exposure to the various contaminates and to determine the accuracy of the real time air monitoring, worker exposure monitoring using NIOSH and OSHA protocols will be conducted. This monitoring will take place at the beginning of each operation in which there is the potential for airborne exposure the contaminant of concern. Also, if the particulate and/or vapor

real time action limit is exceeded, exposure monitoring will then occur. Two of the potentially highest exposed workers per shift will be sampled during each event.

Sample results will be sent to the SSHO and the SHM for review. Affected employees will be notified of the sample results by the SSHO within five working days of their receipt.

8.4.1 Benzene Detector Tubes

An Ultra RAE 3000 with Benzene tubes capable of detecting benzene at 0.5 ppm is not impacted by other VOCs and carbon monoxide that may be present inside the containment structure and will be used to determine the benzene fraction of the gross VOCs measured by the PID.

8.4.2 BTEX/Naphthalene Sampling

Occupational sampling for BTEX compounds and naphthalene may be conducted on a periodic basis to determine the benzene fraction for the BTEX compounds. Worker exposure to BTEX will be monitored with a 3M Organic Vapor Monitoring Badge (NIOSH Method 1501) BTEX sampling will be conducted on the first three days of contaminated Dredging and material handling on one operator and one laborer each day. After the initial exposure assessment, It will be determined if an exposure risk exists the frequency will be decreased to one operator and one deck hand twice a month during contaminated material handling. The frequency of sampling may be increased by the SSHO or SHM at any time based on real time VOC measurements or BTEX sampling results.

9.0 ACCIDENT PREVENTION PROCEDURES/PRACTICES

9.1 Medical and First Aid Requirements

Applicable Standards:

OSHA 29 CFR 1926.23, & 1926.50

First-aid kits/stations and required contents are maintained in a serviceable condition. Unit-type kits have all items in the first-aid kit individually wrapped, sealed, and packaged in comparable sized packages. First-aid stations will be located as close as practicable to the highest concentration of personnel. First-aid stations will be well-marked and available to personnel during all working hours. First-aid stations will be equipped with a first-aid kit, the size of which will be dependent upon the number of personnel normally employed at the work site.

Emergency telephone numbers and Route to the Area Hospital will be clearly posted and easily visible at all times. There should be OSHA posters prominently displayed and warning signs posted for any known or potential hazard(s) present. SDSs must be available on the job site at all times.

Eye wash stations will be made available at each contamination reduction zone and in areas where chemical/compound SDSs indicate flush eyes in slashed into the face or eyes.

9.2 Hazardous Substances

Applicable Standards:

OSHA 29 CFR 1926.53 & 1910.1200

When hazardous substances are used in the workplace, the hazard communication program dealing with SDSs, labeling, and employee training will be in operation. SDS materials will be readily available for each hazardous substance used. A training program, plus regular question and answer

sessions on dealing with hazardous materials will be given to keep employees informed. The program will include an explanation of what an SDS is and how to use and obtain one; SDS contents for each hazardous substance or class of substances; explanation of the "Right to Know"; identification of where employees can see the employer's written hazard communication program and where hazardous substances are present in their work area; the health hazards of substances in the work area, how to detect their presence, and specific protective measures to be used; as well as informing them of hazards of non-routine tasks and unlabeled pipes.

9.3 Fall Protection

Applicable Standards:

OSHA 29 CFR 1926.500, 501, 502, 503; 1926.106

To access high and low places on jobsites a variety of equipment may be used such as ladders, scaffolding, suspended platforms, aerial lifts, stairways, and climbing lines. The use of these access systems often presents fall hazards. In addition, employees may be exposed to falls while working on elevated structures, climbing onto and off of equipment, and even while walking by falling through holes or by slipping or tripping.

To protect employees when they are exposed to fall hazards, some form of fall protection must be used. The most common forms of fall protection are guardrails, personal fall arrest systems, hole covers, and safety nets. Any one, or all of these forms of fall protection may be used on construction worksites. The current OSHA standards also require that employees receive training regarding fall protection issues, and that the training is documented. An alternate fall arrest program may be implemented in cases where none of the traditional methods of fall protection are feasible. Components of our fall protection plans are listed below:

Personal Fall Arrest System - The three main parts of a personal fall arrest system are the body belt or harness, the lanyard/lifeline, and a suitable anchorage. Particular attention must be paid to the anchorage point(s) to ensure that they are capable of supporting 5,000 lb. (22.2 kN) or two times the maximum load on an engineered system.

Guardrail Systems - Guardrail systems consist of a top rail, midrail, and if necessary a toe board. Guardrail systems can be made of various materials.

Training - All employees must receive training on the nature of the fall hazards at the site and on how to avoid falls. Employees should be familiar with the use of all personal fall arrest systems and must wear the equipment when necessary.

The requirements of all applicable OSHA regulations notwithstanding, the minimum fall protection requirements on our projects may include the following:

- All fall protection systems must meet the requirements of Part 1926, Subpart M.
- For situations where lifelines are interrupted, double lanyards are necessary to ensure that the worker is continuously protected from falling by attaching one lanyard ahead of the discontinuity prior to unhooking the trailing lanyard. Where practical, SRL shall be used instead of traditional lanyards.
- Where scaffolds are necessary to provide temporary access to work areas, they must follow §1926.451. Scaffolds must include a top rail, mid rail, and toe board in compliance with 1926.451, on all open sides and ends. Personal fall arrest systems meeting the criteria of Part

1926 Subpart M are required to protect workers during installation and removal of the railings, and in situations where physical restrictions preclude installation of a standard railing. Where practical, SRL shall be used instead of traditional lanyards.

- All workers in approved personnel aerial lifts must use a restraining system meeting the criteria of Part 1926 Subpart M, with the lanyard attached to the manufacturer's designated anchor point, as required by OSHA 1926.556.
- Because falls from structural members constitute a serious and clearly recognizable hazard, fall protection for all steel or concrete beams and other structural elements must be in place prior to erection. This will provide fall protection for workers involved in the initial erection and in subsequent operations until the deck forms are in place. This fall protection will consist of personal fall arrest systems, safety nets, or other means meeting the requirements of Part 1926 Subpart M. Where practical, SRL shall be used instead of traditional lanyards.
- During the initial connection of structural elements, workers exposed to moving members will be required to tie off only if they are not exposed to a greater risk from the moving member. Initial connection is defined as that period during placement or removal of structural members while the member is supported by a crane or other lifting device.
- Instances in which it is impossible to provide fall protection for workers are rare. Where an individual worker must rig the fall protection system, and it cannot be accomplished from an aerial lift or by tying-off to the existing structure, momentary exposure to a fall hazard may be unavoidable. It is essential that adequate planning of construction procedures minimize such occurrence of unprotected exposure to fall hazards. It is equally essential that the fall protection systems utilized enhance safety, rather than creating a secondary hazard.

Sevenson's Fall Protection Program can be referenced in Appendix E.

9.4 Electrical

Applicable Standards:

OSHA 29 CFR 1926.400 through 449, 1910.301 through 399, 1926.550(a)(15)

Electricity is a serious workplace hazard that must be respected at all times. It is important to remember that exposure to even a little electric current can kill! The best protection around electricity is distance -- ample distance between the worker and the conductive materials. The following safe work practices and procedures will help prevent electrical accidents on the jobsite.

Workers should observe and strictly obey all warning and danger signs around electrical apparatus. They should never close a switch that has a danger tag on it signed by or placed there by someone else. Untrained people must not open any electrical enclosures. The one exception is that the door on a circuit breaker panel board may be opened to operate the switches, but other types of electrical enclosures should not be opened. Workers at a minimum must wear leather gloves when switching circuit breakers to the on or off position. At no time will a worker be allowed to access an unprotected circuit panel (bus or power bar exposed) without authorization and the appropriate flash arc protection.

Extension cords or any power tools or equipment must not be used when the cords are frayed, worn out, or the wires are bare. Defective equipment should be reported to the supervisor and turned in for repair. Report all unguarded or broken light bulbs. Do not hang lights by their cords unless the light was designed to be suspended in that manner.

Installation Safety Requirements: Live parts of electrical equipment operating at 50 volts or more must be labeled and guarded against accidental contact. Entrance to rooms and other guarded locations containing exposed live parts must be marked with conspicuous warning signs forbidding unqualified persons from entering. All pull boxes and breaker boxes must be labeled to indicate the equipment they switch and the voltage they carry. Electric installations that exceed 600 volts and that are open to unqualified persons must be made with metal-enclosed equipment or enclosed in a vault or area controlled by a lock. In addition, equipment must be marked with appropriate caution signs.

Conductors and equipment must be protected from overcurrent in accordance with their ability to safely conduct current, and the conductors must have sufficient current carrying capacity to carry the load. Fuses and circuit breakers must also be located or shielded so that employees will not be burned or otherwise injured by their operation.

All wiring components and utilization equipment in hazardous locations must be maintained in a explosion-proof condition without loose or missing screws, gaskets, threaded connections, seals, or other impairments to a tight condition. Unless identified for use in the operating environment, no conductors or equipment can be located:

- In damp or wet locations.
- Where exposed to gases, fumes, vapors, liquids, or other agents having a deteriorating effect on the conductors or equipment.
- Where exposed to excessive temperatures.

Ground Fault Circuit Interrupters To ensure electrical safety from shocks on all construction sites, all 120-volt, single-phase, 15- and 20-amp receptacle outlets must be protected by ground fault circuit interrupters (GFCIs), or assured equipment grounding conductor program must be established. In an assured equipment-grounding program, one or more **competent persons** must be designated to implement and enforce the following assured equipment grounding safety procedures at all construction jobsites.

Each 120-volt extension cord, tool, piece of equipment, and receptacle needs to be inspected and tested before first use, before equipment is returned to service following repairs, and before equipment is used after any incident that can be reasonably suspected to have caused damage.

Each extension cord, tool, or piece of equipment should be visually inspected by the user before each day's use to determine signs of damage. Equipment found to be damaged or defective (frayed or damaged insulation, crushed cable, loose or missing covers or screws, and missing ground prong on plugs, etc.) must not be used until repaired. Equipment suspected to be damaged or defective should be inspected and tested prior to use.

Overhead Transmission and Distribution Lines - A significant hazard on construction jobsites is the accidental contact of moving equipment with live overhead power distribution and service lines. Where work must be done near live lines, the movement of all equipment such as cranes, excavators and other equipment must be guided by an observer who can observe the clearance of the equipment from energized lines and give timely warning to equipment operators. The minimum clearance between live lines and any jobsite equipment is 10 feet, and the clearance increases with increasing line voltages. See Table 1 for clearance distances based on transmission and distribution line voltage.

9.5 Lockout and Tagout

Applicable Standards:

OSHA 29 CFR 1926.417 & 1910.147

Whenever maintenance, servicing, or repairs are done to equipment, tools and machinery, there is a potential for injury from the accidental energization or movement of the equipment. Prior to beginning any work on equipment, steps must be taken to identify the energy sources present in the equipment, and to ensure that the energy sources are neutralized.

Hazardous energy sources fall into categories such as electrical, pneumatic, hydraulic, and potential (gravity, springs, etc.). One simple control in the construction industry has been to unplug cord-connected equipment. Vehicles and other motorized equipment can be protected from accidental starting by disconnecting the battery. Other controls include the use of identifiable padlocks on disconnects, breaker switches, and valves. Stored energy has the potential for release with great kinetic force and potential for injury.

All machinery or equipment capable of movement must be de-energized or disengaged and blocked or locked out during cleaning, servicing, adjusting or setting up operations, whenever required. The lockout procedure requires that stored energy (i.e. mechanical, hydraulic, air) be released or blocked before equipment is locked out for repairs. Appropriate employees are provided with individually keyed personal safety locks. Employees are required to keep personal control of their key(s) while they have safety locks in use. Employees must check the safety of the lockout by attempting a start up after making sure no one is exposed. Where the power disconnector does not also disconnect the electrical control circuit, the appropriate electrical enclosures must be identified. The control circuit can also be disconnected and locked out.

Temporary electrical service installation will be performed by a qualified electrician. Work may only be performed on de-energized equipment. Lockout/Tagout procedures will be implemented to assure the safety of personnel during electrical work activities.

Underground electric lines will be located and clearly marked. These utilities will be protected, removed, or relocated as needed to do the work safely. The excavation work will not be allowed to endanger the underground utility or the people doing the work. Barricades, shoring, or other supports as needed, will protect utilities left in place that are exposed by the excavation.

Sevenson's Control of Hazardous Energy Program is located in Appendix F.

9.6 Motor Vehicles and Mechanized Equipment

Applicable Standards:

OSHA 29 CFR 1926.600 through 606, 1926.1000 through 1003

Many potential hazards are associated with the use of motor vehicles and mechanized equipment on construction projects. Motor vehicles may be involved in accidents due to mechanical failures or operator errors, resulting in injuries to operators themselves or to bystanders. To minimize accidents resulting from the use of motor vehicles, the following safety procedures need to be implemented and enforced on all company projects:

- All equipment left unattended at night, adjacent to highways or construction areas should have lights, reflectors, and/or barricades to identify location of the equipment.

- Supervisory personnel will ensure that all machinery and equipment is inspected prior to each use to verify that it is in safe operating condition.
- Rated load capacities and recommended rules of operation must be conspicuously posted on all equipment at the operator's station.
- Wire rope must be taken out of service when one of the following conditions exist:
  - In running ropes, six random distributed broken wires in one lay or three broken wires in one strand or one lay.
  - Wear of one-third the original diameter or outside individual wires.
  - Kinking, crushing, hoist caging, heat damage, or any other damage resulting in distortion of the rope structure.
  - In standing ropes, more than two broken wires in one lay in sections beyond connections, or more than one broken wire at an end connection.
- A fire extinguisher of 1A:20B:C rating or higher should be available at all operator stations. Where ordinary combustible materials (wood, paper, plastics) are present, an extinguisher suitable for class A fires should also be available for use.
- When vehicles or mobile equipment are stopped or parked, the parking brake must be set. Equipment on inclines must have the wheels chocked as well as the parking brake set.
- All vehicles or combinations of vehicles must have in operable condition at least:
  - Two headlights.
  - Two taillights.
  - Brake lights.
  - Audible warning device at operator's station.
  - Seat belts properly installed.
  - Appropriate number of seats for occupants.
  - Service, parking, and emergency brake system.
- Operators should not travel in reverse with motor equipment having an obstructed rear view unless:
  - The vehicle is equipped with an audible, functioning reverse signal alarm.
  - The vehicle is backed up only under the guidance of an observer who says that it is safe to do so.
- Only those trained in the use of a specific type of machinery should be allowed to operate the machinery. Operators of heavy equipment and trucks greater than 26,000 lbs (11,794 kg) gross vehicle weight used in traffic must have a commercial drivers license.
- Materials handling equipment such as scrapers, front-end loaders, dozers, and similar equipment must be provided with Rollover Protective Structures (ROPS).

- Accessible areas within the swing radius of cranes, backhoes, and other rotating machinery need to be barricaded to prevent employees from being struck or crushed by the rotating parts of the machinery or their loads.
- Employees should not ride on or in motor vehicles unless seats with seat belts are provided.

9.7 Hand and Power Tools

Applicable Standards:

OSHA 29 CFR 1926.300 through 307

Tools are such a common part of construction work that it is difficult to remember that they may pose hazards. Workers must learn to recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent injuries from those hazards. To prevent accidents resulting from the use of hand- and power-operated hand tools, management personnel need to implement and enforce the following safe work procedures on all construction jobsites.

Broken, defective, burned, or mushroomed tools should not be used. They should be reported and turned in for replacement. The proper tool and equipment should be selected and used for each task. For example, a wrench should not be used as a hammer or a screwdriver as a chisel. Leaving tools on scaffolds, ladders, or any overhead working surfaces is hazardous because they may fall. Racks, bins, hooks, or other suitable storage space must be provided to permit convenient arrangement of tools. Striking two hardened steel surfaces together is hazardous because pieces of metal may break off (i.e., two hammers, or a hammer and hardened steel shafts should not be struck together). The practice of throwing tools from one location to another, from one employee to another, or dropping them to lower levels will be prohibited. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes must be used.

Wooden tool handles must be sound, smooth, in good condition and securely fastened to the tool. Sharp-edged or pointed tools should never be carried in employee's pockets. Only non-sparking tools will be used in locations where sources of ignition may cause a fire or explosion. Tools requiring heat-treating should be tempered, formed, dressed, and sharpened by workmen experienced in these operations. Tools designed to accommodate guards must be equipped with such guards when in use.

All rotating, reciprocating or moving parts of equipment (belts, gears, shafts, flywheels, etc.) must be guarded to prevent contact by employees using such equipment. Guarding must meet requirements set forth in ANSI B15.1. All hand-held power tools (e.g., circular saws, chain saws, and percussion tools) without a positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when pressure is released. A positive "on-off" control must be provided on platen sanders, grinders with wheels 2-inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks ¼-inch wide or less.

A momentary contact "on-off" control must be provided on all hand-held powered drills, tapers, fasteners drivers, horizontal, vertical and angle grinders with wheels greater than 2-inches in diameter. Besides safety hazards, the use of power tools sometimes creates potential health hazards as well. The use of jackhammer and chiseling equipment often results in silica and nuisance dust exposures that can sometimes be controlled by wetting the work surfaces. Many times, however, the use of dust/mist respirators is required to prevent overexposures.

In addition to dust hazards, the hand vibration inherent in the use of some power tools may result in a restriction of blood flow to the hands and fingers, causing numbness or tingling. If workers consistently experience these symptoms after the use of power tools, they should contact their supervisor so that steps may be taken to prevent further harm to the nerves and blood vessels in their hands. The use of a different tool, changes to the offending tool to reduce vibrations, and/or the use of special gloves may be recommended to deal with the vibration problems.

Electric Tools - Electric tools present several dangers to the user; the most serious is the possibility of electrocution. The following safe work procedures for electric tools must be implemented and enforced at all company construction projects. Tools must (1) have a three-wire cord with ground and be grounded, or (2) be double insulated, or (3) be powered by a low-voltage isolation transformer. A Ground Fault Circuit Interrupter (GFCI) must be used or the tool must be double insulated to prevent the worker from electrical shock hazards. Never remove the third prong from the plug. Electric tools should be operated within their design limitations.

In general, gloves and safety footwear are recommended during use of electric tools. However, gloves should not be worn when they are a potential entanglement hazard with reciprocating or rotating tools.

When not in use, tools should be stored in a dry place. Electric tools should not be used in damp or wet locations.

Powered Abrasive Wheel Tools - Power abrasive wheel tools present a special safety problem because they may throw off flying fragments. The following safe work procedures for powered abrasive wheel tools need to be implemented and enforced at all company construction projects. Portable grinding tools must be equipped with safety guards to protect workers from flying fragments as well as the moving wheel surface. Inspecting and sound- or ring-testing abrasive wheels prior to mounting is required to ensure that they are free from cracks or defects. Checking to ensure that the abrasive wheel RPM rating is appropriate for the tool will also help prevent wheel failures. The following work rules are appropriate for using a powered grinder:

- Always use eye protection and a face shield.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.
- To prevent the wheel from cracking, the user should ensure that it fits freely on the spindle.
- Grinding wheel users should never stand directly in front of the wheel during start-up because there is always a possibility that the wheel may disintegrate (explode) when accelerating to full speed.

Pneumatic Tools - Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders. The following safe work procedures for pneumatic tools must be implemented and enforced at all company construction projects. Pneumatic tools that shoot nails, rivets, or staples and operate at pressures more than 100 psi must be equipped with a special device to keep fasteners from being ejected unless the muzzle is pressed against the work surface. Eye protection is required and face protection recommended for employees working with pneumatic tools. Whip checks will be used on all charged pneumatic hoses.

Hearing protection is required when working with noisy tools such as jackhammers. When using pneumatic tools, users should check to see that the tools are fastened securely to the hose to prevent

the hose from becoming disconnected. All hoses exceeding ½-inch inside diameter must have a safety device at the supply source or branch line to reduce pressure in the event of hose failure.

Airless spray guns that atomize paints and fluids at high pressures (> 1,000 psi) must be equipped with automatic or visual manual safety devices that will prevent pulling the trigger until the safety device is manually released. Workers operating a jackhammer are required to wear safety glasses, safety footwear, and hearing protection. Compressed air guns should never be pointed toward anyone. A safety clip or retainer must be installed to prevent attachments from being unintentionally shot from the barrel of the tool.

Liquid-Fueled Tools **-** Liquid-fueled tools are usually powered by gasoline. Vapors that can burn or explode and give off dangerous exhaust gases are the most serious hazards associated with liquid-fuel tools. The following safe work procedures for liquid-fueled tools need to be implemented and enforced at all company construction projects.

Gas or fuel should be handled, transported, and stored in approved flammable liquid containers. These containers, also known as safety cans, are no more than 5 gallons in capacity and have a spring-closing lid and spout cover that will safely relieve internal pressure when subjected to fire exposure. Before refilling the tank for a fuel-powered tool, the user must shut down the engine and allow it to cool to prevent accidental ignition of hazardous vapors. Effective ventilation and/or personal protective equipment is necessary when using a fuel-powered tool inside a closed area. Fire extinguishers must be readily available in the work area.

Powder-Actuated Tools **-** Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. Only assigned, qualified operators should operate powder-actuated tools. The following safe work practices and procedures for powder-actuated tools need to be implemented and enforced at all company construction projects. All powder-actuated tools must meet ANSI A10.3 requirements for design, operation, and maintenance. Powder-actuated tools must never be used in an explosive or flammable atmosphere. Before using a powder-actuated tool, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

Never point the tool at anyone. Do not load a tool unless it is to be used immediately. Never leave a loaded tool unattended, especially where it would be available to unauthorized persons. Suitable eye and face protection is essential when using a powder-actuated tool. In case of misfire, the operator should hold the tool in the operating position for at least 30 seconds, and then attempt to operate the tool for a second time. If the tool misfires again, wait another 30 seconds (still holding the tool in the operating position) and then proceed to remove the explosive load from the tool in strict accordance with the manufacturer's instructions.

If the tool develops a defect during use, it should be tagged and taken out of service immediately until it is properly repaired. Warning signs should be posted within the area of operation of any powder-actuated tool. Powder-actuated tool operators must be qualified and carry a card certifying this fact at all times. Failure to comply with any or all safety procedures governing the use of powder-actuated tools will be sufficient cause for the immediate revocation of the operator's card.

9.8 Fire Protection and Prevention

Applicable Standards:

OSHA 29 CFR 1926.150 through 159

Fire on construction projects is a constant hazard that can cause loss of life, equipment and material. To assist in preventing fires on construction projects, all personnel must comply with the following safe work practices and procedures:

Fire Protection - Access to all available firefighting equipment must be maintained at all times. Firefighting equipment must be inspected monthly and maintained in operating condition. Defective or exhausted equipment must be replaced immediately. All firefighting equipment should be conspicuously located at each jobsite. Extinguisher exposed to freezing conditions will be protected from freezing. Employees should not remove or tamper with fire extinguishers installed on equipment or vehicles or in other locations unless authorized to do so or in case of fire. After using a fire extinguisher, it must be recharged or replaced with another fully charged extinguisher. Extinguishers must be selected based on the anticipated fire hazards. To aid in the proper selection of fire extinguishers, the classes of fires are as follows:

- Class A (wood, paper, trash) - use water, dry chemical, or foam extinguisher.
- Class B (flammable liquids, gas, oil, paints, grease) - use foam, carbon dioxide, or dry chemical extinguisher.
- Class C (electrical) - use carbon dioxide or dry chemical extinguisher.
- Class D (combustible metals) - use dry powder extinguisher only.

Fire Prevention - Internal combustion engine-powered equipment should be located so that exhausts are away from combustible materials. Smoking is prohibited at all projects. Project will be conspicuously posted, "No Smoking or Open Flame." Portable battery-powered lighting equipment must be approved for the type of hazardous locations encountered. Combustible materials must be piled no higher than 20 feet (6.1 m). Depending on the stability of the material being piled, this height may be reduced.

Portable fire extinguishing equipment, suitable for anticipated fire hazards on the jobsite, must be provided at convenient, conspicuously accessible locations. Firefighting equipment must be kept free from obstacles, equipment, materials, and debris that could delay emergency use of such equipment. Employees should familiarize themselves with the location and use of the project's firefighting equipment. All oily rags, wastes, and similar combustible materials must be placed in metal containers. The containers must be emptied on a daily basis. Storage of flammable substances on equipment or vehicles should be prohibited unless such unit has adequate storage area designed for such use.

Flammable and Combustible Liquids - Explosive liquids, such as gasoline, will not be used as cleaning agents. Gasoline and similar combustible liquids must be stored, transported, and handled in approved and labeled containers in well-ventilated areas free from heat sources. Approved wooden or metal storage cabinets must be labeled in conspicuous lettering, "Flammable-Keep Fire Away." Storage in an approved storage cabinet should not exceed 60 gallons of flammable, or 120 gallons of combustible liquids. Storage of containers will not exceed 1,100 gallons in any one pile or area. Separate piles or groups of containers by a 5 feet clearance. Never place a pile or

group within 20 feet of a building. A 12-feet wide access way must be provided within 200-feet of each container pile to permit approach of fire control apparatus.

The use of flammable liquids and spray finishing needs to conform to the requirements of 1926.66 and 1926.152. Paints and reducers should be stored away from heat sources and out of the sun. Airless spray-painting apparatus should be of a type approved for hazardous locations. Any electrically or fuel-powered equipment used to mix, convey, and spray flammable and combustible liquids must carry an approval from a nationally recognized testing laboratory. Pneumatically operated equipment is usually suitable for use with flammable and combustible finishes.

Fire Extinguishers **-** Portable fire extinguishers are provided in adequate number and type (4A:80B:C) and are located throughout the site. Fire extinguishers are in readily accessible locations. Fire extinguishers are recharged regularly and the date of last inspection noted on their tags. Extinguishers should be placed free from obstructions or blockage. All extinguishers must be fully charged and in their designated places unless in use. All employees shall be trained annually on use and shall be inspected monthly by the SSHO or designee and annually by a qualified fire service vendor.

9.9 Sanitation

Applicable Standard:

OSHA 29 CFR 1926.51

Employees should not be required to perform work under unsanitary conditions. Adequate supplies of potable water will be provided at the jobsite. Containers used for drinking water will be clearly marked and not used for any other purpose. Cups must not be shared by employees. Outlets for non-potable water (i.e., firefighting purposes) are not to be used by employees for drinking, washing, or cooking purposes. All construction projects must have an adequate number of toilets on the jobsite Hand washing facilities need to be provided in near proximity to the jobsite. Hand washing facilities should also be present when employees are applying paints, coatings, herbicides, and insecticides or in other operations where contaminants may be harmful to the employees.

9.10 Confined Space Entry

Applicable Standards:

OSHA 29 CFR 1910.146, 1926.21(b)(6)

A confined space is a space that is large enough and so configured that an employee can physically enter and perform assigned work, has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits) and is not designed for continuous employee occupancy. Simply working in a confined space is not necessarily a hazard. However, if certain hazardous conditions exist prior to, or are created during entry, then the confined space must be treated with utmost care.

Conditions that make a confined space especially dangerous (i.e., make it a permit-required space) are:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized serious safety or health hazard.

A hazardous atmosphere includes spaces that may expose employees to flammable gases, vapors, mists, or dusts; to an oxygen deficiency (<19.5 percent) or oxygen enriched environment (>23.0 percent); to air contaminants in excess of the PEL, or to any other atmospheric condition that is an immediate danger to life and health (IDLH).

When a permit-required space is present, the following hierarchy of controls should be used on the space:

- Avoid entry.
- Eliminate the hazards that make the confined space a permit-required space. Ventilation, lockout/tagout, block and bleed, and other procedures can be used to eliminate hazards. Hazard elimination must be verified by air monitoring and other test procedures.
- Eliminate the hazards to the point that only atmospheric hazards remain. Use the "atmospheric hazard only" procedures entry system discussed in 1910.146(c)(5).
- Minimize and control hazards to the fullest extent possible, and enter only after the requirements of a full permit entry have been satisfied.

Employees must receive training on confined spaces so that they will acquire the understanding, knowledge, and skills necessary for a safe entry into the confined space. Confined space training should be documented.

All equipment shall be surveyed by the SSHO as it is brought onsite to identify confined spaces. Once identified, the confined space shall be classified as permit or non-permit required confined spaces and labeled appropriately. Sevenson's Confined Space Inventory list will be updated to reflect identified spaces.

Sevenson's Confined Space Program can be referenced in Appendix G.

9.11 Welding and Cutting

Applicable Standards:

OSHA 29 CFR 1926.350 through 354

Welding and cutting operations present various safety and health hazards. Welding and cutting operations on lead-painted surfaces often create lead fumes by "boiling off" the lead. These lead fumes may cause lead poisoning if inhaled or ingested in excessive amounts. Other metal fumes such as iron oxide, chromium, zinc, manganese, and cadmium may also be present during welding and cutting operations. Safety hazards such as fire may result in fatalities, serious injuries, and/or property damage. Therefore, to eliminate or reduce the hazards associated with welding and cutting operations, the following rules and procedures should be included and enforced in any welding safety program.

Welding and Cutting **-** Only qualified welders should be authorized to do welding, heating, or cutting. Inspect work areas for fire hazards and proper ventilation before welding or cutting. Avoid welding or cutting sparks and hot slag. Be alert to hot surfaces and avoid touching metal

surfaces until they have cooled. Place compressed gas cylinders in an upright position and secure in place to prevent dropping or falling. Handle with extreme care and do not store near any sources of heat. Remove any combustibles when welding or cutting must be done. If removal is not feasible, cover combustibles with a noncombustible material. When welding near any combustible material, another employee must be posted to serve as a fire watch. Make sure this person has a fire extinguisher available and keep him/her in the area after welding/cutting is completed until all danger of fire is past.

A hot-work permit system will be utilized to control and minimize the hazards associated with flame or heat producing operations. A hot work permit will be issued by the SSHO prior to performing hot work. As part of the hot work permit the work area shall be inspected by a competent person to ensure the area is free of combustible and flammable materials. Air monitoring will be performed to ensure the area is free of flammable vapors. The SSHO shall ensure the lower explosive limit measurement is 10% or less prior to issuing the hot work permit.

When working in the vicinity of welding operations, wear approved eyewear and avoid looking directly at the flash as serious flash burns could result. When opening valves on tanks that have regulators installed, be sure the pressure adjustment screw is all the way out and do not stand in front of the regulator. An internal failure could rupture the regulator and cause the adjustment screw to become a missile. Flashback arrestors are required on torches and regulators for hot work applications.

Primers, paints, and other coatings should be removed, where feasible, from the area to be heated and for at least 4-inches on all sides.

Gas Welding and Cutting **-** When transporting, moving, and storing compressed gas cylinders, always ensure that the valve protection caps are in place and secured. Secure cylinders on a cradle, sling board, or pallet when hoisting. Never hoist or transport the cylinders by means of magnet or choker slings. Move cylinders by tilting and rolling them on their bottom edges. Do not allow cylinders to be dropped, struck, or come into contact with other cylinders violently. Secure cylinders in an upright (vertical) position when transporting by powered vehicles. Do not hoist cylinders by lifting on the valve protection caps. Do not use bars under valves or valve protection caps to pry cylinders loose when frozen. Use warm, not boiling, water to thaw cylinders loose.

Remove regulators and secure valve protection caps prior to moving cylinders, unless cylinders are firmly secured on a special carrier intended for transport. Close the cylinder valve when work is finished, when cylinders are empty, or when cylinders are moved at any time. Secure compressed gas cylinders in an upright position (vertical) except when cylinders are being hoisted or carried. Oxygen cylinders should be stored at least 20 feet from other combustible materials such as acetylene. Alternatively, oxygen and fuel gas cylinders may be separated by a 5 feet-high non-combustible barrier with at least a 30-minute fire resistance rating.

Arc Welding and Cutting **-** Use only manual electrode holders that are specifically designed for arc welding and cutting. All current-carrying parts passing through the portion of the holder must be fully insulated against the maximum voltage encountered to ground. All arc welding and cutting cables must be completely insulated, flexible type, and capable of handling the maximum current requirements of the work in progress. Employees should report any defective equipment to their supervisor immediately and refrain from using such equipment. Shield all arc welding and cutting operations, whenever feasible, by noncombustible or flameproof screens to protect employees and other persons working in the vicinity from the direct rays of the arc.

Fire Prevention - Welders should locate the nearest fire extinguisher in their work area in case of a fire emergency. Fire extinguishing equipment must be immediately available in the work area. Never use matches or cigarette lighters to light torches. Use only friction lighters to light torches. Never strike an arc on gas cylinders. Flashback arrestors are required on torches and regulators for hot work applications. Move objects to be welded, cut, or heated to a designated safe location. If the objects cannot be readily moved, then all movable fire hazards in the vicinity must be taken to a safe place or otherwise protected. Fuel lines should have flashback arrestors. Do not weld, cut, or heat where the application of flammable paints or the presence of other flammable compounds, or heavy dust concentrations creates a hazard. Additional employees must be assigned to guard against fire while the actual welding, cutting, or heating is being performed when the operation is such that normal fire prevention precautions are not sufficient. Prior to applying heat to a drum, container, or hollow structure, provide a vent or opening to release any built-up pressure during the application of heat. Never cut, weld, or heat on drums, tanks, process lines, or containers that have contained flammable liquids until they have been purged and cleaned.

A fire watch will be required when normal fire prevention precautions are not sufficient for a period of 30 minutes post hot work operations. The fire watch shall be trained and instructed on the specific anticipated fire hazard, how to properly extinguish it, and how to alert site personnel in the event of a fire.

PPE – Personnel involved in hot work operations shall utilize the proper PPE for the task being performed. Flame resistant or all cotton clothing shall be worn by the person performing welding or using a cutting torch or open flame. Welders and personnel using torches shall wear sufficient eye shielding for the type of welding and cutting they are performing as well as proper hand and wrist protection.

9.12 Stairways and Ladders

Applicable Standards:

OSHA 29 CFR 1926.1050 through 1060

Stairways and ladders are a major source of injuries and fatalities among construction workers. Because of the potential hazards involved in using stairways and ladders, the following safety practices and procedures need to be implemented and enforced at all construction projects. Ladders that project into passageways or doorways where they could be struck by personnel, moving equipment, or materials being handled must be secured to prevent accidental displacement or be protected by barricades. Workers should always face the ladder and use both hands when going up and down ladders. Materials and tools should be lowered or raised by a rope or other mechanical means. Hold on to the railing on stairways. The areas around the top and base of ladders must be free of tripping hazards such as loose materials, trash, and electrical cords. The same holds true for the bottom of stairways and on stairway platforms.

Ladders - Ladders must be capable of supporting four times the maximum intended load. Ladder rungs, cleats, and steps must be parallel, level, and uniformly spaced (not less than 10-inches nor more than 14-inchs). Do not tie or fasten ladders together to provide longer sections unless they are specifically designed for such use. All stepladders must be equipped with a metal spreader or locking device. Do not paint wooden ladders, except to stencil for identification. Maintain ladders free from oil, grease, and other slipping hazards. Ladders must extend at least 3-feet above the upper landing surface and be equipped with a rope to secure the ladder the first time it is ascended

(during the first climb the ladder is to be held by a ground person to prevent movement). The horizontal distance for the base of the ladder should extend 1-foot for every 4-feet in vertical distance. Wood job-made ladders must be used at an angle so that the horizontal distance is one-eighth the working length of the ladder. Do not use ladders on slippery surfaces unless they have been properly secured or provided with slip-resistant feet. Do not move, shift, or extend ladder while occupied. Never stand on the top step of a stepladder.

A competent person on a periodic basis and after any occurrence that could affect their performance must inspect ladders. Ladders with structural defects must be tagged with "Do Not Use" or similar language and withdrawn from service until repaired. Never use a metal ladder when working on electrical equipment or near electrical equipment where contact is possible. Any employee who uses a ladder or stairway must receive training by a **competent person** in the following areas:

- Types of fall hazards.
- Correct procedures for erecting, securing, maintaining, and disassembling fall protection systems.
- Proper construction (man-made), use, placement, and handling.
- Maximum intended load-carrying capacities.
- Requirements contained within 29 CFR 1926 Subpart X.

Stairways **-** Stairways that are not permanent parts of the structure must have landings of not less than 30-inches in the direction of travel. A platform must be provided where doors or gates open directly on a stairway. Metal pan landings and metal pan treads must be filled in with wood or other materials if they are to be used prior to being finished. Maintain all parts of stairways free from hazardous projections, such as protruding nails. Eliminate slippery conditions on stairways before the stairways are used to reach other levels.

9.13 Materials Handling, Storage, Use, and Disposal

Applicable Standards:

OSHA 29 CFR 1926.250 through 252

In the handling of materials, employees must know the following: There must be safe clearance for equipment through aisles and doorways. Vehicles must be shut off and brakes must be set prior to loading or unloading. Containers of combustibles or flammables, when stacked while being moved, must be separated by dunnage sufficient to provide stability. Trucks and trailers will be secured from movement during loading and unloading operations. Hand trucks must be maintained in safe operating condition. Chutes must be equipped with sideboards of sufficient height to prevent the handled materials from falling off. At the delivery end of rollers or chutes, provisions must be made to brake the movement of the handled materials. Hooks with safety latches or other arrangements will be used when hoisting materials, so that slings or load attachments won't accidentally slip off the hoist hooks. Securing chains, ropes, chokers, or slings must be adequate for the job to be performed. When hoisting material or equipment, provisions must be made to assure no one will be passing under the suspended loads.

Stack, rack, block, interlock, or otherwise secure all materials and supplies to prevent sliding, falling, or collapse. Post the maximum safe load limits for floors within buildings and structures

in a conspicuous location. Never exceed the maximum safe load limit. Keep aisles and passageways clear to provide for the free and safe movement of material handling equipment and employees. Use ramps, blocking, or grading when a difference in road or working levels exists to ensure the safe movement of vehicles between the two levels. Do not place material within 6-feet of any hoist way or floor opening inside buildings under construction, nor within 10-feet of an exterior wall that does not extend above the material being stored. Stack bagged materials by stepping back the layers and cross keying the bags at least every 10 bags high. Do not store materials on scaffolds or runways more than supplies needed for immediate operations. Remove all nails from used lumber prior to stacking. Stack lumber on level and solidly supported sills. Do not stack lumber higher than 20-feet (16-feet if handled manually).

Stack and block structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked, to prevent spreading or tilting. Attach handles or holders to the load to reduce the possibility of pinching or smashing fingers. Unload materials close to the point of final use to avoid unnecessary lifting. Do not stack non-compatible materials in the same pile.

Manual Materials Handling - Employees working alone should not attempt to lift or move a load that is too heavy for one person - get help! When working with materials stored in silos, hoppers, tanks, or similar storage areas, be aware that confined spaces may exist. Attach handles or holders to the load to reduce the possibility of pinching or smashing fingers. Wear protective gloves and clothing (i.e., aprons), if necessary, when handling loads with sharp or rough edges. When pulling or prying objects, workers should be properly positioned. Riding loads, slings, the ball, crane hook, or other material hoisting equipment is prohibited.

Engineering Controls - Engineering controls should be used, if feasible, to redesign the job so that the lifting task becomes less hazardous. This includes reducing the size or weight of the object lifted, changing the height of a pallet or shelf, or installing a mechanical lifting aid

OSHA standard 1926.251 provides guidance about the limitations and uses of slings used in conjunction with other material handling equipment for the movement of material by hoisting. Slings covered by this standard include those made of alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope, and synthetic web (nylon, polyester, and polypropylene). Some general work practices related to rigging include:

- Rigging equipment must be inspected prior to use on each shift and during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
- Rigging equipment must not be loaded in excess of its recommended safe working load. All rigging must have capacity tags fixed to the rigging.
- Free or loose rigging from the tines on a fork lift or fork lift attachment will not be permitted.
- Rigging equipment, when not in use, must be removed from the immediate work area.
- Custom rigging must be marked to indicate the safe working loads and will be proof tested prior to use to 125 percent of their rated load.

In addition to these general guidelines, the standard has specific requirements related to alloy steel chains, wire rope, natural and synthetic rope, and synthetic webbing. Employees performing rigging work should be adequately trained in the safety and functional aspects of rigging for materials handling operations.

9.14 Signs, Signals, and Barricades

Applicable Standards:

OSHA 29 CFR 1026.200 – 203

The use of signs, signals, and barricades is essential to make employees aware that an immediate or potential hazard exists. Both traffic and health hazards such as airborne lead are examples of hazards on bridge renovation/demolition sites that require signs and other devices. The following sections discuss the primary ways that employees are made aware of hazards in their work areas.

Accident Prevention Signs/Tags **-** Signs, signals, regulated areas, and barricades must be used on each construction project as appropriate.

Danger Signs are used wherever an immediate hazard (i.e., exposed electrical conductor) exists. The danger signs must have red as the predominant color in the upper panel and a white lower panel for additional sign wording.

Caution Signs are used to warn against potential hazards or to caution against unsafe practices. The caution signs must have yellow as the predominant color with a black upper panel (yellow lettering of "caution" on the upper panel) and a yellow lower panel for additional sign wording.

Safety Instruction Signs, when used, must be white with a green upper panel and white lettering to convey the principal message. Any additional wording must be in black lettering on the white background.

Directional Signals must be white with a black panel and a white directional symbol. Any additional wording must be in black lettering on the white background.

Accident Prevention Tags are used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc.

Out of Order Tags are used to designate equipment that requires repair or maintenance. Equipment with such a tag may not be used until the tag is removed.

Cones, Barrels, Barricades, and Barriers **-** Channeling devices such as cones, barrels, or barricades may be used to establish work zone boundaries as well as on site vehicle traffic flow if necessary. Road ways shall be clearly marked to assist site vehicle drivers around the project site.

9.15 Cranes and Hoists

Applicable Standards:

OSHA 29 CFR 1926.550 - 556

Oregon OSHA Standards1926.1430 Subdivision CC

The target goal of a crane safety program is zero crane accidents. To achieve this goal, the following safe work procedures must be implemented and enforced at all company projects:

- The crane must have an annual inspection within the past 12 months.
- Crane operators shall be licensed and certified for the type of crane to be used. The operator shall also have a ODOT or NCCCO physical.
- Crane operators are required to comply with crane manufacturer's specifications and limitations applicable to the operation of any and all cranes, derricks, and hoists.

- Rated load limits and recommended operating speeds, special hazard warnings, or instructions must be posted on all equipment.
- Hand signals to crane operators must conform to the applicable ANSI standard for the type of crane being used. A qualified signal person will only be allowed to direct crane movements. However, anyone on the crew may give the "STOP" command at any time to the crane operator.
- Rigging shall only be performed by a qualified rigger or under the direction of a qualified rigger. The qualified rigger is responsible for ensuring all rigging has been properly selected and attached to the crane hook and load prior to authorizing the lift.
- A **competent person** who is knowledgeable in proper crane setup and operation activities must inspect all machinery and equipment prior to each use, and during use, to ensure it is in safe operating condition.
- A competent person who is knowledgeable in suitable stable ground conditions as well as maximum slope determination for the crane and associated lifting activities that will be performed shall be responsible for ensuring these conditions are satisfactory for performing crane activities.
- Any defective parts must be repaired or replaced before use.
- A **competent person** who is knowledgeable in crane inspection techniques must perform an annual inspection of the hoisting machinery and provide a copy of the dates and results of inspections for each hoisting machine and piece of equipment to the site superintendent.
- All moving parts or equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheel, etc.) must be guarded to prevent contact by employees.
- Accessible areas within the swing radius of the rotating superstructure of the crane must be barricaded to prevent an employee from being struck or crushed by the crane.
- Exhaust pipes must be guarded or insulated to prevent contact by employees.
- Windows in cabs must be of safety glass, or equivalent, that introduces no visible distortions.
- Where necessary, a ladder or steps must be provided to allow access to a cab roof.
- Platforms and walkways must have anti-skid surfaces.
- A fire extinguisher of 5ABC rating must be accessible at all operator stations or cabs of equipment. No part of a crane or load is permitted within 10 feet (3.0 m) of electric power lines, except where electrical distribution and transmission lines have been de-energized and visibly grounded. A person will be designated to observe clearance of the equipment and provide timely warning to the crane operator.
- No employee is permitted to work beneath a suspended load.
- All lifts are to be planned by the lifting supervisor, crane operator, and rigger prior to making a lift with the crane. One Lift Plan may be prepared to cover multiple lifts of the same shape/size, weight, lifting radius, and rigging. The maximum lift radius shall be identified on the Lift Plan for this sheet and may not be exceeded at any time no matter what the weight of the sheet being lifted. If the maximum lift radius for the heaviest sheet to be lifted needs

to be exceeded with a lighter sheet, a new Lift Plan shall be completed to reflect the change in weight and lift radius.

The Superintendent or his designee will conduct daily inspections to observe compliance with established Sevenson and NW Naturals crane and rigging procedures and immediately shut down any crane operations that jeopardize the safety of any jobsite personnel.

Crane use for this project will be limited to mobilization/demobilization of the sediment treatment facility and placement of sheet piling. The crane operator will ensure the crane is on stable ground or sufficient floating platform and is capable of performing the task requested.

Sevenson's Critical Lift Program can be referenced in Attachment 7.

9.16 Housekeeping

Applicable Standard:

29 CFR 1910.25

A policy of trash removal and the maintenance of good housekeeping practices should be implemented on all jobsites. The accumulation of construction debris may pose a significant fire hazard in addition to tripping and falling hazards.

Good housekeeping practices are the result of planning and organization. All personnel on the site must work together to maintain a clean worksite. The prompt removal of waste materials will permit a free flow of traffic through the work areas. Daily, or more frequent, inspections will be conducted by the general contractor to verify that the housekeeping controls are in place and being enforced.

Housekeeping activities in themselves may pose health hazards such as exposures to dusts, biological agents, and discarded chemicals. Liquid and solid waste chemicals must be placed in leak-proof containers for proper disposal.

9.17 Working On or Near Water

A significate majority of work conducted during this scope of work will be performed on or around water. This presents unique hazards and will be thoroughly addressed in all AHAs and Safe Plans of Actions; consideration will be given to and any applicable Coast Guard Regulations.

Personnel shall use Coast Guard approved Type I, III, or V PFDs while working over or on water where a drowning hazard exists.

Type II PFDs are not approved to be worn during activities at this project because the capability of a Type II PFD for turning unconscious wearers to a face-up position is not as effective as a Type I PFD.

Most Type III and V PFDs are not as effective as Type I in turning an unconscious wearer face up, but they are generally less bulky and restrictive, and are typically the PFD of choice in a marine work environment.

The use of inflatable PFDs is discouraged due to questionable reliability and maintenance requirements. In any case, the SSHO is available to help users select the appropriate type and style for the activity being conducted. The SSHO has the authority to prohibit the use of a particular PFD if it is damaged or otherwise not fit for use.

Each watercraft or work platform shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until retrieved from the water. A life ring or horseshoe buoy are two common examples of a Type IV PFD. Each style of Type IV PFD must be approved by the SSHO prior to use. Type IV PFDs shall have at least 90 feet of 3/8-inch solid braid polypropylene line, or equivalent attached to it.

For on shore areas or docks where PFDs are required, at least one Type IV PFD with 90 feet of 3/8-inch solid braid polypropylene line, or equivalent attached to it, shall be at intervals of not more than 200 feet.

Employees are responsible for watching out for each other while working on the water. Deck hands shall be responsible for assisting the Boat Captains while underway and securing the vessel to docks, floating work platforms, and other vessels. Boat Captains are responsible for the overall operation of their vessel and crew. The SSHO is responsible for supporting Boat Captains and Deck Hands for questions related to the safe operation of the vessel and inspecting the vessel for non-compliance items.

LIFE SAVING SKIFFS

At least one lifesaving skiff (a powered John Boat or other smaller boat used in emergencies), shall be immediately available at locations where employees are working over or adjacent to water (based on an assessment by the SSHO for adjacent work).

OSHA has established the following criteria for determining when a lifesaving skiff is to be considered ‘immediately available’:

- The skiff must be in the water or capable of being quickly launched by one person.
- There must be at least one person present and specifically designated to respond to water emergencies and operate the skiff at all time when there are employees above water.
- When the operator is on break, another operator must be designated to provide the requisite coverage while employees are above water.

The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.

9.18 Cold Water Immersion/Circum-Rescue Collapse

When water temperatures fall below 50°F workers shall be trained in cold water immersion and circum-rescue collapse. Any worker who experiences a cold-water immersion event (water temperature < 50°F) shall receive medical observation.

Circum-rescue collapse is a complex physical phenomenon that can occur immediately before, during, or shortly after rescue from cold water. Its symptoms can range from fainting to death due to cardiac arrest.

In simple terms, the causes center around the body’s lack of ability to maintain proper heart function, blood pressure, and core temperature under the stressful conditions of cold-water immersion and/or the demanding physical requirements of the rescue itself. This condition was well documented in World War II when it was found that the safe recovery of downed pilots and sailors was greatly enhanced when rescued horizontally instead of pulled vertically form the water (thereby relieving some of the strain on the heart).

However, is some cases, even shortly after rescue, the consequence of rapid body cooling may cause the heart to continue to cool, until it reaches the temperature threshold for spontaneous cardiac arrest. In addition, stress hormones may also play a role. In this case, these hormones increase muscle strength and help maintain blood pressure during cooling. However, the rescue process could decrease these levels of hormones due to mental relaxation, and that could cause a decrease in blood pressure. To complicate matters, if a victim is placed in a vertical position, it caused the blood to pool in the legs and decreased blood pressure even more. The combination of a cooling heart and increased cardiac work to maintain blood pressure may cause symptoms ranging from fainting to cardiac arrest.[2]

9.19 Severe Weather

9.19.1 High Winds

If high winds are forecast, work on the River shall stop before the winds become hazardous. Workers shall go to an appropriate shelter. In the event that a Small Craft Advisory is issued by the National Weather Service, work onboard vessel(s) will be halted and the vessel(s) will return to shore as quickly as possible. If a Small Craft Advisory is issued before work commences, work will be rescheduled following lifting of the advisory. Work from a vessel will be conducted at the discretion of the vessel operator/Captain and will cease if Force 6 winds (Strong Breeze) as defined on the Beaufort Wind scale (20 to 33 knots and waves 5 to 7 feet with whitecaps) are reported by National Weather Service. If an evacuation is enacted, an account for all persons will be conducted before leaving the Site.

9.19.2 Lightning

Work will not be permitted on the river, open areas, near trees or other equipment outside during lightning storms. Work will cease and field personnel provided appropriate shelter until the storm passes. Work shall not resume until at least 30 minutes after lightning was last observed. A lightning detection meter shall be utilized at the Site to monitor for storms that may produce lightning. When an approaching storm is within 20 minutes of the Site, water operations will be suspended. All waterborne personnel will be brought to shore to seek appropriate shelter.

9.19.3 Flash Floods/Tornadoes

In the event of a flash flood watch/warning all activities will be immediately suspended and workers brought to shore. In the event of a tornado warning all site activities will be suspended immediately and all workers will seek appropriate shelter.

10.0 SITE CONTROL MEASURES

This section outlines site control measures to be implemented to minimize potential exposure to and accidental spread of hazardous substances during construction activities. Listed below are the work zones that will be established. The zone boundaries may be modified as necessary as new information becomes available.

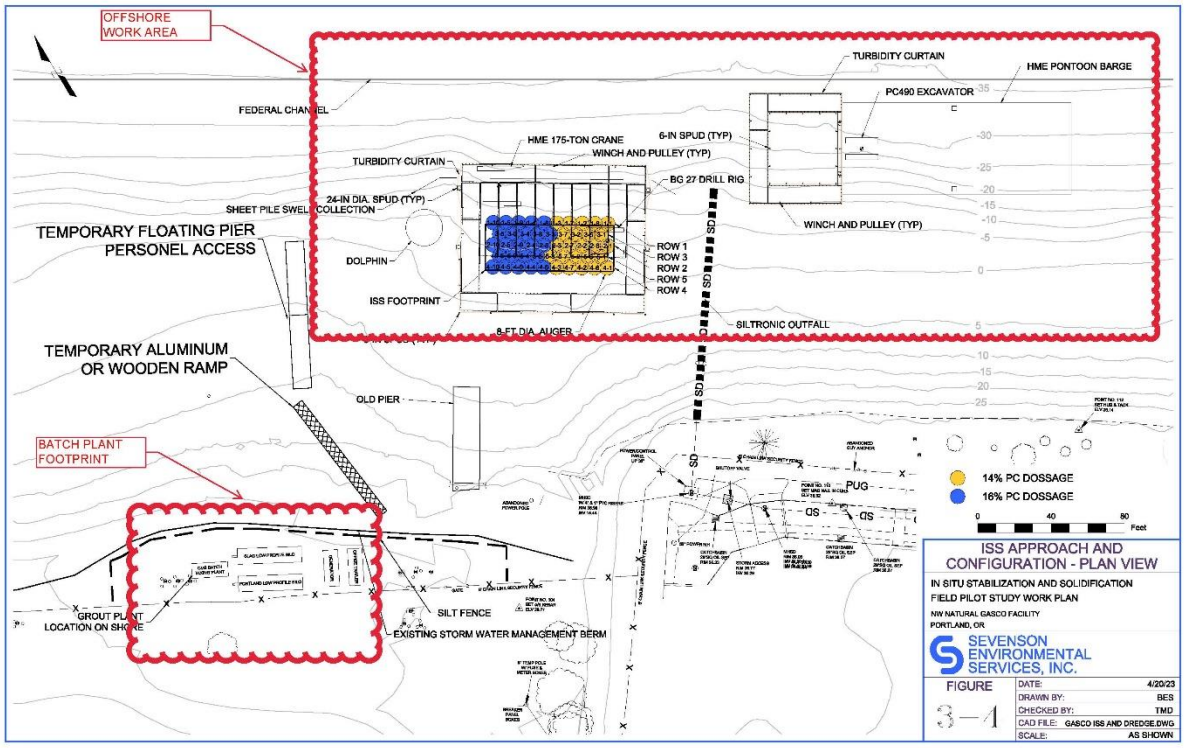
[2] Gordon G. Giesbrecht, PhD: John S. Hayward, PhD (2006). Problems and Complications with Cold-Water Rescue. *Wilderness and Environmental Medicine,* 17, 26 30.

10.1 Work Zones

The Site will be divided into Exclusion, Contamination Reduction, and Support Zones. It should be recognized that the Site control zones will be modified continually. A map (see Figure 3) showing the work zones will be updated daily and posted in the Site office. The SSHO will review the location of work zones at the daily safety briefing.

The SSHO and at least one person who have completed Supervisor's Training will be present at the Site whenever work is performed in the Exclusion Zone or Contamination Reduction Zone. Similarly, at least two First aid/CPR-trained individuals will be present at the Site when work is performed in those zones.

Figure 3
Site Layout Map



10.1.1 Exclusion Zone

This zone, commonly known as the Hot Zone, is where there will be direct contact with the potentially contaminated material. PPE will be required in this zone. The SSHO will enforce these requirements. The level of PPE required will be based on hazard, site condition and air monitoring performed. Modification to the size and boundary of the Exclusion Zone will be made in the field by the SSHO based on operations and wind direction. The Exclusion Zone may be subdivided into different areas of contamination and different levels of PPE may be assigned based upon the expected type and degree of hazard.

All activities in exclusion zone will be conducted using the "buddy system". This involves a buddy who can provide his or her partner with assistance, observe for signs of chemical or heat exposure, check integrity of PPE and go for help when needed.

10.1.2 Contamination Reduction Zone

This zone, commonly known as the Warm Zone, is where workers and equipment will be decontaminated. This will minimize the spread of contaminants from the Exclusion Zone into clean areas. The Contamination Reduction Zone will consist of the area located in front of or next to the exclusion zone so that personnel or equipment exiting the Exclusion Zone can be decontaminated and doff the PPE. Emergency equipment to be in this area will include eye wash stations, fire extinguishers, first aid kits and other appropriate equipment. The Contamination Reduction Zones or personal decontamination stations will be established adjacent to the Exclusion Zones. These stations will provide a means for prompt removal of potentially contaminated outer PPE at a location convenient to operations.

10.1.3 Support Zone

This zone, commonly known as the Clean Zone, is uncontaminated. This area will be used as a storage area for operations equipment and where break and toilet facilities will be located.

10.2 Site Entry and Control Log

All site personnel on this project will undergo safety orientation by the SSHO prior to starting work at the site. This training will include general site safety rules, hazardous locations, personal protective equipment guidelines, and onsite emergency procedures. All site personnel will satisfy the following requirements before initiating work onsite within the Exclusion or Contamination Reduction Zones:

- Receive and pass a physical examination, including certification of ability to wear respiratory protection.
- Receive adequate hazardous waste training according to 29 CFR 1910.120 or 29 CFR 1926.65.
- Receive a briefing on all aspects of the CHASP.
- Are properly dressed, equipped, and trained in accordance with all personal protective guidelines.
- Are thoroughly trained regarding decontamination procedures.
- All personnel performing tasks when respiratory protection is needed will comply with the requirements of this plan.

All personnel entering and exiting the Exclusion and Contamination Reduction Zones will sign in and out through the Support Zone. The log will indicate the date and time entering and exiting, the location entered, personal protective equipment utilized and decontamination procedures, refer to ***Appendix B – Safety and Health Forms for the Site Entry and Exit Log***

11.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination (Decon) is the process of removing or neutralizing potentially harmful contaminants that have accumulated on personnel and equipment to reduce the spread of contamination outside the work area. Decontamination is critical to the Safety and Health of Site workers and it protects the community by minimizing the off-site migration of contaminants. One

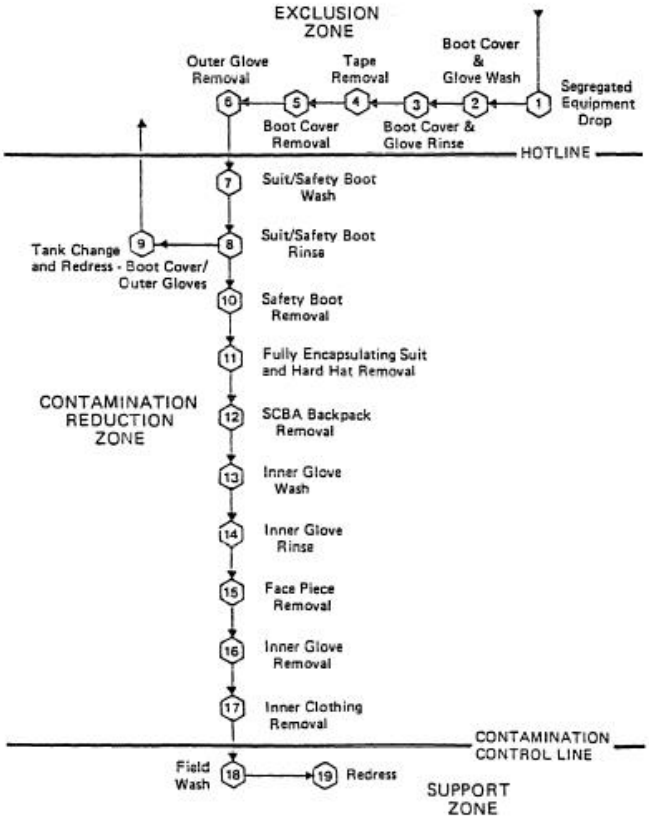
of the most important aspects of controlling contaminated material migration is the prevention of the spread of contamination. Good contamination prevention will minimize employee and public exposure.

All personnel and equipment leaving the Exclusion Zone must be decontaminated in the Contamination Reduction Zone prior to entering the Support Zone. The decontamination process is composed of a series of steps performed in a specific sequence. The basic concept is that more heavily contaminated items will be decontaminated and removed first, followed by decontamination and removal of inner, less contaminated items.

During construction activities at the Site, all items taken into the Exclusion Zone must be considered contaminated and must be carefully inspected and/or decontaminated before leaving the Site. All contaminated vehicles: equipment and material will be cleaned and decontaminated to the satisfaction of the SSHO prior to leaving the Site. Decontamination procedures will be posted at every decontamination station throughout the project.

11.1 Personal Decontamination

Personnel exiting the Exclusion Zone during construction activities at the Site will follow the procedure below. Note: some steps may be skipped if they are not applicable to the process.



11.2 Respirator Decontamination

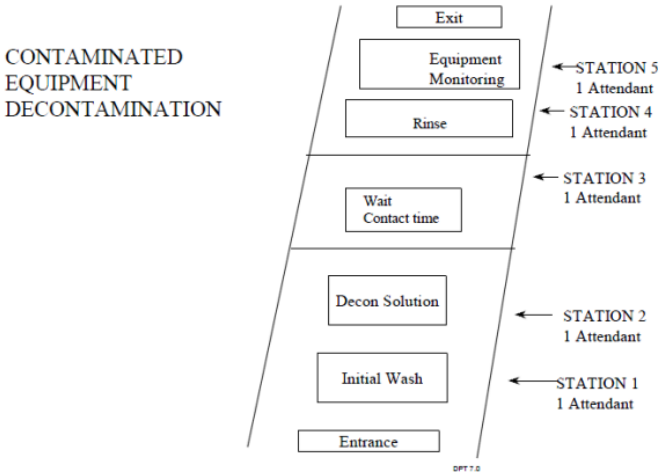
Respirators are to be decontaminated, cleaned, and sanitized before reuse. Cartridges and/or filters must be replaced as needed and, as a minimum, changed daily. The respirators are then cleaned with cleaning and sanitizing solutions, wiped dry and placed into sanitary containers or bags and sealed closed. Before departing the change locker facility, respirators are placed into storage compartments for next day use.

OSHA: Respirator Cleaning Procedure
1. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
2. Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
3. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.
4. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following: a. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or, b. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or, c. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
5. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
6. Components should be hand-dried with a clean lint-free cloth or air-dried.
7. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
8. Test the respirator to ensure that all components work properly.

11.3 Equipment Decontamination

Nearly all contractor hardware (not consumable) is recoverable. As such, they will be decontaminated using the proper equipment, (i.e., brushes, sprayers, detergent and, if necessary, other appropriate solvents). Large heavy equipment will be decontaminated with pressure steam wash as required.

The decontamination area equipment leaving the Exclusion Zone will be located within the Contamination Reduction Zone. Equipment will be decontaminated over 2 layers of 6-mil plastic placed on the ground.



11.4 Decontamination Log

A decontamination log will be maintained and will list the equipment name and model number, the equipment I.D. number, the activities the equipment was used for, the method of decontamination, amount of decontamination, date and time of decontamination and names of personnel doing the decontamination. This log will be maintained by the SSHO and included in the Safety and Health Report. Refer to ***Attachment 2 – Safety and Health Forms for the Equipment Decontamination Log***.

11.5 Decontamination Residue

Decontamination residue consists of disposable PPE (such as Tyvek, gloves, tape and cartridges) and settled solids. Decontamination residue will be drummed and stored in the Exclusion Zone until subsequent disposal or for treatment.

11.6 Personal Hygiene and Sanitation

Hands and face will be thoroughly washed before eating, smoking, drinking, chewing gum or tobacco.

When possible, avoid contact with contaminated materials.

Temporary support facilities such as wash facilities, eating areas, changing areas, and portable toilets will be in the Support Zone. This area will remain “clean” and free of contamination.

An adequate supply of potable water will be provided to the employees working at the Site. Clearly labeled potable containers will be used to dispense drinking water. Containers will be cleaned at the beginning of each day. The containers will be equipped with taps to access the water. Clean disposable cups will be provided daily.

Portable toilet facilities will be provided on-site for employees and will be in the Support Zone.

Eating, drinking, smoking, chewing gum or tobacco, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited during construction activities except in designated eating or smoking areas outside the Exclusion and Contaminant Reduction Zones. Sevenson employees, subcontractor employees, and service personnel are required to thoroughly decontaminate themselves prior to entering the Support Zone

Hands and face will be thoroughly washed before eating, smoking, drinking, chewing gum or tobacco.

When possible, avoid contact with hazardous materials.

Temporary support facilities such as wash facilities, eating areas, changing areas, and portable toilets will be in the support area.

An adequate supply of potable water will be provided to the employees working at the Site. Clearly labeled potable containers will be used to dispense drinking water. Containers will be cleaned at the beginning of each day. The containers will be equipped with taps to access the water. Clean disposable cups will be provided daily.

12.0 EMERGENCY CONTINGENCY PLAN

This section describes the emergency response plan that will be implemented by Sevenson employees to handle emergencies. The nature of the project, the contaminants present and the activities planned for the site are such that there is little potential for an emergency, which would result in a significant release of hazardous substances, and in any way threaten the adjoining community. However, there is always the potential at any construction site for emergency situations to occur which threaten the on-site workers. Possible examples of emergency situations during construction activities include man overboard, equipment fires or contact of equipment with overhead power lines. In all these cases, procedures will be implemented to minimize the possibility of an emergency situation. The procedures outlined below are designed to ensure that the workforce reacts quickly and appropriately to emergency situations, thereby protecting the health and wellbeing of the individual workers. It is expected that modifications may be necessary upon actual site set-up and conditions.

NOTE: In the event of a serious or life-threatening emergency the primary consideration is the immediate health of the individual rather than routine contamination controls. Standard contamination control protocols shall not interfere with the prompt medical attention required of a seriously injured worker.

12.1 Pre-Emergency Planning

During the site safety briefings held daily, all employees will be informed of the location of this plan, the procedures outlined in this plan, and the communication systems and evacuation routes to be used during an emergency.

On a continual basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency.

12.2 Personnel Responsibilities

All on-site employees have a role in mitigating an emergency incident. The Project Superintendent has primary responsibility for responding to and directing emergency response operations to correct emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. He is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed.

The following is an outline of job titles and corresponding responsibilities during an emergency.

- The Site Superintendent directs emergency response activities and serves as liaison with appropriate Client and Client representative's personnel and subcontractors. In the event of an emergency the Project Superintendent will be the Incident Commander.
- The SSHO recommends that work be stopped if any operation threatens worker or public health or safety and advises Site Manager of emergency procedures if necessary. Provides emergency medical care on site. Notifies emergency services. The SSHO will assume the responsibility of Incident Commander if the Project superintendent is off-site.

12.3 Evacuation Routes and Procedures

In the event of an emergency that necessitates an evacuation of the site; on-site personnel will be notified by hand-held or mobile two-way radios to leave the area by immediate emergency exit. An alternate method of communication will be the use of a portable air horn sounded in regularly spaced, repeated blasts.

During an evacuation, all non-emergency radio transmissions will cease. The SSHO will control the scene until the appropriate municipal and state agencies arrive. Since site conditions, (i.e., wind direction, precipitation, and work location), change often, the SSHO will determine the appropriate evacuation procedures.

All personnel will assemble/muster at the designated rally point for roll call. Access to the site will be restricted.

12.4 Emergency Decontamination Procedures

Decontamination of an injured or exposed worker will be performed if decontamination does not interfere with essential treatment. The objective is to successfully administer first aid without exposing rescue workers and the victim to contaminants. Project personnel will meet with the local hospital to discuss the possibility of having to treat injured personnel from the site.

If the hazards are low and decontamination can be performed, then a wash, rinse and removal of protective clothing will be performed.

If the hazards are high and decontamination cannot be done, then the following procedures will be performed:

- Wrap the victim in blankets or plastic sheeting to reduce contamination of rescue workers or other personnel.
- Alert emergency and medical personnel to potential contamination. Emergency entry into the exclusion zone will be controlled by the SSHO. The SSHO will determine if the victim can be moved from the exclusion zone. If entrance into the exclusion zone is required, the SSHO will ensure that the emergency workers don the proper PPE.
- If required, arrange to have the SSHO accompany the victim to the hospital if required.

12.5 Medical Treatment/First Aid

The SSHO will be trained in CPR and First Aid and have first aid kits for use in a medical emergency. First Aid Kits will be in the main support area, Contamination Reduction Zone and at the work activity locations. Eyewash stations will be available at the Contamination Reduction Zone. Eyewash stations will be of the pressurized, 15-minute discharge type. On-site employees have a basic knowledge of first aid and will assist the Site Superintendent and SSHO. Community

emergency services (EMS, Fire, and Police) will be notified immediately if their resources are needed on site.

If necessary, the injured or sick party will be taken to Legacy Good Samaritan Hospital– The route from the nearest location to unload personnel in the case of a medical emergency while work is being conducted on the Willamette River is the public boat dock next to River place Marina at the southern end of Tom McCall Waterfront Park near the intersection of SW Naito Parkway and SW Columbia Street. If emergency life threating transport is required EMS first responders will be notified of the landing location in advance, Please refer to ***Figure 4 – "Route to Hospital Map"***, for directions to the area hospital. Route to the area hospital will be posted and easily visible at all times.

12.6 Emergency Alarms/Notifications and Procedures

When any emergency occurs on-site the SSHO and Project Superintendent will be notified immediately. The Project Superintendent or the SSHO will notify the Client Representative. Please refer to the ***Table 9 – "Emergency Telephone Numbers"*** for emergency telephones. Emergency Telephone numbers will be posted and easily visible at all times.

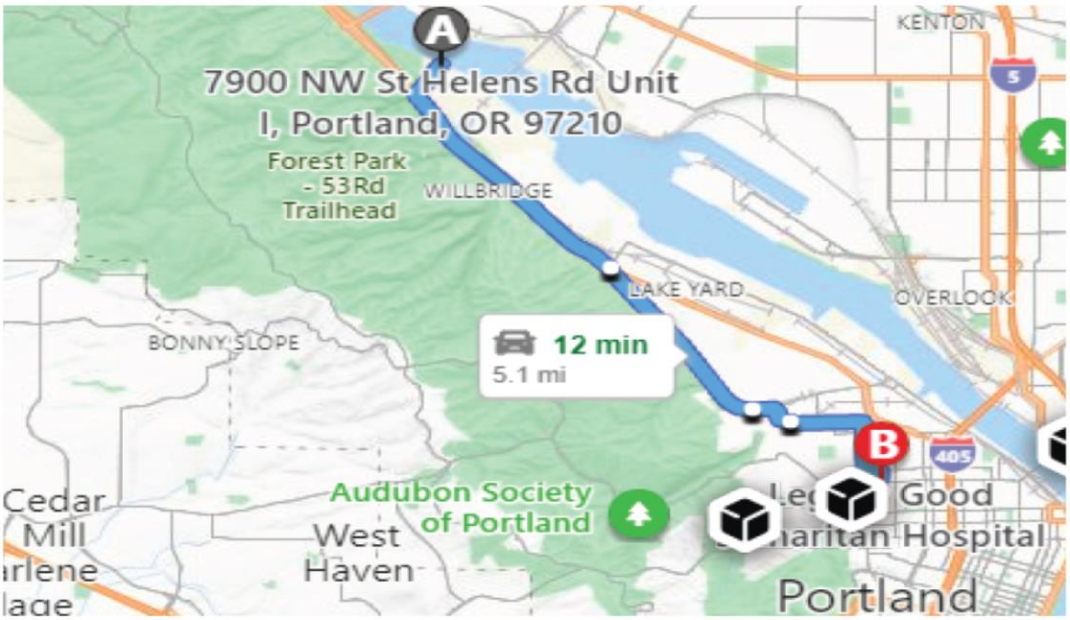
To notify any site workers of an emergency, workers can be signaled by way of hand held or mobile two-way radios or as a backup, the use of an emergency alarm (portable air horn). Any audible pattern of blasts from a portable air horn becomes difficult to interpret due to distance and the inhibitory effects of a respirator.

All emergency communications will flow through the radio network. Outside emergency services will be notified, as necessary. The site evacuation alarm consists of one long blast on a horn, every 10 seconds. Any time the alarm system is activated; on site personnel will be notified immediately. Personnel will extinguish any nearby ignition source and prepare for emergency response activities. This alarm will also be used to alert personnel of a sudden release of hazardous materials.

The observer of the emergency condition will brief the responding personnel as to the nature and location of the incident. When they have assessed the situation, a decision whether or not to implement these procedures will be made. If these Emergency Contingency Procedures are not implemented, supervisory personnel will give the "All Clear" verbally. The "All Clear" will be used to indicate a return to normal (non-emergency) conditions following emergency response activities. The alarm signals will be prominently posted at the site. The audible alarm system will be discussed with each resident within hearing range of the alarm system.

In the event of an emergency rescue while working on the water develops the highest-level supervisor working on the water will be responsible for determining what immediate actions need to take place. This person shall be responsible for identifying the emergency, direct personnel in rescue or evacuation operations, summons first aid or medical assistance, coordinate movement of injured personnel with medical responders, and assist local emergency personnel as necessary. Evacuation and rescue procedures shall be developed as part of the SPA for the work to be performed on or over water.

Figure 4
Route to Hospital Map



A 7900 NW St Helens Rd Unit I, Portland, OR 97210

↑	1.	Depart and head toward **NW Front Ave** • *Private Road*	0.2 mi
↑	2.	Keep **straight** to get onto **NW Front Ave**	0.1 mi
↰	3.	Turn **left** onto **US-30 E / NW Saint Helens Rd**	1.9 mi
↱	4.	Turn **right** onto **NW Saint Helens Rd**	1.5 mi
↑	5.	Road name changes to **NW Nicolai St**	0.1 mi
↗	6.	Bear **right** onto **NW Wardway St**	0.2 mi
↑	7.	Road name changes to **NW Vaughn St**	0.5 mi
↱	8.	Turn **right** onto **NW 23rd Ave**	0.4 mi
↰	9.	Turn **left** onto **NW Northrup St**	518 ft
↱	10.	Turn **right** onto **NW 22nd Ave**	331 ft
	11.	Arrive at **NW 22nd Ave** The last intersection before your destination is NW Marshall St If you reach NW Lovejoy St, you've gone too far	

B Legacy Good Samaritan Hospital

Table 9 Emergency Telephone List	
Police	911 503-823-3333 Non-Emergency
Fire	911 503-823-3700 Non-Emergency
Ambulance/EMS	911
Hospital: Legacy Good Samaritan Hospital, 1015 NW 22nd Ave, Portland, OR 97210	503- 413-7711
WorkCare Incident Intervention	888-449-7787
Dr. Greaney – Occupational Medicine (Work Care)	714-456-2154
Sevenson Environmental Services, Inc.	
Paul Jung - Safety and Health Manager	716-284-0431 (Office); 716-609-1767 (Cell)
Mike Crystal - Program Manager V.P.	716-284-0431 (Office)
Joe Burke- Site Project Manager	401-486-8204 (Cell)
Taylor Crystal – Site Superintendent	716-807-1937 (Cell)
Terry Templeton – Site Health and Safety Officer Ryan Baldwin – Site Health and Safety Officer	716-476-6790 (ell) 716-343-1487 (ell)
NW Natural	
Bob Wyatt- Respondent Project Manager	503 226-4211 Ext. 5425 (Office)
Tim Stone - Anchor Project Manager	503-475-9150
OTHERS	
U.S. Environmental Protection Agency, Region 10	206-553-1200 or 1-800-424-4372
Public Health Division	971-673-0440
Office of Emergency Management	503-378-2911
U.S. Coast Guard Willamette River Station	503-240-9311 or 503-861-6211 (Emergency Only)
Oregon Department of Environmental Quality	503-229-5696
Oregon Emergency Response System (Spills)	800 452-0311
National Response Center	800-424-8802
EPA Emergency Response Team, Region X	800 424-4372
Oregon Dig Safely	811 or 800 332-2344
CHEMTREC	800-424-9300
Poison Control	800-222-1222

12.7 Implementation of the Plan

There is a logical sequence of steps to follow in responding to emergencies, which should be followed by site personnel. This sequence involves identifying the emergency, investigating the extent of the emergency, deciding on the proper initial course of action, taking corrective action to rectify the situation, and following up with a post-emergency investigation.

Equipment breakdowns, power failures, injuries, and natural disasters are usually rather dramatic and will capture the individual's attention immediately upon occurrence. In other cases, the individual may have warning of impending emergencies through weather reports in the case of natural disasters and trends in equipment performance in the case of some breakdowns.

Some emergency situations exist long before the operator is aware that an emergency exists. These cases may produce situations, which then become immediate and obvious. For example, unattended equipment may have minor breakdowns which go unnoticed; further operation thus

leading to complete breakdown of the equipment resulting in possible injury to the unwary bystander.

In the event of a fire, explosion, accidental material release, or any other emergency, response activities will be initiated following the evaluation of the event. An assessment of the situation will be performed by the SSHO immediately upon notification. The Superintendent/SSHO is authorized to commit resources to the extent detailed in this plan. If it is determined that an emergency exists, he will then implement the appropriate emergency response activities.

If a medical emergency or accident occurs in the Exclusion Zone, all personnel responding to the emergency should be outfitted in the Personal Protective Equipment appropriate for the situation. As a rule, personnel should not enter the Exclusion Zone without donning the minimal level of PPE required. If a worker is overcome or disabled for an unknown reason, the Superintendent/SSHO must decide as to the level of respiratory protection, which is appropriate. Specifically, a determination must be made as to whether Supplied Air Respirators are necessary for the protection of the responders.

12.7.1 Conditions for Implementation

The contingency plan will be activated by the Superintendent/SSHO immediately in the event of a fire or explosion, or emissions of toxic chemicals more than limits set forth by Federal, State, and local agencies. In the event of a spill or material release, it will be up to the Superintendent/SSHO to decide as to when emergency conditions exist, as opposed to routine maintenance of the site. His determination will depend upon the location of the spill, the size of the spill, weather conditions and the proximity of the release to workers, the community, and environmental receptors.

Once it becomes apparent that an emergency situation exists or that a disaster is impending, the Project Superintendent or his designee should immediately be notified, and an immediate investigation conducted. Assessment of the emergency should include assessing the severity of the situation and collecting enough information to make an initial action decision.

Assessing the emergency should include identifying injured persons (if any), damage to buildings and equipment, noting potential impending damage if corrective action is not taken immediately, and itemizing resources required to correct the situation.

12.7.1.1 Fire or Explosion

Although the potential for fire or explosion is minimal, sources of risk do exist. These sources include welding gases, gasoline for portable equipment, diesel fuel for the heavy equipment and combustible debris. In the event of an explosion, possible emergency conditions would exist. Unless extinguished immediately, a fire or explosion will trigger implementation of these procedures.

12.7.1.2 Material Spills

Material Spills could occur during truck loading and from vehicle accidents. Additionally, equipment fueling operations could produce spills. Ultimately, a spill could contaminate receiving surface water or cause a release of vapors to the air. A spill of fuel could also ignite. A small spill should be cleaned up immediately but should not trigger activation of these procedures. Should an onsite spill occur, the immediate response will include closing off the source of the spill, if possible, application of the sorbent material or sand bagging, and street sweeping, as appropriate.

Any spill that results in a discharge to offsite surface water will be contained with sorbent booms as needed. All spills will be investigated, and a written report will be provided to the regulatory agencies in accordance with applicable regulations.

12.7.1.3 Severe Weather

In the event of severe weather, the Site Superintendent and/or the SSHO have the authority to stop operations and direct evacuation procedures, if conditions warrant. All equipment will be secured and grounded. After the storm, a visual inspection will be performed by the Superintendent and/or the SSHO to check for damage and hazards. These will be performed before any work is resumed. If damage or hazards are noted, the designated or other Sevenson personnel will evaluate the conditions and implement corrective actions to repair the damage or eliminate the hazard. These actions will begin as soon as possible and will take precedence over other site activities.

12.7.2 Initial Action

Once the extent of the emergency is known, the Superintendent and the SSHO will make an immediate decision as to what initial steps should be taken to remedy the emergency. This first action, in the case of large-scale emergencies, usually consists of notifying responsible authorities and/or calling for the necessary assistance in order of priority.

The individual(s) should not unduly endanger him or herself or others by attempting tasks for which the proper equipment is not available or with which he or she is unfamiliar. In all cases, if in doubt, wait until qualified help arrives before acting.

12.7.3 Corrective Action

When help arrives, the site superintendent/SSHO should immediately inform those called of the pertinent details of the situation. Corrective action should be continued until the situation is either under control or completely rectified. If corrective actions will take considerable time, a long-term effort to complete the task should be developed.

12.7.4 Follow-Through

After the situation is corrected, the cause of the emergency event is to be determined and review of the corrective actions taken, etc. In the case of equipment failure, if negligence was not a factor, then revising maintenance procedures would be the most likely first preventive step. For natural disasters that cannot be prevented from recurring, the procedures followed in dealing with them can be reviewed to develop more effective action plans. The entire event, along with all the responses, will be thoroughly documented for review by management and project supervisory personnel.

12.8 Spill Response and Control Plan

An Environmental Protection Program and Spill and Contamination Prevention Plan have been developed under separate cover and have been included as Appendix I and J respectively. *(Note: these plans may still be under development during plan review period and will be attached once accepted by NW Natural. This note shall be removed at that time)*

13.0 INSPECTION AND REPORTING

13.1 Safety and Health Inspections

Safety and Health inspections will be conducted to discover, through specific, methodical auditing, checking, or inspection procedures, conditions and work practice that lead to job accidents and illnesses.

The Health and Safety Manager shall be responsible for ensuring that inspections are conducted at the frequency stated, reviewing the Daily Safety and Inspection Logs for completeness, thoroughness, and trends; performing monthly project inspections; and training site personnel on proper inspection techniques. The SSHO shall be responsible for ensuring that daily inspections are conducted, reviewing the inspections findings and corrective actions for applicability and thoroughness, and providing the site management personnel with a summary of inspection findings each month.

13.2 Daily Safety and Inspections Log

The SSHO will ensure that all aspects of the CHASP are complied with daily. The SSHO has the authority to shut the work down and ban any individual from the Site. If deficiencies are noted, they will be recorded on the Daily Safety and Inspection Log and will be corrected immediately. The Daily Safety and Inspection Log will be attached to the Daily Quality Control Report. The Daily Safety and Inspection Log will include the date, work area, employees present at the work area, PPE and work equipment in each area, specific safety and health issues, and notes and the signature of the preparer. Refer to ***Appendix B – Safety and Health Forms for the Daily Safety and Inspection Log.***

13.3 Certification of Worker/Visitor Acknowledgment

A Certification of Worker/Visitor Acknowledgment will be submitted to the Client Representative prior to initial entry onto the Site. The certification/acknowledgment will include both formal, field and site-specific training received, personal protective equipment supplied and trained in use, and medical certification. Certificates and Medical certification will be kept on file at the site. Refer to ***Appendix B – Safety and Health Forms for the Certificate of Worker/Visitor Acknowledgement.***

13.4 Incident Reports

Incident reporting will ensure an immediate report on all near misses, spills, injuries, equipment and property damage events shall be reported immediately or as soon as practical but no later than 24 hours form time of discovery. This is to facilitate an effective follow-up for corrective action to eliminate unsafe practices and unsafe conditions. An **Incident/Accident Form** must be completed within 24 hours of the Incident/Accident. This report is utilized in the event of injuries, off-site releases, utility breaks, near misses, spills, injuries or accidents. Immediately following the incident/accident, the Site Superintendent and the SSHO will initiate an Incident/Accident Investigation. An Accident Report will be completed and submitted to The Client Representative within two working days. ***Refer to Appendix B – Safety and Health Forms for the Incident/Accident Form.***

"Near misses" will be documented and investigated in the same manner as accidents or incidents.

13.5 Daily Air Monitoring Report

The Daily Air Monitoring Report will be prepared by the SSHO. The Report will include all air monitoring data collected including real-time monitoring, personal monitoring within the Exclusion Zone, and perimeter monitoring.

13.6 Weekly Safety Meeting/Daily Tool Box Talks

As part of Sevenson's Corporate Health and Safety Program, a Weekly Safety Meeting is conducted on Monday mornings in conjunction with Daily Toolbox Talks. This safety meeting outlines current industry safety issues and allows for discussion of job-specific issues. In addition, a daily site briefing will be held to discuss current work activities and hazards for the day along with the air monitoring results from the previous day. The SSHO/Superintendent will conduct Daily Tool Box Talks and Weekly Safety Meetings with ALL on-site personnel Refer to ***Appendix B – Safety and Health Forms for Daily Toolbox Talks and Weekly Safety Meetings.***

In addition to the daily toolbox talks and the weekly safety meeting, Sevenson will conduct monthly project management safety meetings. All site management, including sub-contractor personnel, is required to attend. Topics of discussion will include hazards identified and abated during the previous month, any outstanding action, new tasks to be performed, site concerns etc. The SSHO will submit a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items, and a signed attendance list.

13.7 Safe Plan of Action

Prior to the start of the job, an activity hazard analysis will be performed by the Health and Safety Department or SSHO. The health and safety hazards for each operation will be noted, then the appropriate control(s) for each hazard will be recommended. Prior to the start of any operation, the tasks, possible hazards, and their associated control techniques will be discussed with the affected employees through the Safe Plan of Action Program.

Safe Plan of Action Program

As part of Sevenson's Activity Hazard Analysis program a daily Safe Plan of Action or SPA is to be completed for job tasks assigned during the day. This program is to supplement, not replace the Activity Hazard Analysis already prepared prior to work assignments. The SPA is to be completed by the supervisor assigning the work and the personnel who are to perform the work. The Activity Hazard Analysis may be used as a generic temple to complete the SPA but should not be the SPA. The expectation of the SPA is for the worker and supervisor to identify each specific hazard present, determine how to minimize the hazard, resources required to minimize the hazard, and where to find those resources.

Example, the Activity Hazard Analysis identifies pinch points as a hazard associated with the job task. The supervisor and worker(s) will evaluate the work area and identify the pinch point such as drill being used near an object where the torque on the drill could cause pressure to place on the fingers or hand between the drill and the object.

Once all specific hazards have been identified and written on the SPA form a pre job briefing can occur to ensure all affected personnel understand the hazards present. The SPA may be modified at any time during the day as new hazards develop. Refer to ***Appendix B –Safe Plan of Action form.***

13.8 Job Safety Enhancement Program (JSEP)

JSEP is a tool used at Sevenson projects to identify behaviors and unsafe workplace conditions. These reports are reviewed and discussed by the Project Manager, Site Superintendent, Quality Control Manager, and the SSHO to determine if corrective actions are required. Each report is recorded on a tracking matrix to ensure the report has been reviewed, responsible person for corrections properly closed out and discussed with the affected site personnel. Sevenson encourages all personnel involved in a project to complete a JSEP Form. Refer to ***Appendix B – JSEP Form.***

Appendix A
Activity Hazard Analysis

Sevenson Environmental Services, Inc.
100 Years of Family
Est. 1917

Job Hazard Analysis (JHA)

JHA Filename: Site Mobilization/Setup

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued	May 18, 2021	**JHA**	Construction/Remediation	**JHA Author**	Sevenson Environmental Services, Inc.
Date Revised	August 15, 2023	**Client**	**NW Natural**		
Work Activity	Site Mobilization/Setup				
Work Site	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area Portland, Oregon				
Key Equipment	Excavator, front-end loader, forklift, trucks, crane				
Task-specific Training	Task-Specific Training; 40-HR and 8-HR HAZWOPER training; HAZCOM; PPE; Equipment Signaling; Flagging/Spotting Trucks				

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)

☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR:_____*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE/HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER* _____
☒ SAFETY GLASSES	☒ HARD TOED BOOTS	☐ OTHER* _____	☐ OTHER* _____

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II

Gloves –A4 or higher cut-resistant

JSA Development Team	Position/Title	JSA Development Team	Position/Title
Peter Boland	Corporate Safety & Health Officer		
Paul Jung	Health & Safety Manager		

GASCO0052590

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Perform the SPA process and discuss Stop Work Authority (SWA)	• Site personnel not aware of site hazards and SWA responsibilities	• Project team to discuss the importance of, and documentation procedures for, SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe. Prior to beginning work activities for the day, each crew will meet with the supervisor to develop a Safe Plan of Action (SPA) for the day's work, outlining the steps of the task, anticipated hazards, and the safe means and methods for completing each step of the task.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Pre-job setup/existing conditions	• Emergency response • Biological hazards (Poisonous plants; biting/stinging insects; snakes; wild/feral/rabid animals; infectious materials) • Walking/working surfaces • Severe weather • Utilities	• Review site emergency response plan and ensure that all employees are aware of site rally point(s) and emergency contact numbers in the event of an emergency. • Survey the area for biological hazards prior to commencing work. Avoid insect nests and spiders/spider webs. Check skin and clothing periodically throughout the day when working in areas that are potential tick areas. Use insect repellents. Use Wasp/Bee spray for observed nests. Use Poison Ivy Barrier Cream (Ivy-X or equivalent) in areas where the potential for contact with poisonous plants exists. Use cool water and mild soap (or a designated poisonous plant scrub, if available) if personnel is believed to have come into contact with poisonous plants. (Hot water will open skin pores and allow increased contact with irritating oils.) Use loud sounds to attempt to scare off animals. **DO NOT APPROACH ANIMALS.** If an animal is behaving aggressively, get to a safe shelter (vehicle, site trailer, etc) and contact Animal Control. If used hypodermic needles or other potentially infectious materials are observed, contact SSHO to ensure that they are safely collected and properly disposed of to eliminate the risk of Bloodborne Pathogen (BBP) contamination. • Survey work area to locate any pre-existing trip hazards and eliminate them whenever possible. If trip hazards cannot be eliminated, make sure that they are clearly marked or cordoned off. Practice good housekeeping – keep walkways and work areas clear of hoses, cords, and clutter. Route hoses and cords away from higher traffic areas. Restrict site to essential personnel. Wear safety toe (steel or composite) boots. • Monitor weather for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e.; tornado warnings/watches, thunderstorms, tsunamis, and flooding conditions, etc). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. • Survey work area to locate any overhead utility lines and properly mark them out or cordon them off. At least three days prior to the start of any excavation activities, contact DIG SAFE services (811)

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		for utility mark out. Dig permits expire every 28 days, so every 25 days, the service must be notified of any continuing excavation activities. All known utility lines/services entering the site will be marked out and a subsurface utility investigation will be performed using Ground Penetrating Radar (GPR), vacuum excavation, and/or hand excavation. Within 24 inches of any known utility lines or services, only hand excavation is permitted unless specifically directed otherwise by the Client Representative. Utility clearance perimeter trenching will be performed to a minimum of 5' below ground surface (or deeper, depending on the proposed depth of the excavation and depth(s) of any adjacent utility). If a subsurface anomaly or utility line that has not been previously marked out is discovered within the excavation limits or could interfere with the installation of excavation support system components, a confirmation test pit will be required to expose and physically verify the exact location and configuration of all nearby utilities. All utility clearance perimeter trenching and confirmation test pit excavation will be performed by non-mechanical methods (hand auger, post hole digger, and/or shovel, in conjunction with a vacuum truck if necessary) and should extend throughout the tolerance zone for any known utility line(s) or subsurface anomaly. If not previously marked, the tolerance zone will be defined in the field as one-half of the known diameter of the utility plus two feet on either side of the marked center line. For known below ground facilities, a minimum of five feet clearance from all critical facilities' exterior surfaces and ten feet clearance from all high-priority facilities' exterior surfaces must be maintained at all times. If excavation will be required within these limits, then a PG&E "Standby Person" is required to oversee the excavation.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Equipment mobilization	• Equipment/materials offloading, inspection, and use • Hand tool inspections and use • Struck by/crushed by/caught between heavy equipment • Exposure to sharp objects/materials or pinch points • Exposure to vehicle traffic • Exposure to high noise (>85dB) • Exposure to high or low ambient temperature • Flying debris • Falls from elevation • Working on, over or near water	• Ensure that equipment and materials will not move prior to releasing chains or straps. SSHO and a qualified operator will perform an Initial Equipment Inspection to ensure that all equipment is in good working condition and that backup alarms and seat belts are operable. Rollover Protection Structures (ROPS) are required for all heavy equipment. After initial inspection is complete, a qualified operator is to perform a daily inspection of each piece of equipment to be used to ensure that all controls and safety features are in good working condition and that fluid levels are within operating limits. Only qualified employees are authorized to operate heavy equipment. Ensure that all nonessential personnel are clear of the area when any equipment is being loaded or unloaded. • Before beginning any work with hand tools, ensure that all personnel are trained on the use of the tool(s) that they are expected to use and that each tool has been inspected for functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job and tag out and remove any tools that are damaged or missing safety features. • Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. High-visibility vest/clothing required at all times. • No straight blades unless approved by the SSHO for the task. Cut away from the body and wear cut-resistant gloves. To avoid scratches, wear long pants, long sleeves, and work gloves that are cut and puncture rated. Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. • Traffic in and out of the site must be maintained in an orderly fashion throughout the workday. Traffic control (barricades/signage/flaggers) required for any work performed on, or adjacent to, an active street. Traffic control flaggers will be courteous, professional, and alert at all times and will be assigned, where necessary, by the Superintendent. Truck drivers

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		are to follow the direction of flaggers/spotters unless they have a concern about a location or condition that could cause an accident, incident, injury, or property damage based on their knowledge as a driver and of their equipment; the driver is to exercise SWA and review the situation with the Superintendent and SSHO. Drivers will follow all safe-driving regulations, including wearing seat belts, while on site, and if they exit their cabs for any reason, they will wear safety reflective vests whenever they are outside of the cabs. • Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on selection, fit, and use of hearing protection. All employees will be enrolled in SES hearing conservation program. • Discuss the signs and symptoms of heat and cold stress and conduct periodic safety briefs about heat or cold stress during relevant weather conditions. If work takes place in cold weather: dress warmly and protect exposed skin when performing work outdoors. Workers should dress in layers and have extra clothing available if they get wet. Watch for symptoms of exposure (loss of feeling in extremities, skin discoloration, disorientation, or drowsiness, etc.), drink warm liquids, and monitor workers' core temperature periodically throughout the day. Utilize work/warmup schedule. If work takes place in hot weather: plan strenuous activities for early in the day whenever possible. Dress in loosely fitted clothing that allows air to circulate and protect exposed skin with clothing or sunscreen when performing work outdoors. Protect eyes with tinted and/or polarized safety glasses. Drink plenty of cool fluids (at least 8 oz every hour) and remain alert for symptoms of heat-related illness (dizziness, confusion, clammy skin, stop sweating, nausea, cramping, etc.). Take frequent breaks, monitor core temperatures of workers throughout the day, and utilize work/cooldown schedule. • Ensure guards are installed and working on tools and equipment being used. Initiate dust control measures if visible dust is observed. Wear safety glasses at a minimum, along with googles or a face shield if grinding or performing other tasks that generate dust or flying debris. • Personnel shall not ride on moving equipment unless a seat with a seat belt is provided. Maintain three points of contact when entering, exiting, or otherwise climbing on equipment. For any work to be performed from

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		heights greater than six feet or within six feet of an exposed edge, a Fall Prevention or Personal Fall Arrest System (PFAS) is required. Fall Prevention will consist of a guardrail system (top rail, mid-rail, and toe board) capable of supporting at least 200 pounds within 2" of the top edge in any direction. PFAS will consist of a body harness, lanyard (retractable or fixed length), and secure anchorage point(s). All personnel shall wear United States Coast Guard (USCG)-approved Type I or II Personal Flotation Devices (PFDs) while working near the water where a drowning hazard exists.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Fueling Operations	• Spills • Fires/explosion	• Use good housekeeping practices and maintain spill response equipment on-site at all times. Follow best spill prevention and chemical storage practices at all times, including using secondary containment during all fueling activities. Ensure that a spill control plan is in place and that employees have been trained on it for spills encountered during work activities. Turn off all equipment and use secondary containment while fueling. Report all spills to the SSHO immediately. Subcontractors to supply Safety Data Sheets (SDS) for any chemicals to be used or stored on-site to ensure that proper storage procedures are being followed and proper spill protection materials are on-site. Survey the immediate area for inlets and sensitive receptors, and block or cover any in the area. • Ensure that fire extinguishers are in place and have been inspected. Permit. No such activities will be permitted in the presence of an explosive atmosphere.. Use good housekeeping practices and ensure that all ignition sources have been eliminated or otherwise protected by fire blankets or wetting the area. All equipment is to be shut down during fueling operations and equipment will not be staged in areas of high vegetation. Smoking is never permitted on site, especially not during fueling operations. Fueling will take place in well-ventilated areas away from ignition sources. Equipment and fuel tanks do not need to be grounded if the metal nozzle is in contact with the metal of the equipment's fuel tank.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Construction of support facilities	• Struck by/crushed by/caught between heavy equipment • Spills • Exposure to sharp objects/materials or pinch points • Exposure to vehicle traffic • Exposure to high noise (>85dB) • Exposure to high or low ambient temperature • Flying debris • Hand/power tools • Falls from elevation	• Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. Type II high-visibility vest/clothing required at all times. • Use good housekeeping practices and maintain spill response equipment on-site at all times. Follow best spill prevention and chemical storage practices at all times, including using secondary containment during fueling operations. Ensure that a spill control plan is in place and that employees have been trained on it for spills encountered during work activities. Turn off all equipment and use secondary containment while fueling. Report all spills to the SSHO immediately. Subcontractors to supply Safety Data Sheets (SDS) for any chemicals to be used or stored on-site to ensure that proper storage procedures are being followed and proper spill protection materials are on-site. • Use care with utility knives, replace and properly dispose of dull blades, and store all utility knives properly. Cut away from the body and wear Kevlar cut-resistant gloves. To avoid scratches, wear long pants, long sleeves, and leather or equivalent work gloves. Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. • Traffic in and out of the site must be maintained in an orderly fashion throughout the workday. Traffic control (barricades/signage/flaggers) required for any work performed on, or adjacent to, an active street. Traffic control flaggers will be courteous, professional, and alert at all times and will be assigned, where necessary, by the Superintendent. Truck drivers are to follow the direction of flaggers/spotters unless they have a concern about a location or condition that could cause an accident, incident, injury, or property damage based on their knowledge as a driver and of their equipment, the driver is to exercise SWA and review the situation with the Superintendent and SSHO. Drivers will follow all safe-driving regulations, including wearing seat belts, while on site, and if they exit their cabs for

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		any reason, they will wear safety reflective vests whenever they are outside of the cabs. • Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on proper selection and use of hearing protection. All employees will be enrolled in SES hearing conservation program. • Discuss the signs and symptoms of heat and cold stress and conduct periodic safety briefs about heat or cold stress during relevant weather conditions. If work takes place in cold weather: dress properly and protect exposed skin when performing work outdoors. Workers should dress in layers and have extra clothing available if they get wet. Watch for symptoms of exposure (loss of feeling in extremities, skin discoloration, disorientation or drowsiness, etc), drink warm liquids, and monitor workers' core temperature periodically throughout the day. Utilize work/warmup schedule. If work takes place in hot weather: plan strenuous activities for early in the day whenever possible. Dress in loosely fitted clothing that allows air to circulate and protect exposed skin with sunscreen when performing work outdoors. Protect eyes with tinted and/or polarized safety glasses. Drink plenty of cool fluids (at least 8 oz every hour) and remain alert for symptoms of heat-related illness (dizziness, confusion, clammy skin, stop sweating, nausea, cramping, etc). Take frequent breaks, monitor core temperatures of workers throughout the day once ambient temperatures have reached 73°, and utilize work/cooldown schedule. • Ensure guards are properly installed and working on tools and equipment being used. Initiate dust control measures if visible dust is observed. Wear safety glasses at a minimum, along with googles or a face shield if grinding or performing other tasks that generate dust or flying debris. • Before beginning any work with hand tools, ensure that all personnel are trained on the proper use of the tool(s) that they are expected to use and that each tool has been inspected for proper functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job and tag out and remove any tools that are damaged or missing safety features. • Personnel shall not ride on moving equipment unless a seat with a seat belt is provided. Maintain three points of contact when entering, exiting, or

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		otherwise climbing on equipment. For any work to be performed from heights greater than six feet or within six feet of an exposed edge, a Fall Prevention or Personal Fall Arrest System (PFAS) is required. Fall Prevention will consist of a guardrail system (top rail, mid-rail, and toe board) capable of supporting at least 200 pounds within 2-inches of the top edge in any direction or a restraining device that prevents the worker from accessing the leading edge. PFAS will consist of a body harness, lanyard (retractable or fixed length), and secure anchorage point(s).
Placement of erosion controls	• Muscle sprains/strains • Exposure to sharp objects/materials or pinch points • Hand tools (shovels, rakes, sledgehammer) • Working near on or over water	• Use good ergonomics while installing erosion controls and properly stretch affected muscle groups prior to beginning strenuous work activities. • Use care with utility knives, replace and properly dispose of dull blades, and store all utility knives properly. Cut away from the body and wear Kevlar cut-resistant gloves. To avoid scratches, wear long pants, long sleeves, and leather or equivalent work gloves. Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. • Before beginning any work with hand tools, ensure that all personnel are trained on the proper use of the tool(s) that they are expected to use and that each tool has been inspected for proper functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job and tag out and remove any tools that are damaged or missing safety features. • All personnel shall wear United States Coast Guard (USCG)-approved Type I or II Personal Flotation Devices (PFDs) while working near the water where a drowning hazard exists.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Electrical Work	• Exposure to hazardous energy • Hand tools (screwdrivers, bit drivers)	• All electrical work is to be performed by licensed electricians, in compliance with National Electrical Code and contract specifications. All circuits are to be de-energized prior to beginning work activities and rendered inoperable with locks and tags at any point where the circuits could be energized. Affected personnel will develop a specific LOTO plan for each task based on the conditions involved. • Before beginning any work with hand tools, ensure that all personnel are trained on the proper use of the tool(s) that they are expected to use and that each tool has been inspected for proper functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job and tag out and remove any tools that are damaged or missing safety features.
Maintenance Work	• Exposure to hazardous energy	• Lockout/Tagout/Try Program in place. Ensure that all equipment or circuits are de-energized prior to beginning work activities and that they have been rendered inoperable with locks and tags at any point where such equipment or circuits can be energized. SES personnel will develop a specific LOTO plan for each task based on the conditions involved.
Offloading of equipment	• Crane failure/overload • Suspended loads/swing radius/ struck-by/crushed-by • Slips/trips near water's edge • Severe weather • Working on or near water	• Crane operator to possess required certification and crane to have load charts and current inspection certificates. SSHO to complete inspection of crane with crane operator to ensure that crane is in good working condition and that all safety functions are working. Lift plan to be developed in the field for any lift utilizing a crane. Qualified lifting supervisor to ensure that all aspects of the lift plan have been completed and documented and that the lift plan is being followed. Crane to be mobilized only on stable ground with outriggers fully extended and outrigger pads in place if required. Qualified rigger is required to be present during rigging operations and picks. A single, designated,

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		qualified signal person required to direct crane operator if operator cannot pick and place load unassisted. • A pre-job briefing will be performed with the entire crew prior to the commencement of any lift that will outline specific tasks to be performed and all potential hazards specific to those tasks. No work is to be performed beneath suspended loads and outriggers are to be blocked and the crane's swing radius delineated to prevent persons from entering pinch points prior to commencing any picks. All rigging is to be inspected prior to each use, load rating tags are to be attached, and all rigging to be used is to meet the load requirements based on the rigging plan. If any rigging does not meet these requirements, it is to be taken out of service, tagged, and given to the SSHO. Tag lines are required on all loads unless it is deemed hazardous to do so. Loads are not to be handled by hand, and tag lines or poles are required to move the load into position before it is set. • USCG-approved Type IV (Throwable) PFD with at least 150' of 3/8" line with a 600-pound capacity will be available within 200' of any work area near water. Any trip hazards that can be removed prior to commencing lift activities should be eliminated; otherwise, all slip and trip hazards should be marked out or otherwise communicated prior to commencing lifting activities. • Monitor weather for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e., tornado warnings/watches, thunderstorms, tsunami, and flooding conditions, etc.). Outside work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. All personnel are to keep an "eye to the sky" and be aware that unexpected storms may occur with little or no warning. Crane work will be suspended during periods of poor visibility as determined by the Superintendent, SSHO, and/or crane operator. In the event of winds greater than 25 mph, all crane activities will be suspended; additionally, the crane operator has SWA at lower wind speeds if they do not believe that they can properly

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		complete the lift.

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Job Hazard Analysis (JHA)

JHA Filename: Site Mobilization/Setup

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught."

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Name	Signature	Date

Name	Signature	Date

GASCO0052604

Job Hazard Analysis (JHA)

Mobile Elevated Work Platform (MEWP)

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/	May, 14, 2021	**JHA**	Construction/Remediation
Date Revised	August 15, 2023 September 8, 2023		
JSA Author	Sevenson Environmental Services Inc.	**Client**	NW Natural
Work Activity	**Mobile Elevated Work Platform (MEWP) Use**		
Work Site	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area Portland, Oregon		
Key Equipment	MEWP / basket ejection protection		
Task-specific Training	HAZWOPER 40/8 certification, MEWP operator certification and training, site specific HASP training;		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR:_____*	☒ GLOVES* Cut Resistant Kevlar 6/ Fire rated burn gloves for hot work
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☒ LIFELINE/HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☒ OTHER* FR Clothing required for hot work
☒ EYE PROTECTION	☒ HARD TOED BOOTS	☒ US COAST GUARD APPROVED TYPE I, III, OR V PERSONAL FLOATATION DEVICE	☐ OTHER* _____
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
USCG-approved Type I, III, or V PFD			
Gloves – Cut resistant A5			
Full body harness with restraining lanyard			

JSA Development Team	Position/Title	**JSA Development Team**	Position/Title
Peter Boland	Corporate Safety & Health Officer		
Paul Jung	Health & Safety Manager		

GASCO0052605

Job Hazard Analysis (JHA)

Mobile Elevated Work Platform (MEWP)

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Perform the Safe Plan of Action (SPA) process and discuss Stop Work Authority (SWA)	• Site personnel not aware of site hazards and SWA responsibilities	Project team to discuss the importance of and documentation procedures for, SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe. Prior to beginning work activities for the day, each crew will meet with the supervisor to develop a SPA for the day's work, outlining the steps of the task, anticipated hazards, and the safe means and methods for completing each step of the task.
Mobile Elevated Work Platform (MEWP) use	• Improper training and inspection	• A pre check inspection is to be performed and documented by the SSHO upon arrival of MEWP. • MEWP shall be free of fluid leaks and tires are in good condition • MEWP lift controls shall be tested in accordance with the manufacturer's recommendations or instructions prior to use to determine that such controls are in safe working condition. • All controls and signaling devices are tested and are in good operating condition. • Operator to possess current, Federal, State or local MEWP certification and the MEWP must have current manufactures user Manuel attached to Folder pocket located on basket of lift • Operator to perform and complete daily inspection prior to use and documented. • All components shall be inspected and tested prior to each use and documented daily. • Before moving an aerial device for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position. • All tools and fall protection to be immediately stored in its proper location upon completion of task at no time is fall protection to be left hanging on basket and left out in the elements which can cause weathers and degradation of the components.
	• Uneven terrain	• The route to be traveled will be surveyed by lift operator immediately prior to the work trip, checking for overhead obstructions, traffic, holes and soft spots in the pavement, ground or shoulder, ditches, slopes, etc., for areas other than paved, a survey will be made on foot.
	• Overhead hazards	• Where work must be done near live lines, the movement of all equipment such must be guided by an observer who can observe the clearance of the equipment from energized lines and give timely warning to equipment operators. • The minimum clearance between live uninsulated lines and any jobsite equipment is 10 feet (and the clearance increases with increasing line voltages. In areas of insulated low voltage (300 v or less) the operator must avoid contact with the line.

		• When an insulated aerial device is required, the aerial device shall not be altered in any manner that might reduce its insulating value
	• Maintenance Hazards	• Prior to any maintenance, work, repair or trouble shooting to be performed on any specific equipment a JHA specific to that equipment, hazards and controls will be developed, submitted for review and approved prior to initiating work involving equipment maintenance. • When maintenance work on MEWP is required it must be performed by a qualified technician.
	• Blind spots/struck by/caught between	• Do not walk, work, or stand near equipment being used or moved, spotter to be used when working in tight work areas. • Swing radius of work area to be delineated warning of hazards when overhead work is being conducted. • All tools and materials in use to be secured inside basket with tool tethers or tool buckets and good housing within the basket to be used and maintained at all times
	• Ejection Hazard/Fall from elevation	• Immediately upon entry into the MEWP platform and prior to moving the basket a restraining system must be connected to the manufacturers anchor point. Full Body harness and positioning lanyard must be inspected by the user and documented prior to each use. • An employee, while in an elevated aerial device, shall be secured to the manufactures approved anchor point and the positioning lanyard device system shall be rigged such that an employee cannot free fall more than 2 feet. • Employees shall not sit or climb on the toe board, mid rail, or top rail of the basket nor may they use planks, ladders or other devices to gain greater working height. • Boom and basket and platform load limits specified by the manufacturer shall not be exceeded. • Employees are not permitted to leave the basket to perform work activities when elevated at any time. • Wheel chocks shall be installed before raising an aerial device on an incline. • Aerial lifts equipped with outriggers shall be positioned on pads or a solid surface. All outriggers shall be equipped with hydraulic holding valves or mechanical locks at the outriggers. • The speed of the vehicle is not to exceed three (3) miles per hour when personnel are located within the basket
	• Severe Weather	• National weather forecasts will be monitored daily for predicted inclement weather, earthquakes that may cause a potential for Tsunami's and immediate evacuation from water to posted Evac route. • All personnel shall be aware of the forecast and keep an "eye to the sky." • In the event of lightning in the area, work will cease at the direction of Sevenson's Supervisor or SSHO, A required 30 minute rule between lightning

		strikes or sound of thunder will be in effect and work activities will not proceed until it is determined that the storm has passed by the SSHO. • Wind speed to be determined daily prior to use of aerial lifts. Sustained wind speeds of 25 MPH will suspend work when using MEWPs. The SSHO or operator have the right to suspend work at lower sustained wind speeds should unsafe conditions develop.
	• Spills	• Maintain spill response equipment on-site at all times. • Follow best spill prevention and chemical storage practices per the manufacturers' SDS at all times. • Secondary containment (i.e., catch basin, inside designated containment area, etc.) is required during all fueling activities. • Survey the immediate area for inlets and sensitive receptors, and block or cover any in the area. • Spill control plan covers task and employees have been trained for spill prevention and response. • Report all spills to the SSHO immediately.
	• Working on or near water	• MEWPs located on a barge to perform work activities must be secured to the barge engineered anchoring system. • Personnel working on or near the water where a drowning hazard exists will be required to wear a Type I, III, or V USCG approved personal floatation device. A Type IV throw able PDF with 90-feet of 3/8 synthetic line (600 pound capacity) within 200 feet of the work area
	• Malfunction or Loss of Power	• The Fall Protection Rescue Plan shall be completed by the SSHO and Superintendent for MEWP work specific to the area the lift and height the MEWP is being used. The Fall Protection Rescue Plan is located in the Fall Protection Program in Appendix E of the CHASP.
	•	•
	•	•
	•	•

Job Hazard Analysis (JHA)

Mobile Elevated Work Platform (MEWP)

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Name	Signature	Date

Name	Signature	Date

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Job Hazard Analysis (JHA)

JHA Filename: Crane Operations

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued	May 15, 2021	**Work Type**	Construction/Remediation	**JHA Author**	Sevenson Environmental Services, Inc.
Date Revised	August 15, 2023	**Client**	NW Natural		
Work Activity	Crane Operations				
Work Site	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area Portland, Oregon				
Key Equipment	Hydraulic or lattice-boom crane (size to be determined)				
Task-specific Training	Task-Specific Training; HAZCOM; PPE; Equipment Signaling/Crane Signalperson; Flagging/Spotting Trucks; Qualified Rigger; Qualified and Competent Assembly/Disassembly Director				

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR:_____*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE/HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☒ OTHER* Personal Fall Arrest System (PFAS)
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* _____	☐ OTHER* _____

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II

Gloves –A4 or greater cut-resistant

PFAS consisting of full body harness with lanyard when working from heights greater than 6 ft, unless working from a secured, inspected ladder

JSA Development Team	Position/Title	**JSA Development Team**	Position/Title
Peter Boland	Corporate Safety & Health Officer		
Paul Jung	Health & Safety Manager		

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Perform the SPA process and discuss Stop Work Authority (SWA)	• Site personnel not aware of site hazards and SWA responsibilities	• Project team to discuss the importance of, and documentation procedures for, SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe. Prior to beginning work activities for the day, each crew will meet with the supervisor to develop a Safe Plan of Action (SPA) for the day's work, outlining the steps of the task, anticipated hazards, and the safe means and methods for completing each step of the task.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Pre-job setup/existing conditions	• Emergency response • Biological hazards (Poisonous plants; biting/stinging insects; snakes; wild/feral/rabid animals; infectious materials) • Walking/working surfaces • Severe weather • Utilities	• Review site emergency response plan and ensure that all employees are aware of site rally point(s) and emergency contact numbers in the event of an emergency. • Survey the area for biological hazards prior to commencing work. Avoid insect nests and spiders/spider webs. Check skin and clothing periodically throughout the day when working in areas that are potential tick areas. Use insect repellents. Use Wasp/Bee spray for observed nests. Use Poison Ivy Barrier Cream (Ivy-X or equivalent) in areas where the potential for contact with poisonous plants exists. Use cool water and mild soap (or a designated poisonous plant scrub, if available) if personnel is believed to have come into contact with poisonous plants. (Hot water will open skin pores and allow increased contact with irritating oils.) Use loud sounds to attempt to scare off animals. **DO NOT APPROACH ANIMALS.** If an animal is behaving aggressively, get to a safe shelter (vehicle, site trailer, etc) and contact Animal Control. If used hypodermic needles or other potentially infectious materials are observed, contact SSHO to ensure that they are safely collected and properly disposed of to eliminate the risk of Blood borne Pathogen (BBP) contamination. • Survey work area to locate any pre-existing trip hazards and eliminate them whenever possible. If trip hazards cannot be eliminated, make sure that they are clearly marked or cordoned off. Practice good housekeeping – keep walkways and work areas clear of hoses, cords, and clutter. Route hoses and cords away from higher traffic areas. Restrict site to essential personnel. Wear safety toe (steel or composite) boots. • Monitor weather for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e.; tornado warnings/watches, thunderstorms, earthquake, tsunami, and flooding conditions, etc). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. • Survey work area to locate any overhead utility lines and properly mark them out or cordon them off. At least three days prior to the start of any excavation activities, contact DIG services (811)

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		for utility mark out. Dig permits expire every 28 days, so every 25 days, the service must be notified of any continuing excavation activities. All known utility lines/services entering the site will be marked out and a subsurface utility investigation will be performed using Ground Penetrating Radar (GPR), vacuum excavation, and/or hand excavation. Within 24 inches of any known utility lines or services, only hand excavation is permitted unless specifically directed otherwise by the Client Representative. Utility clearance perimeter trenching will be performed to a minimum of 5' below ground surface (or deeper, depending on the proposed depth of the excavation and depth(s) of any adjacent utility). If a subsurface anomaly or utility line that has not been previously marked out is discovered within the excavation limits or could interfere with the installation of excavation support system components, a confirmation test pit will be required to expose and physically verify the exact location and configuration of all nearby utilities. All utility clearance perimeter trenching and confirmation test pit excavation will be performed by non-mechanical methods (hand auger, post hole digger, and/or shovel, in conjunction with a vacuum truck if necessary) and should extend throughout the tolerance zone for any known utility line(s) or subsurface anomaly. If not previously marked, the tolerance zone will be defined in the field as one-half of the known diameter of the utility plus two feet on either side of the marked center line. For known below ground facilities, a minimum of five feet clearance from all critical facilities' exterior surfaces and ten feet clearance from all high- priority facilities' exterior surfaces must be maintained at all times..

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Equipment mobilization	• Equipment/materials offloading, inspection, and use • Hand tool inspections and use • Struck by/crushed by/caught between heavy equipment • Exposure to sharp objects/materials or pinch points • Exposure to vehicle traffic • Exposure to high noise (>85dB) • Exposure to high or low ambient temperature • Flying debris • Falls from elevation	• Ensure that equipment and materials will not move prior to releasing chains or straps. SSHO and a qualified operator will perform an Initial Equipment Inspection to ensure that all equipment is in good working condition and that backup alarms and seat belts are operable. Rollover Protection Structures (ROPS) are required for all heavy equipment. After initial inspection is complete, a qualified operator is to perform a daily inspection of each piece of equipment to be used to ensure that all controls and safety features are in good working condition and that fluid levels are within operating limits. Only qualified employees are authorized to operate heavy equipment. Ensure that all nonessential personnel are clear of the area when any equipment is being loaded or unloaded. • Before beginning any work with hand tools, ensure that all personnel are trained on the use of the tool(s) that they are expected to use and that each tool has been inspected for functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job. • Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. Type II high-visibility vest/clothing required at all times. • Use care with utility knives, replace and dispose of dull blades, and store all utility knives and blades in a secure area. Cut away from the body and wear Kevlar cut-resistant gloves. To avoid scratches, wear long pants, long sleeves, and leather or equivalent work gloves. Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. • Traffic in and out of the site must be maintained in an orderly fashion throughout the workday. Traffic control (barricades/signage/flaggers) required for any work performed on, or adjacent to, an active street. Traffic control flaggers will be courteous, professional, and alert at all times and will be assigned, where necessary, by the Superintendent. Truck drivers

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		are to follow the direction of flaggers/spotters unless they have a concern about a location or condition that could cause an accident, incident, injury, or property damage based on their knowledge as a driver and of their equipment; the driver is to exercise SWA and review the situation with the Superintendent and SSHO. Drivers will follow all safe-driving regulations, including wearing seat belts, while on site, and if they exit their cabs for any reason, they will wear safety reflective vests whenever they are outside of the cabs. • Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on selection, fit, and use of hearing protection. All employees will be enrolled in SES hearing conservation program. • Discuss the signs and symptoms of heat and cold stress and conduct periodic safety briefs about heat or cold stress during relevant weather conditions. If work takes place in cold weather: dress warmly and protect exposed skin when performing work outdoors. Workers should dress in layers and have extra clothing available if they get wet. Watch for symptoms of exposure (loss of feeling in extremities, skin discoloration, disorientation or drowsiness, etc), drink warm liquids, and monitor workers' core temperature periodically throughout the day. Utilize work/warmup schedule. If work takes place in hot weather: plan strenuous activities for early in the day whenever possible. Dress in loosely fitted clothing that allows air to circulate and protect exposed skin with clothing or sunscreen when performing work outdoors. Protect eyes with tinted and/or polarized safety glasses. Drink plenty of cool fluids (at least 8 oz every hour) and remain alert for symptoms of heat-related illness (dizziness, confusion, clammy skin, stop sweating, nausea, cramping, etc). Take frequent breaks, monitor core temperatures of workers throughout the day once ambient temperatures have reached 73°, and utilize work/cooldown schedule. • Ensure guards are installed and working on tools and equipment being used. Initiate dust control measures if visible dust is observed. Wear safety glasses at a minimum, along with googles or a face shield if grinding or performing other tasks that generate dust or flying debris. • Personnel shall not ride on moving equipment unless a seat with a seat belt is provided. Maintain three points of contact when entering, exiting, or

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		otherwise climbing on equipment. For any work to be performed from heights greater than six feet or within six feet of an exposed edge, a Fall Prevention or Personal Fall Arrest System (PFAS) is required. Fall Prevention will consist of a guardrail system (top rail, mid-rail, and toe board) capable of supporting at least 200 pounds within 2-inches of the top edge in any direction. PFAS will consist of a body harness, lanyard (retractable or fixed length), and secure anchorage point(s).
Crane Requirements	• Lack of Training	• All crane work will be performed in accordance with OSHA regulations. Only a trained operator, who will be supplied by the crane rental company, will be permitted to operate the crane. No one other than the operator shall enter the cab of the crane, with the exception of persons such as helpers and/or supervisors whose duties require them to do so, and then only in the performance of their duties and with the knowledge of the operator and/or other designated person(s). Operators shall be required to possess a certificate or card showing their qualifications and shall be limited to the specific type of equipment for which they hold those certificates/cards. Operators shall be fit for duty and have completed a yearly physical or as otherwise required by federal, state, or local crane operator hoisting laws. The crane's load chart and inspection certificate are to be in the crane and documented as such upon arrival to site. A qualified and competent assembly/disassembly director is to be assigned to the project during crane assembly and disassembly.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Crane Assembly/Disassembly	• Struck by/crushed by dropped objects • Exposure to pinch points • Struck by/crushed by/caught between heavy equipment • Overhead hazards • Improper component assembly/equipment failure • Falls from elevation • Hand/power tools • Exposure to high noise (>85dB) • Heavy equipment use/inspections • Rigging failure	• Workers will not be permitted to work under the boom to install or remove pins or bolts unless the boom has been blocked and/or secured to prevent falling. Workers will not be permitted to work beneath a worker at a higher elevation without a drop zone established. • Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. Discuss potential pinch points and body positioning prior to moving components into position. Use spotters when moving large components to avoid damage to property or other personnel/equipment working in the area. Tag lines are required on all loads unless it is deemed hazardous to do so. Loads are not to be handled by hand, and tag lines or poles are required to move components into position before they are set. Communicate any pinch points that develop while moving equipment/materials, rigging, raising, cribbing, or assembling/disassembling equipment. • Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. The assembly/disassembly area is to be delineated using cones, barrier sticks, or caution/danger tape and signs warning of the hazards. Keep all nonessential personnel out of the assembly/disassembly area. • No suspended loads are to be swung over personnel working on the ground in the area, and no personnel are permitted to be in the path of the load as it is moved into position. Low overhead hazards that personnel could potentially walk into should be communicated and demarcated whenever possible. • The qualified and competent assembly and disassembly director will be present during all assembly and disassembly activities. All manufacturers' instructions will be followed for the assembly and disassembly of the crane. All components to be assembled are to be inspected prior to installation and documented, and if any deficiencies are noted, that

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		component is to be repaired or replaced before being installed or used. All equipment and tools to be used in the assembly and disassembly process will be used per the manufacturers' specifications if applicable. • Personnel shall not ride on moving equipment unless a seat with a seat belt is provided. Maintain three points of contact when entering, exiting, or otherwise climbing on equipment. For any work to be performed from heights greater than six feet or within six feet of an exposed edge, a Fall Prevention or Personal Fall Arrest System (PFAS) is required. Fall Prevention will consist of a guardrail system (top rail, mid-rail, and toe board) capable of supporting at least 200 pounds within 2-inches of the top edge in any direction. PFAS will consist of a body harness, lanyard (retractable or fixed length), and secure anchorage point(s). Any ladders to be used will be inspected prior to each use and properly braced/secured/held to prevent tipping or falling. • Before beginning any work with hand tools, ensure that all personnel are trained on the use of the tool(s) that they are expected to use and that each tool has been inspected for functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job. • Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on selection, fit, and use of hearing protection. All employees will be enrolled in SES hearing conservation program. • SSHO and a qualified operator will perform an Initial Equipment Inspection to ensure that all equipment is in good working condition and that backup alarms and seat belts are operable. Rollover Protection Structures (ROPS) are required for all heavy equipment. After initial inspection is complete, a qualified operator is to perform a daily inspection of each piece of equipment to be used to ensure that all mechanical, electrical, and safety controls and safety features are in good working condition and that fluid levels are within operating limits. Only qualified employees are authorized to operate heavy equipment. • All rigging is to be inspected prior to each use, load rating tags are to be attached, and all rigging to be used is to meet the load requirements based on the rigging plan. If any rigging does not meet these requirements, it is to be taken out of service, tagged, and given to the

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		SSHO. Tag lines are required on all loads unless it is deemed hazardous to do so.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Crane Operation	• Crane failure/overload/tip over • Suspended loads/swing radius – struck-by/crushed-by • Exposure to vehicle traffic • Severe weather • Working on or near water	• Crane operator to possess required certification and crane to have load charts and current inspection certificates. SSHO to complete inspection of crane with crane operator to ensure that crane is in good working condition and that all safety functions are working. Lift plan to be developed in the field for any lift utilizing a crane. Qualified lifting supervisor to ensure that all aspects of the lift plan have been completed and documented and that the lift plan is being followed. Crane to be mobilized only on stable ground with outriggers fully extended and outrigger pads in place if required. If a wheeled crane is to be used, the outriggers are to be used with floor blocks in place and beams fully extended. The crane is to be leveled with wheels fully off of the ground, regardless of the size or weight of the load to be lifted. Qualified rigger is required to be present during rigging operations and picks. A single, designated, qualified signal person required to direct crane operator if operator cannot pick and place load unassisted. Operators shall not engage in any practice that could divert attention while actually engaged in operating the crane. Operators shall respond to signals only from the designated signal person; however, a stop signal given by any employee at any time is to be obeyed. Prior to leaving the controls of the crane, the operator is to land any suspended load, disconnect power, set trolley brakes or other locking devices, bring the block to the highest position, set the controls to the OFF position, and secure the crane against accidental travel. If there is a warning sign on the disconnecting means or starting controls, the operator shall not close the circuit or start the motor until the warning sign has been removed by a competent person. Before closing the disconnecting switch, the operator shall ensure that all controls are in the OFF position and that all personnel are clear. If power fails during operation, the operator will set travel, hoist, and trolley brakes and other locking devices, move all controls to the OFF position, and, if practical, land the suspended load under brake control. All controls and safety features will be tested and documented daily by the crane operator at the start of each shift. Any controls or safety features that do not operate as designed are to be reported to the Superintendent and SSHO and must be adjusted or otherwise repaired prior to beginning any operations. • A pre-job briefing will be performed with the entire crew prior to the

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		commencement of any lift that will outline specific tasks to be performed and all potential hazards specific to those tasks. No work is to be performed beneath suspended loads and outriggers are to be blocked and the crane's swing radius delineated to prevent persons from entering pinch points prior to commencing any picks. All rigging is to be inspected prior to each use, load rating tags are to be attached, and all rigging to be used is to meet the load requirements based on the rigging plan. If any rigging does not meet these requirements, it is to be taken out of service, tagged, and given to the SSHO. Tag lines are required on all loads unless it is deemed hazardous to do so. Loads are not to be handled by hand, and tag lines or poles are required to move the load into position before it is set. • Traffic in and out of the site must be maintained in an orderly fashion throughout the workday. Traffic control (barricades/signage/flaggers) required for any work performed on, or adjacent to, an active street. Traffic control flaggers will be courteous, professional, and alert at all times and will be assigned, where necessary, by the Superintendent. Truck drivers are to follow the direction of flaggers/spotters unless they have a concern about a location or condition that could cause an accident, incident, injury, or property damage based on their knowledge as a driver and of their equipment; the driver is to exercise SWA and review the situation with the Superintendent and SSHO. Drivers will follow all safe-driving regulations, including wearing seat belts, while on site, and if they exit their cabs for any reason, they will wear Level D PPE whenever they are outside of the cabs. Special attention is to be emphasized on ground personnel and vehicular or equipment traffic to/from the work area during the use of the crane. Hand signals or radio communication to be used prior to moving, lifting, or unloading equipment and access controls around the work area are to be in place. • Monitor weather (via forecasts, weather apps, and marine radio) for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e. tornado warnings/watches, thunderstorms, tsunami, flooding conditions, etc.). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. All personnel are to keep an "eye to the sky" and be aware that unexpected storms may occur with little or no warning. In the event of winds greater than 25 mph, all crane activities will be suspended; additionally, the crane operator has SWA at lower wind speeds if they do not believe that they can safely complete the lift. If a wind alarm is given, or when leaving the crane overnight, rail clamps, where provided, will be set. The swing brake is to be released to allow for weather vanning unless 360 degree rotation is not possible/could cause damage. Where the crane must be restrained from swinging freely, the manufacturers' recommendations will be followed. • Cranes located on a barge to perform work activities must be secured to the barge by an engineered anchoring system naval stability analysis to be completed prior to placement on barges. • Personnel working on or near the water where a drowning hazard exists will be required to wear a Type I, III, or V USCG approved personal floatation device. A Type IV throw able PDF with 150-feet of 3/8 synthetic line (600 pound capacity) within 200 feet of the work area.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Handling loads	• Crane failure/loss of load • Exposure to pinch points • Overhead hazards/falling objects • Rigging failure • Muscle sprains/strains • Exposure to high noise (>85dB) • Hand tool inspection/use • Exposure to high or low ambient temperature • Struck by/crushed by/caught between heavy equipment	• Crane operator to possess required certification and crane to have load charts and current inspection certificates. SSHO to complete inspection of crane with crane operator to ensure that crane is in good working condition and that all safety functions are working. Lift plan to be developed in the field for any lift utilizing a crane. Qualified lifting supervisor to ensure that all aspects of the lift plan have been completed and documented and that the lift plan is being followed. The crane's load chart and inspection certificate are to be in the crane and documented as such upon arrival to the site. All controls and safety features will be tested and documented daily by the crane operator at the start of each shift. Any controls or safety features that do not operate as designed are to be reported to the Superintendent and SSHO and must be adjusted or otherwise repaired prior to beginning any operations. Loads shall be lifted the minimum height necessary to clear the ground or other obstacles in the path of the lift and are to be kept as low as possible when being moved into position. If lifting material from a truck or trailer, ensure that the wheels are chocked prior to beginning the lift. • Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire. Discuss potential pinch points and body positioning prior to moving components into position. Use spotters to avoid damage to property or other personnel/equipment working in the area. Tag lines are required on all loads unless it is deemed hazardous to do so. Loads are not to be handled by hand, and tag lines or poles are required to move loads into position before they are set. • Areas of hoist and swing and the crane's swing radius are to be barricaded prior to commencing a lift to warn of swing radius hazards and the potential for overhead loads/falling objects. No suspended loads are to be swung over personnel working on the ground in the area, and no personnel are permitted to be in the path of the load as it is moved into position. Low overhead hazards that personnel could potentially walk into should be communicated and demarcated whenever possible. If employees are working with hand tools at a height of 6' or above, tools are to be secured by a tether or other means to prevent them from fallingonto an employee at a lower elevation. If overhead utilities are present, all

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		equipment is to remain a minimum of 10' from energized electrical lines at 50kV or less. The distance will increase 4' for each additional 10kV above 50kV. • All rigging is to be inspected prior to each use, load rating tags are to be attached, and all rigging to be used is to meet the load requirements based on the rigging plan. If any rigging does not meet these requirements, it is to be taken out of service, tagged, and given to the SSHO. Tag lines are required on all loads unless it is deemed hazardous to do so. Additionally, boat hooks or other similar poles may be used to better control the load if necessary. • Site personnel will be instructed in repetitive motion injuries and lifting techniques including stretching prior to lifting. Best paths of travel will be noted and followed during manual material handling or placement. Team or mechanical lifting will be used when the load is greater than 50 pounds or oddly/awkwardly shaped. • Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on selection, fit, and use of hearing protection. All employees will be enrolled in SES hearing conservation program. Additionally, when working in areas or performing tasks where verbal communication is not feasible due to noises above 90dB, all employees working together on a specific task will be required to discuss the hazards of the task outside of the high noise area before beginning work. Prior to initiating the task or moving to the next step, each involved employee is to use agreed-upon hand signals and visual confirmation of acknowledgment of one another to ensure that all employees' hands, body, and feet are clear of any pinch point, swing radius, or suspended load. • Before beginning any work with hand tools, ensure that all personnel are trained on the use of the tool(s) that they are expected to use and that each tool has been inspected for functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job. • Discuss the signs and symptoms of heat and cold stress and conduct periodic safety briefs about heat or cold stress during relevant weather conditions. If work takes place in cold weather: dress warmly and protect exposed skin when performing work outdoors. Workers should dress in

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		layers and have extra clothing available if they get wet. Watch for symptoms of exposure (loss of feeling in extremities, skin discoloration, disorientation or drowsiness, etc), drink warm liquids, and monitor workers' core temperature periodically throughout the day. Utilize work/warmup schedule. If work takes place in hot weather: plan strenuous activities for early in the day whenever possible. Dress in loosely fitted clothing that allows air to circulate and protect exposed skin with clothing or sunscreen when performing work outdoors. Protect eyes with tinted and/or polarized safety glasses. Drink plenty of cool fluids (at least 8 oz. every hour) and remain alert for symptoms of heat-related illness (dizziness, confusion, clammy skin, stop sweating, nausea, cramping, etc). Take frequent breaks, monitor core temperatures of workers throughout the day once ambient temperatures have reached 73 degrees F, and utilize work/cooldown schedule. Cooldown areas to be provided for employees to get out of direct sunlight during cooldown periods/breaks. • Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. All personnel will wear Type II reflective vests/clothing at all times. All equipment will be equipped with operable backup alarms adequate for expected background noise.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
• Fueling Operations	• Spills • Fires/explosion	• Use good housekeeping practices and maintain spill response equipment on-site at all times. Follow best spill prevention and chemical storage practices at all times based on manufacturers' Safety Data Sheets, including using secondary containment during all fueling activities. Ensure that a spill control plan is in place and that employees have been trained on it for spills encountered during work activities. Survey the immediate area for inlets and sensitive receptors, and block or cover any in the area Turn off all equipment and use secondary containment while fueling. Report all spills to the SSHO immediately. Subcontractors to supply Safety Data Sheets (SDS) for any chemicals to be used or stored on-site to ensure that proper storage procedures are being followed and proper spill protection materials are on-site. • Ensure that fire extinguishers are in place and have been inspected. Use good housekeeping practices and ensure that all ignition sources have been eliminated or otherwise protected by fire blankets or wetting the area. All equipment is to be shut down during fueling operations and equipment will not be staged in areas of high vegetation. Smoking is never permitted on site, especially not during fueling operations. Fueling will take place in designated, well-ventilated areas away from ignition sources. Equipment and fuel tanks do not need to be grounded if the metal nozzle is in contact with the metal of the equipment's fuel tank.

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Job Hazard Analysis (JHA)

JHA Filename: Crane Operations

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Name	Signature	Date

Name	Signature	Date

GASCO0052627

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Job Hazard Analysis (JHA)

JHA Filename: Grout Batch Plant

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued	June 29th 2021	**Work Type**	Construction/Remediation	**JHA Author**	Sevenson Environmental Services, Inc.
Date Revised	August 15, 2023	**Client**	NW Natural		
Work Activity	Grout Batch Plant				
Work Site	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area Portland, Oregon				
Key Equipment	Grout Batch Plant/Silos				
Task-specific Training	Task-Specific Training; 40-HR and 8-HR HAZWOPER training; HAZCOM; PPE				

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR:_____*	☒ GLOVES*
☒ HARD HAT	☒ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE/HARNESS*	☒ HEARING PROTECTION*	☒ PPE CLOTHING*	☐ OTHER* _
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☒ OTHER* Potential level C half face respirator	☐ OTHER* _____

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II

Gloves –A6 cut-resistant,

Tyvek/nitrile gloves

JSA Development Team	Position/Title	**JSA Development Team**	Position/Title
Peter Boland	Corporate Safety & Health Officer		
Paul Jung	Health & Safety Manager		

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JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Perform the SPA process and discuss Stop Work Authority (SWA)	• Site personnel not aware of site hazards and SWA responsibilities	• Project team to discuss the importance of, and documentation procedures for, SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe. Prior to beginning work activities for the day, each crew will meet with the supervisor to develop a Safe Plan of Action (SPA) for the day's work, outlining the steps of the task, anticipated hazards, and the safe means and methods for completing each step of the task.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Pre-job setup/existing conditions	• Emergency response	• Review site emergency response plan and ensure that all employees are aware of site rally point(s) and emergency contact numbers in the event of an emergency.
	• Biological hazards (Poisonous plants; biting/stinging insects; snakes; wild/feral/rabid animals; infectious materials)	• Survey the area for biological hazards prior to commencing work. Avoid insect nests and spiders/spider webs. Check skin and clothing periodically throughout the day when working in areas that are potential tick areas. Use insect repellents. Use Wasp/Bee spray for observed nests. Use Poison Ivy Barrier Cream (Ivy-X or equivalent) in areas where the potential for contact with poisonous plants exists. Use cool water and mild soap (or a designated poisonous plant scrub, if available) if personnel is believed to have come into contact with poisonous plants. (Hot water will open skin pores and allow increased contact with irritating oils.) Use loud sounds to attempt to scare off animals. **DO NOT APPROACH ANIMALS.** If an animal is behaving aggressively, get to a safe shelter (vehicle, site trailer, etc) and contact Animal Control. If used hypodermic needles or other potentially infectious materials are observed, contact SSHO to ensure that they are safely collected and properly disposed of to eliminate the risk of Blood borne Pathogen (BBP) contamination.
	• Walking/working surfaces	• Survey work area to locate any pre-existing trip hazards and eliminate them whenever possible. If trip hazards cannot be eliminated, make sure that they are clearly marked or cordoned off. Practice good housekeeping – keep walkways and work areas clear of hoses, cords, and clutter. Route hoses and cords away from higher traffic areas. Restrict site to essential personnel. Wear safety toe (steel or composite) boots.
	• Severe weather	• Monitor weather for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e.; tornado warnings/watches, thunderstorms, earthquake, tsunami, and flooding conditions, etc). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Grout batch plant operations	• Improper training	• Only Qualified trained and competent operators will operate the grout batch plant in accordance with the Manufacture's specifications. Review and maintain at Batch Plant area operations manual's and specific energy control procedures for each piece equipment.
	• Walking Working/ slip trip Fall hazards	• Clearly delineate the entire area restricting unauthorized persons from entering the Grout plant mix area during operations. Work Areas and means of access shall be maintained safe and orderly. Tripping and poor footing hazards will be addressed as they are discovered or clearly identified and marketed to potential hazard. Keep walkways and work areas clear of hoses, cords, and clutter. Restrict site to essential personnel.
	• Fall Hazards	• Workers shall utilize proper means to gain access to elevated working levels and platforms. Fall prevention shall be utilized when practical versus fall protection for work greater than six feet high. Maintain three points of contact when climbing on or off equipment. Tanks and other structures that provide an elevated working platform shall be guarded against falls. Straight ladders shall be at a 4:1 pitch and shall extend at least 36-inches above the landing and shall be secured at the top. Fall protection required when working from heights greater than 6 feet.
	• Confined Spaces	• Only properly training personnel are permitted to enter into a confined space or permit required confined space. The SSHO shall determine the classification of the confined space prior to entering. An entry specific Safe Plan of Action shall be prepared for each entry. All confined spaces shall be identified and the crew shall be informed of their location and classification status as they are identified.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
	• Electrical/Hazardous energy	• Licensed electrician to establish and hook up power drop. Installation shall be in compliance with the National Electric Code. All equipment must maintain a minimum of 10 feet from overhear distribution lines. Ground fault circuit interrupters (GFCI) shall be used on all power corded tools and equipment. All electrical tools and equipment will be equipped with GFCI. Electrical cords will not be laid across roads where vehicular traffic may damage the cord. All extension cords will have a three blade-grounding plug. All electrical work and repairs will be conducted by a licensed electrician. All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50kV or less). The distance will increase 4 feet for each additional 10kV above 50kV.Perform Lockout/Tagout procedures on all electrical work to be performed and conducted by a licensed electrician. No maintenance or repairs will be performed until a zero energy condition exists, primary power source is shut off and disconnected, kinetic energy is dissipated, and lock out/ tag out procedures are completed on all electrical / mechanical components and all system keys have been removed.
	• Caught between and against/ pinch points	• Employees should recognize and be aware as to surface conditions, swing radius, pinch points and suspended loads prior to moving, lifting, or placement of equipment Be sure that area is clear of vehicles/pedestrians/non-essential personnel. Make use and ensure of all safety devices are in place and ensure they are functioning. Hydraulic lines, Cam locks with pins in place and whip checks to be used as per the specifications. All deficient items will be immediately corrected prior to commencing or resuming operations. Never put hands or tools into mixers or other pinch point situations when in

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		operation, setup and demobilization of any equipment. Never attempt to disconnect or open a coupling on any part of the discharge system while pump is in operation or under pressure. Hydraulic components may be hot. To prevent serious injury use only the handles provided. Allow system to cool prior to servicing. Ensure all guards, shields, grates and screens are in place over moving parts, sheaves, couplings, augers, paddles and belts to prevent injury. Maintain Warning stickers to remind operators of the potential hazards. Ensure e-stops are functioning as required.
	• Noise exposure	• Employees shall wear proper hearing protection…>85 decibel TWA 8hrs as needed. Rule of thumb, if you need to increase your voice volume in an area to have a conversation, hearing protection is more than likely needed. Perform sound survey with noise meter to identify hearing protection required areas or operations.
	• Heat Stress	• Working in hot weather will be discussed in daily safety briefing. Plan strenuous activity early in the day (if possible). Review the signs and symptoms of heat related illness. Dress properly and protect exposed skin when performing work outdoors. Drink plenty of fluids and Drink cool liquids as appropriate. Wear sunscreen and tinted safety glasses. Monitor and document core temperatures of workers using temporal monitors documented throughout the work day. Follow Heat stress regiment as outlined in the HASP. Shade tents to be used with cool breeze fans to provide workers a work zone rest area when extreme temperatures are encountered
	• Spills	• Survey adjacent area for sensitive receptors/Drainage Inlets. Cover/block them prior to fueling Keep a Spill Control and Countermeasures Plan in place, and review/update it periodically. Report all spills/leaks to the SSHO. If any spills/leaks occur, they will

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		be contained, identified, and disposed of in accordance with Federal, State, and Local regulations.
	• Inhalation Hazards	• Perform active air monitoring in work zone. Initiate Odor and dust control measures if visible dust or odors are observed or detected. SSHO shall determine level of PPE based on work zone readings. Refer to SDS sheets.
	• Decontamination	• Review with all site personnel decontamination procedures. Follow emergency contingency procedures. Implement site control areas. Wear appropriate PPE for task/activity performed as determined by SSHO. Emergency Eye washes stations to be in place. Refer to SDS sheets.
	• Working on or near water	• Personnel working on or near the water where a drowning hazard exists will be required to wear a Type I, III, or V USCG approved personal floatation device. A Type IV throw able PDF with 150-feet of 3/8 synthetic line (600 pound capacity) within 200 feet of the work area.

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Job Hazard Analysis (JHA)

JHA Filename: Grout Batch Plant

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Name	Signature	Date

Name	Signature	Date

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Job Hazard Analysis (JHA)

JHA Filename: ISS OPERATIONS

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued	May 27 2021	**Work Type**	Construction/Remediation	**JHA Author**	Sevenson Environmental Services, Inc.
Date Revised	August 15, 2023	**Client**	NW Natural		
Work Activity	ISS Operations				
Work Site	In Situ Stabilization and Solidification Field Pilot Study Gasco Sediments Project Area Portland, Oregon				
Key Equipment	PC 400 Excavator				
Task-specific Training	Task-Specific Training; 40-HR and 8-HR HAZWOPER training; HAZCOM; PPE; Heavy Equipment, Grout plant training and qualifications				

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR:_____*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☒ LIFELINE/HARNESS*	☒ HEARING PROTECTION*	☒ PPE CLOTHING*	☒ OTHER* Personal Fall Arrest System (PFAS)
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☒ OTHER* POTENTIAL LEVEL C	☐ OTHER* _____

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II

Gloves –A6 cut-resistant, potential Level C Respirator ,Tyvek, rubber boots, hearing protection , half face respirator, PFD

PFAS consisting of full body harness with lanyard when working from heights greater than 6 ft, unless working from a secured, inspected ladder

JSA Development Team	Position/Title	**JSA Development Team**	Position/Title
Peter Boland	Corporate Safety & Health Officer		
Paul Jung	Health & Safety Manager		

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JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Perform the SPA process and discuss Stop Work Authority (SWA)	• Site personnel not aware of site hazards and SWA responsibilities	• Project team to discuss the importance of, and documentation procedures for, SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe. Prior to beginning work activities for the day, each crew will meet with the supervisor to develop a Safe Plan of Action (SPA) for the day's work, outlining the steps of the task, anticipated hazards, and the safe means and methods for completing each step of the task.

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
Pre-job setup/existing conditions	• Emergency response • Biological hazards (Poisonous plants; biting/stinging insects; snakes; wild/feral/rabid animals; infectious materials) • Walking/working surfaces • Severe weather • Utilities	• Review site emergency response plan and ensure that all employees are aware of site rally point(s) and emergency contact numbers in the event of an emergency. • Survey the area for biological hazards prior to commencing work. Avoid insect nests and spiders/spider webs. Check skin and clothing periodically throughout the day when working in areas that are potential tick areas. Use insect repellents. Use Wasp/Bee spray for observed nests. Use Poison Ivy Barrier Cream (Ivy-X or equivalent) in areas where the potential for contact with poisonous plants exists. Use cool water and mild soap (or a designated poisonous plant scrub, if available) if personnel is believed to have come into contact with poisonous plants. (Hot water will open skin pores and allow increased contact with irritating oils.) Use loud sounds to attempt to scare off animals. **DO NOT APPROACH ANIMALS.** If an animal is behaving aggressively, get to a safe shelter (vehicle, site trailer, etc) and contact Animal Control. If used hypodermic needles or other potentially infectious materials are observed, contact SSHO to ensure that they are safely collected and properly disposed of to eliminate the risk of Blood borne Pathogen (BBP) contamination. • Survey work area to locate any pre-existing trip hazards and eliminate them whenever possible. If trip hazards cannot be eliminated, make sure that they are clearly marked or cordoned off. Practice good housekeeping – keep walkways and work areas clear of hoses, cords, and clutter. Route hoses and cords away from higher traffic areas. Restrict site to essential personnel. Wear safety toe (steel or composite) boots. • Monitor weather for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e.; tornado warnings/watches, thunderstorms, earthquake, tsunami, and flooding conditions, etc.). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. • Survey work area to locate any overhead utility lines and properly mark them out or cordon them off. At least three days prior to the start of any excavation activities, contact DIG services (811)

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		for utility mark out. Dig permits expire every 28 days, so every 25 days, the service must be notified of any continuing excavation activities. All known utility lines/services entering the site will be marked out and a subsurface utility investigation will be performed using Ground Penetrating Radar (GPR), vacuum excavation, and/or hand excavation. Within 24 inches of any known utility lines or services, only hand excavation is permitted unless specifically directed otherwise by the Client Representative. Utility clearance perimeter trenching will be performed to a minimum of 5' below ground surface (or deeper, depending on the proposed depth of the excavation and depth(s) of any adjacent utility). If a subsurface anomaly or utility line that has not been previously marked out is discovered within the excavation limits or could interfere with the installation of excavation support system components, a confirmation test pit will be required to expose and physically verify the exact location and configuration of all nearby utilities. All utility clearance perimeter trenching and confirmation test pit excavation will be performed by non-mechanical methods (hand auger, post hole digger, and/or shovel, in conjunction with a vacuum truck if necessary) and should extend throughout the tolerance zone for any known utility line(s) or subsurface anomaly. If not previously marked, the tolerance zone will be defined in the field as one-half of the known diameter of the utility plus two feet on either side of the marked center line. For known below ground facilities, a minimum of five feet clearance from all critical facilities' exterior surfaces and ten feet clearance from all high-priority facilities' exterior surfaces must be maintained at all times

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
• Excavator/Drill Rig ISS operations	Struck by/crushed by/caught between heavy equipment	• SSHO and a qualified operator will perform an Initial Equipment Inspection to ensure that that the excavator is in good working condition and that backup alarms and seat belts are operable. Rollover Protection Structures (ROPS) are required for all heavy equipment. After initial inspection is complete, a qualified operator is to perform a daily inspection of each piece of equipment to be used to ensure that all controls and safety features are in good working condition and that fluid levels are within operating limits. Only qualified employees are authorized to operate heavy equipment. • Ensure that all nonessential personnel are clear of the area when any equipment is performing ISS Operation. • Approach heavy equipment within the operator's view. Prior to entering operator's work area or swing radius, receive verbal, visual, or radio contact from the operator and acknowledge it. Flaggers/spotters will be assigned where necessary to ensure that unnecessary personnel are kept away from the work area and that no one enters the work area without first getting confirmation from the operator. For stationary equipment, swing radius is to be roped off or otherwise protected. Type II high-visibility vest/clothing required at all times. Area of mixing is to be delineated with barricades and marked to warn of trench hazard and maintained at all times. Swing radius around excavators to be delineated to warn of potential swing radius hazard when in operation. Only essential personnel to be in area of slurry trench operations. Cranes mats to be utilized as needed along mixing cell. Foam suppression to be used as needed as well as Bio solve to mitigate odors or as directed.
	• Hand tool malfunction	• Before beginning any work with hand tools, ensure that all personnel are trained on the use of the tool(s) that they are expected to use and that each tool has been inspected for functionality and damage. If unsure about the use of any tool, ask the SSHO before attempting to utilize the tool or equipment. Use the correct tool for the job, and tag out and remove any tools that are damaged or missing safety features.

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JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
	• Exposure to sharp objects/materials or pinch points	• Avoid placing hands in tight spaces when moving materials and use good hand, head, and body positioning to keep away from the line of fire.
	• Exposure to vehicle traffic	• Traffic in and out of the site must be maintained in an orderly fashion throughout the workday. Traffic control (barricades/signage/flaggers) required for any work performed on, or adjacent to, an active street. Traffic control flaggers will be courteous, professional, and alert at all times and will be assigned, where necessary, by the Superintendent. Truck drivers are to follow the direction of flaggers/spotters unless they have a concern about a location or condition that could cause an accident, incident, injury, or property damage based on their knowledge as a driver and of their equipment; the driver is to exercise SWA and review the situation with the Superintendent and SSHO. Drivers will follow all safe-driving regulations, including wearing seat belts, while on site, and if they exit their cabs for any reason, they will wear safety reflective vests whenever they are outside of the cabs.
	• Exposure to high noise (>85dB)	• Perform noise level monitoring and wear ear plugs or muffs. SSHO to instruct personnel on selection, fit, and use of hearing protection. All employees will be enrolled in a hearing conservation program.
	• Exposure to high or low ambient temperature	• Discuss the signs and symptoms of heat and cold stress and conduct periodic safety briefs about heat or cold stress during relevant weather conditions. If work takes place in cold weather: dress warmly and protect exposed skin when performing work outdoors. Workers should dress in layers and have extra clothing available if they get wet. Watch for symptoms of exposure (loss of feeling in extremities, skin discoloration, disorientation or drowsiness, etc), drink warm liquids, and monitor workers' core temperature periodically throughout the day. Utilize work/warmup schedule. If work takes place in hot weather: plan strenuous activities for early in the day whenever possible. Dress in loosely fitted clothing that allows air to circulate and protect exposed skin with clothing or sunscreen when performing work outdoors. Protect eyes with tinted and/or polarized safety glasses. Drink plenty of cool fluids (at least 8 oz every hour) and remain alert for symptoms of heat-related illness (dizziness, confusion, clammy skin, stop sweating, nausea, cramping, etc.). Take frequent breaks, monitor core temperatures of workers

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
		throughout the day once ambient temperatures have reached 73°F, and utilize work/cooldown schedule.
	• Flying debris	• Ensure guards are installed and working on tools and equipment being used.
	• Inhalation Hazards	• Perform active air monitoring in work zone. Initiate Odor and dust control measures if visible dust or odors are observed or detected. SSHO shall determine level of PPE based on work zone readings. Refer to SDS sheets.
	• Falls from elevation • Slips Trip Falls • Working on or near water	• Personnel shall not ride on moving equipment unless a seat with a seat belt is provided. Maintain three points of contact when entering, exiting, or otherwise climbing on equipment. For any work to be performed from heights greater than six feet or within six feet of an exposed edge, a Fall Prevention or Personal Fall Arrest System (PFAS) is required. • When working near ISS operation PFD no be worn Work Areas and means of access shall be maintained safe and orderly. Tripping and poor footing hazards will be addressed as they are discovered or clearly identified and marketed to potential hazard• Do not approach unit until all moving components have come to a complete stop • Do not step onto newly mixed column as the surface may be extremely soft. If necessary, ask the operator to rotate the mast to an area to avoid stepping onto soft surface. • Operator will resume mixing only when given permission by the person collecting QA/QC samples. • Once completely clear of the swing radius of mixing rig, give operator permission via radio or hand signal

JOB TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	HAZARD CONTROLS (Beyond wearing REQUIRED PPE)
	Spills	• Keep a Spill Control and Countermeasures Plan in place, and review/update it periodically. Cover drains and sensitive receptors. Report all spills/leaks to the SSHO. If any spills/leaks occur, they will be contained, identified, and disposed of in accordance with Federal, State, and Local regulations.
	Severe weather	• Monitor weather (via forecasts, weather apps, and marine radio) for approaching/developing severe conditions. SSHO to discuss severe conditions with Client Representatives and Superintendent when they pose a hazard to workers (i.e.; tornado warnings/watches, thunderstorms, earthquake, tsunami, flooding conditions, etc). Work will be suspended during thunderstorms when lightning is reported within 10 miles of the work area and remain suspended for the duration of the storm, until lightning has moved 10 miles out of the area or until 30 minutes has passed since lightning was last observed. All personnel are to keep an "eye to the sky" and be aware that unexpected storms may occur with little or no warning.
	Decontamination	• Ensure site personnel Follow decontamination procedures. Follow emergency contingency procedures. Implement site control areas. Wear appropriate PPE for task/activity performed. Emergency Eye washes stations to be in place. .Refer to SDS sheets.
	Working on or near water	• Excavators and Drill rigs located on a barges to perform work activities must be secured to the barge by an engineered anchoring system naval stability analysis to be completed prior to placement on barges. • Personnel working on or near the water where a drowning hazard exists will be required to wear a Type I, III, or V USCG approved personal floatation device. A Type IV throw able PDF with 150-feet of 3/8 synthetic line (600 pound capacity) within 200 feet of the work area

GASCO0052643

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Job Hazard Analysis (JHA)

JHA Filename: ISS OPERATIONS

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Name	Signature	Date

Name	Signature	Date

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Appendix B
Safety and Health Forms

Sevenson Environmental Services, Inc.
Equipment Decontamination Log

Project Number:	Project Name:	Project Supervisor:

Equipment Description	Equipment Number	Date Decontaminated	Date Demobilized

Comments:

Site Safety and Health Officer	Signature

Job No. _____

Job Address _____

_____

Sevenson Environmental Services, Inc.

Report of Accident, Injury, or Illness

Instructions: Please print. Fill in all blanks. When completed, return this form to Sharon Lee at the main office.

Name _____ Sex:_____ Age: _____

Social Security Number _____ Birth Date: _____

Address _____ Phone Number _____

Marital Status: ☐ Single; ☐ Married; ☐ Separated; ☐ Divorced; ☐ Widowed

# of Dependents _____ Date of Accident _____ Time _____AM/PM

Date Employee notified employer: _____ Who was notified: _____

Employment Start Date:	Wage Rate:
Occupation:	Average Hours Worked:
Date Last Worked:	Average Days Per Week:
Time Shift Began:	Was worker paid for day of injury?
Name of Witness:	Did salary continue?
Describe how the accident happened:	
What was employee doing when injured?	
Describe the injury in detail and indicate part of body affected:	
Name of object or substance that directly injured the employee:	
Date & Time medical attention was sought:	

Name, address and phone number of hospital or doctor:
Was employee involved in any other incidents/accidents? If yes, describe:
Any history of work accidents, absenteeism, and/or disciplinary problems:
Substance abuse test administered:___ Yes, ___ No – if no, why not?
Medical release obtained:
Corrective Action Taken:

Supervisor _____ Date _____

Safety Officer _____ Date _____

Comments:_____

_____

_____

_____

Report of Accident, Injury, or Illness

Daily Air Monitoring Report

Project Number:	Project Name:	Project Supervisor

Date:	Duration of Monitoring

Work Location and Task:

Instrument:		Instrument:		Instrument:	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		Calibration:		Calibration:	

Perimeter Samples Collected:

Personnel Samples Collected:

Perimeter and Personnel Sample Results from Previous Day (Provide Data when Received):

Comments:

Name:	Title:
Signature:	Date:

Daily Air Monitoring Report (Cont.)

Project Number:		Project Name:		Project Supervisor	
Instrument:		Instrument:		Instrument:	
Reading	**Time**	**Reading**	**Time**	**Reading**	**Time**
Calibration:		Calibration:		Calibration:	
Signature:			Date:		

Sevenson Environmental Services, Inc.

Acknowledgment of Site Safety and Health Plan

I certify that I have received a Site orientation and have been given the opportunity to read and ask questions on the contents of the Site Safety and Health Plan to include emergency response actions and the contaminates of concern for the project.

DATE	NAME (please print)	SIGNATURE

Safe Plan Of Action

Project No. _____
Job/Task _____ **Work Area** _____ **Date** _____

Steps of Task	Hazard/Reaction to Change	Safe Plan	Resources

Team Members' Signatures

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

The signature of the supervisor confirms the completion of the hazard assessment and Safe Plan of Action by the crew.

Supervisors Signature: _____ Date_____

Instructions: 1. Write name of job or task in space provided. 2. Conduct walk-through survey of work area. 3. Write the steps of the task in a safe sequence. 4. List all possible hazards involved in each step and reaction to change. 5. In the Safe Plan column, state actions that will be taken to prevent the hazards or injury from reaction to change. 6. In Resources column, list equipment, tools, etc. needed to do the job. 8. Ask each team member, who helped develop and will use this SPA, to sign in spaces provided. 9. Review the SPA at the end of the task for improvements.

Work shall stop when conditions change, the job changes, or a deficiency in the plan is discovered, and the current SPA will be modified or a new SPA created.

GASCO0052654

Project No. _____

Job/Task _____ **Work Area** _____ **Date:** _____

Team Member Signature Sheet Continuation

GASCO0052655

Review checklist while completing front page of SPA. Check all that apply.

A new SPA is required if the job scope or work conditions change.

Required Permits	Hazards	Safe Plan
☐ Confined Space	☐ Overhead Utilities	☐ Power de-energization required ☐ Insulation blankets required ☐ Wire watcher required
☐ Critical Lift		☐ Required clearance distance = _____Ft. ☐ Safe work zone marked
☐ Hot Work	☐ Crane or other	☐ Signalman assigned ☐ Tag lines in use ☐ Area around crane barricaded
☐ Lock Out/Tag Out	Lifting Equipment	☐ Lifting equipment inspected ☐ Personnel protected from overhead load
☐ Soil Disturbance (Over 12")	☐ Underground Utilities	☐ Reviewed as-builts ☐ Subsurface surveys ☐ Received dig permit
☐ Utility Clearance		☐ Required clearance distance = _____ Ft. ☐ Safe work zone Marked
Required PPE	☐ Electrical	☐ Lock Out/Tag Out/Try Out ☐ Permit required? ☐ Confirm that equipment is de-energized
☐ Hard Hat, Class C		☐ Reviewed electrical safety procedures
☐ Hard Hat, Class E *(Elect. Protect)*	☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Proper sloping/shoring
☐ Ear Plugs/Ear Muffs		☐ Barricades provided ☐ Access/egress provided ☐ Protection from accumulated water
Eye Protection:	☐ Fire Hazard	☐ Hot Work Permit ☐Fire Extinguishers ☐ Fire watch
☐ Safety Glasses		☐ Adjacent area protected ☐ Unnecessary flammable material removed
☐ Face Shield	☐ Vehicular Traffic or	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Flagmen ☐ Lane closure
☐ Chemical Goggles	Heavy Equipment	☐ Communication with equipment operator
☐ Welding Hood	☐ Noise >85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear Muffs ☐ Both
Hand Protection:	☐ Hand & Power Tools:	☐ Inspect general cond. ☐ GFCI in use ☐ Identified PPE required for each tool
☐ Cut Resistant Gloves		☐ Reviewed safety requirements in operators manual(s) ☐ Guarding OK
☐ Welders Gloves	☐ Hand Hazards	List sharp tools, material, equipment: _____
☐ Nitrile Gloves		☐ PPE gloves, etc. ☐ Protected sharp edges as necessary
☐ Surgical Gloves	☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Identified material requiring lifting equipment
☐ Rubber Gloves		☐ Hand protection required ☐ Back support belts
☐ Elect. Insulated Gloves	☐ Ladders	☐ Inspect general cond. before use ☐ Ladder inspected with in last quarter
☐ Arm Sleeves		☐ Ladder tied off or held ☐ Proper angle and placement ☐ Reviewed ladder safety
Foot Protection:	☐ Scaffolds	☐ Inspect general condition before use ☐ Tags in place ☐ Properly secured
☐ Sturdy Work Boots		☐ Toe boards used ☐ Footings adequate ☐ Materials properly stored on scaffold
☐ Safety Toe Boots	☐ Slips, Trips Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Tools & material properly stored
☐ Rubber Boots		☐ Extension cords properly secured ☐ Work zone free of debris
☐ Rubber Boot Covers	☐ Pinch Points	List potential pinch points: _____
☐ Dielectric Footwear		☐ Working near operating equipment ☐ Hand/Body positioning
Respiratory. Protection:	☐ Working w/ Chemicals	☐ List specific chemicals involved and list hazards and precaution on front side.
☐ Dust Mask		☐ Reviewed MSDS ☐ Exposure Monitoring required ☐ Have proper containers and labels.
☐ Air Purifying Respirator	☐ Asbestos or Lead Paint	☐ Identified proper PPE (respirators, clothing, gloves, etc.)
☐ Supplied Air Respirator	Potential	☐ Areas to be worked may contain asbestos or lead paint ☐ Asbestos controls incorporated
☐ SCBA	☐ Heat Stress Potential	☐ Lead based point controls in place ☐ Exposure monitoring conducted.
☐ Emergency Escape Respirator		☐ Heat stress monitoring (>85°) ☐ Liquids available ☐ Cool down periods
Special Clothing:	☐ Cold Stress Potential	☐ Sun Screen ☐ Reviewed Heat Stress symptoms
☐ Tyvek ®	☐ Environmental	☐ Proper clothing (i.e.. gloves, coat, coveralls) ☐ Wind chill <32°
☐ Poly Coated Tyvek ®		☐ Reviewed Cold Stress symptoms ☐ Warm up periods
☐ Fire Resistant Coveralls	☐ Natural or Site Hazards	☐ Air emissions ☐ Water discharge ☐ Hazardous wastes ☐ Other wastes
☐ Rain Suit		☐ Pollution prevention ☐ Waste minimization
☐ Safety Vest	☐ Adjacent Work/Processes	☐ Weather ☐ Terrain ☐ Adjacent operations or processes ☐ Biological hazards
Fall Protection:		☐ Animals/reptiles/insects hazards
☐ Harness	☐ Barricades/covers	☐ Notified them of our presents ☐ Other workers adjacent, above, or below.
☐ Double Lanyard Required		☐ Coordinated with adjacent supervisor/customer/operator ☐ Need barriers between.
☐ Anchorage Point Available		☐ Caution barricade tape required ☐ Danger barricade tape required ☐ Rigid railing required
☐ Additional Anchorage Connector Needed e.g. Cross Arm Strap, etc.		☐ Covers over opening ☐ Warning signs required
☐ Retractable Device Needed	**Additional Information:**	
☐ Horizontal Life Line System Req'd.		
☐ Fall Clearance Distance Adequate		
☐ Fall Rescue/Retrieval Plan Set Up		

Sevenson Environmental Services, Inc.

CONFINED SPACE PERMIT

Date_____ Time of Issue_____ Length of Permit_____
Location _____ Equipment ID_____
Purpose of Entry & Description of Work _____

Authorized Entrant(s)_____
Will "HOT" Work be authorized for this Entry? ☐ No; ☐ Yes (describe)_____

HAZARDOUS IDENTIFICATION

Indicate ALL potential Hazards of this Permit Space:	YES	N/A
a. Contains or may contain a hazardous atmosphere	☐	☐
b. Contains a material for potential engulfment	☐	☐
c. Has an internal configuration for potential entrapment	☐	☐

If "Yes", describe _____

d. Contains the following serious safety or health Hazards:_____

PRE-ENTRY PREPARATION

		YES	N/A	Done			Removed		
				Date	Time	By	Date	Time	By
1. Lines broken and/or blanked:									
Line Contents	Location								
a.									
b.									
c.									
2. Drain or at a workable level									
3. Purge - flush and vent									
4. Force air to bottom & vent									
5. Lock out power feeds:									
Equip/Location of Lock out									
a.									
b.									
6. Shut-off heating systems									
7. Other:									

TEST TO BE TAKEN

	P.E.L.	Time		Time	Time	Time
		Tester		Tester	Tester	Tester
		Yes	N/A	Results	Results	Results
% of Oxygen	19.5% to 23%					
% of LEL	Any % over 10					
Carbon Monoxide	25 ppm					
Hydrogen Sulfide	10 ppm					
VOC						
Temperature	< 110ºF/43ºC					

PREVENTION OF UNAUTHORIZED ENTRY

	YES
1. Have Worker(s) to enter been trained for this specific entry?	☐
2. Have Attendants been trained for this specific space?	☐
3. Post "WORKER IN CONFINED SPACE" Sign	☐

4. Set-up the following additional barriers:

_____

_____

MANDATORY SAFETY EQUIPMENT REQUIRED

	YES	N/A
1. Fire Extinguisher	☐	☐
2. Retrieval Lines	☐	☐
3. Respirator	☐	☐
4. Goggles	☐	☐
5. Hearing Protection	☐	☐
6. Protective Clothing	☐	☐
7. Special Boots or Shoes	☐	☐
8. Gloves	☐	☐
9. Other Safety Equipment Required	☐	☐

_____ _____

_____ _____

_____ _____

_____ _____

COMMUNICATION PROCEDURES AND EQUIPMENT TO BE USED FOR THIS ENTRY

(Verify that chosen equipment is in place and operation.)

Verified by:

1._____ _____

2._____ _____

RESCUE EQUIPMENT TO BE PROVIDED ON-SITE

		YES	N/A
a.	Two chest harnesses or two wristlets	☐	☐
b.	Two five minute supplied air escape respirators	☐	☐
c.	One 30 minute S.C.B.A.	☐	☐
d.	One emergency siren	☐	☐
e.	Man basket	☐	☐
f.	Retrieval wench	☐	☐
g.	Other necessary Rescue Equipment	☐	☐

_____

_____

_____

IN CASE OF EMERGENCY

Rescue Service	Phone Number or Ext.
1._____	_____
2._____	_____
3._____	_____

Confined Space Entry Supervisor or designee must sign below AFTER all the above actions are fully understood and conditions necessary for SAFE entry have been met.

Authorization of Entry

Signature (if not CSE Supervisor, add title)	Date	Time

Termination of Entry

Signature	Date	Time

Sevenson Environmental Services, Inc.
Daily Safety Meeting

DATE: DAY:	JOB NAME: & NUMBER:

TOPIC:

PRINT	SIGNATURE:

Sevenson Environmental Services, Inc.
DAILY SAFETY REPORT

DATE:

WORK PERIOD COVERED:

WEATHER CONDITIONS:

SUMMARY OF DAY'S WORK ACTIVITY:

EQUIPMENT UTILIZED BY SAFETY MONITORS:

PROTECTIVE CLOTHING AND EQUIPMENT BEING USED BY TASK:

PHYSICAL CONDITION OF WORKERS (any heat or cold stress or other medical problems):

ACCIDENTS OR BREACH OF PROCEDURES:

DESCRIPTION OF MONITORING AND AIR SAMPLES TAKEN:

TYPE AND NUMBER OF PERMITS ISSUED:

SUMMARY OF TRAINING AND SAFETY MEETING:

NAME:	TITLE: Site Health and Safety Officer
SIGNATURE:	

Sevenson Environmental Services, Inc.

EMPLOYEE & VISITOR LOG

DATE:

PRINT NAME	SIGNATURE	COMPANY	Time In	Time Out

Sevenson Environmental Services, Inc.

HOT WORK PERMIT

Job Description: ☐ Welding; ☐Torch/oxy/acetylene; ☐ Grinding/Cut saw; ☐Maintenance; ☐ Heating Operation; ☐ Other:_____

Permit Duration: ☐ 4 hrs; ☐ 8 hrs; ☐ 10 hrs; ☐ 12 hrs

Person(s) Performing Hot Work: _____

Fire Watch Required? ☐ Yes; ☐ No

If yes, Fire Watch Attendant:_____

Air Monitoring Required? ☐ Yes; ☐ No **Respiratory Protection Required?** ☐ Yes; ☐ No

MONITORING
(Acceptable Levels)

DATE	TIME	O_2 (19.5-22.0%)	LEL (0-10%)	ORGANIC VAPOR* (0-25ppm)

FIRE PROTECTION

Fire extinguisher present: YES ☐; Area cleared of combustibles: YES ☐; Are operations in compliance with OSHA Regulations: YES ☐;

Activity Hazard Analysis attached and reviewed by affected personnel: YES ☐

Requirements for Performing Hot Work

- **Flame retardant gloves, coat, and proper eye protection (glasses or shield with welding/cutting rated glass lens)**
- **Respirators will be required when welding/cutting/heating areas that cannot be decontaminated or when welding on stainless steel (Cr-VI) or galvanized metal (metal fume fever).**
- **Use fire blankets when necessary to protect material or areas where removing combustibles is not practical.**
- **Inspect welder, lead lines, and ensure unit is properly grounded.**
- **Maintain a 50 ft diameter clearance for flammables (i.e., fuel cans, vapors) an/or 25 ft diameter clearance for combustibles (i.e., wood, rags, debris)**
- **Oxygen & Acetylene bottles are secure with regulators removed and caps installed prior to moving or unattended during breaks**
- **Inspect all hoses, torch, tips and regulators for defects and ensure flash suppressors are installed**
- **Properly store all empty and full cylinders from vicinity and protect from hot work activities**
- **Barricade walkway under any overhead work**
- **If welding shields are not available, barricade and delineate all work areas when using a torch or welder with a minimum distance of 75 feet.**
- **When normal fire prevention precautions are not sufficient, a qualified fire watch is required. The fire watch shall be instructed in anticipated fire hazards and shall perform assigned duties to 30 minutes after hot work was stopped.**
- **At completion of work activity, disassemble all hoses and regulators and properly store**
- **Toxic surface coatings must be removed prior to welding, cutting or heating. A minimum of 4-inches must be cleared from each side of the weld, cut, or heated area.**
- ***If working with fuel oil the PID for organic vapors will be used to determine the LEL due to the poor LEL sensor response to heavy hydrocarbons. Acceptable PID readings for ensuring vapors are less than 10% LEL will be less than 250 ppm VOCs.**

Health and Safety Officer:_____ **DATE:**_____

Job Safety Enhancement Program

JSEP Form

"You can force compliance, you have to earn commitment"

☐ Safety Observation ☐ Task Improvement ☐ Hazard Identification

Description:_____

_____

_____

_____

Recommendations:_____

_____

_____

_____

Submitted By:_____ Date:_____

JESP Number:_____

Follow up or Corrective Action (if required):_____

_____

_____

_____

Person Responsible for Follow up or Corrective Action:_____

Estimated Completion Date:_____ Actual Completion Date:_____

Person responsible for verification:_____ Date:_____

Figure 1: Lift Plan - Load and Capacity Calculations

Lift Load and Capacity Calculations
(Page 1 of 3)

Lift Description:	

A. Weight of Load (Equipment) – Live Load

1. Load/Equipment Condition New	( )	Used	( )

2. Weight of Load/Equipment Empty		Lbs.
3. Weight of Attachments		Lbs.
a. Platforms and Ladders		Lbs.
b. Piping and Accessories		Lbs.
c. Liquids Inside		Lbs.
d. Dirt and Debris		Lbs.
e. Internal Trays or Liners		Lbs.
f. Other		Lbs.
		Lbs.
4. Total Amount of Load/Equipment Weight (A2 through A3f)		Lbs.

B. Total Lifted Weight (load and/or equipment + rigging + main crane deductions)

1. Load and/or equipment weight plus contingency*		%	7. Wt. Jib Erected		Lb
2. Amount of Equipment Weight		Lb	7a. Wt. Of Jib Stowed		Lb
3. Weight of Headache Ball		Lb	8. Wt. Of Jib Headache Ball		Lb
4. Weight of Main Block		Lb	9. Wt. Of Cable (Load Fall)		Lb
5. Weight of Spreader Bar		Lb	10. Auxiliary Boom Head		Lb
6. Weight of Slings and Shackles		Lb	11. Other:		Lb

*Use 100% plus some percentage (example +10%) to multiply times number in A 4 to allow for contingency to compute B2.

TOTAL LIFTED WEIGHT (Sum B2 thru B11)	Lbs.

Source of Load Weight (A2):
(Name Plate, Drawings, Calculated, Weighed, etc.)

Weights and Calculations By:		Date:	
Weights and Calculations Verified By:		Date:	

(See page 2)

Load and Capacity Calculations (Page 2 of 3)					
C. Capacities of the (Main) Crane					
Make & Model of Crane					
2. Counter Weight Size:		Type of Boom:			
3. Lifting Arrangement					
a. Max. Radius During Lift		Ft.			
b. Length of Boom		Ft.			
c. Angle of Boom at Pick		Deg.			
d. Angle of Boom at Set		Deg.			
Rated Capacity Under Most Severe Conditions					
1. Over Rear		Lbs.			
2. Over Front		Lbs.			
3. Over Side		Lbs.			
f. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or….)		Lbs.			
4. Jib					
a. Is the Jib to be used	Yes	No			
b. Length of Jib		Ft.			
c. Jib Angle		Deg.			
d. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or…)		Lbs.			
5. Load Line/Fall Cable					
a. Is Main Block to be used?	Yes	No			
b. Number of Parts of Cable					
c. Size of Cable		Ø inches			
d. Maximum Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or ….)		Lbs.			
D. Percent of Cranes Capacity (>85% requires High Hazard Lift Approvals)					
	Total Lifted Weight X 100 = Rated Capacity	%			
E. Size of Slings					
1. Sling Selection					
a. Type of Arrangement		(Spreader, Vertical Slings, etc.			
b. Number of Slings to Hook	Ø	Capacity	Lbs.		
c. Sling Size		Ø			
d. Sling Length		Ft.			
e. Sling Capacity (At angle used)		Lbs.			
f. Number of Slings to Load		#			
g. Total Rigging capacity (e x f)		Lbs.			
Comments:					
Sketch of rigging arrangement available	Yes	No	See Page ( )		
End of Standard Lift Plan Paperwork (					

Comments and Signatures (Page 3 of 3)			
Comments:			
Sketch of rigging arrangement available	**Yes**	**No**	**See Page ( )**
Reviewed by (*additional reviews required for high hazard lifts*):			
Safety Officer:			
Lift Supervisor:			
Rigging Supervisor:			
Crane Operator:			

Figure 2: Pre-Lift Checklist

		Yes	No
1.	Crane operator meets company qualification requirements?	☐	☐
2.	Lift calculations and rigging plan completed?	☐	☐
3.	Are lift equipment swing & travel requirements & clearances known?	☐	☐
4.	Are all required approvals/permits signed?	☐	☐
5.	Crane inspections up to date (Annual/Monthly/Daily)?	☐	☐
6.	Weather conditions and wind speed acceptable?	☐	☐
7.	Has the stability of the ground been assured by soil bearing analysis?	☐	☐
8.	Location and size of underground facilities are known?	☐	☐
9.	Matting and/or outrigger pads inspected and approved?	☐	☐
10.	Electrical equipment and power lines at required distance?	☐	☐
11.	Rigging Inspected for defects?	☐	☐
12.	Engineered lifting lugs fabricated and installed correctly?	☐	☐
13.	Connecting/disconnecting means been developed?	☐	☐
14.	Have the safety precautions been reviewed?	☐	☐
15.	Is survey equipment required?	☐	☐
16.	Lift Hold Point of ≥_____ lbs communicated to crew?	☐	☐
17.	Signal person(s) assigned?	☐	☐
18.	Safe Plan of Action (SPA) Completed?	☐	☐
19.	Pre-Lift Meeting/Task Safety Awareness Meeting (TSA) held?	☐	☐
20.	Hoist area & load path cleared of non-essential personnel?	☐	☐
21.	Crane set up per the lift plan (radius, configuration, etc)?	☐	☐
22.	Rigging equipment and tag line(s) installed per plan?	☐	☐

Completed By Signature: Name Printed: Date:

Appendix C
Chemical Information Sheets

Occupational Health Guideline for Coal Tar Pitch Volatiles

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

Anthracene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Pale green solid with a faint aromatic odor.

Phenanthrene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Pyrene

- Formula: $C_{16}H_{10}$
- Synonyms: None
- Appearance: Bright yellow solid

Carbazole

- Formula: $C_{12}H_9N$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Benzo(a)pyrene

- Formula: $C_{20}H_{12}$
- Synonyms: BaP, 3,4-benzopyrene
- Appearance and odor: Colorless solid with a faint aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar pitch volatiles is 0.2 milligram of coal tar pitch volatiles per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit for coal tar products be reduced to 0.1 mg/m^3 (cyclohexane-extractable fraction) averaged over a work shift of up to 10 hours per day, 40 hours per week, and that coal tar products be regulated as occupational carcinogens. The NIOSH Criteria Document for Coal Tar Products and NIOSH Criteria Document for Coke Oven Emissions should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Coal tar pitch volatiles can affect the body if they are inhaled or if they come in contact with the eyes or skin.

- **Effects of overexposure**

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing bronchitis and cancer of the lungs, skin, bladder, and kidneys. Pregnant women may be especially susceptible to exposure effects associated with coal tar pitch volatiles. Repeated exposure to these materials may also cause sunlight to have a more severe effect on a person's skin. In addition, this type of exposure may cause an allergic skin rash.

- **Reporting signs and symptoms**

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar pitch volatiles.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to coal tar pitch volatiles at potentially hazardous levels:

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

September 1978

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the oral cavity, respiratory tract, bladder, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders, for premalignant and malignant lesions, and evidence of hyperpigmentation or photosensitivity.

—Urinalysis: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. A urinalysis should be obtained to include at a minimum specific gravity, albumin, glucose, and a microscopic on centrifuged sediment, as well as a test for red blood cells.

—Urinary cytology: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. Employees having 5 or more years of exposure or who are 45 years of age or older should have a urinary cytology examination.

—Sputum cytology: Coal tar pitch volatiles are associated with an excess of lung cancer. Employees having 10 or more years of exposure or who are 45 years of age or older should have a sputum cytology examination.

—14" x 17" chest roentgenogram: Coal tar pitch volatiles are associated with an excess of lung cancer. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Coal tar pitch volatiles are reported to cause an excess of bronchitis. Periodic surveillance is indicated.

—A complete blood count: Due to the possibility of benzene exposure associated with coal tar pitch volatiles, a complete blood count is considered necessary to search for leukemia and aplastic anemia.

—Skin disease: Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of these agents.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, and semi-annually for employees 45 years of age or older or with 10 or more years' exposure to coal tar pitch volatiles.

- **Summary of toxicology**

Coal tar pitch volatiles (CTPV) are products of the destructive distillation of bituminous coal and contain polynuclear aromatic hydrocarbons (PNA's). These hydrocarbons sublime readily, thereby increasing the amounts of carcinogenic compounds in working areas. Epidemiologic evidence suggests that workers intimately exposed to the products of combustion or distillation of bituminous coal are at increased risk of cancer at many sites. These include cancer of the respiratory tract, kidney, bladder, and skin. In a study of coke oven workers, the level of exposure to CTPV and the length of time exposed were related to the development of cancer. Coke oven workers with the highest risk of cancer were those employed exclusively at topside jobs for 5 or more years, for whom the increased risk of dying from lung cancer was 10-fold; all coke oven workers had a 7-½-fold increase in risk of dying from kidney cancer. Although the causative agent or agents of the cancer in coke oven workers is unidentified, it is suspected that several PNA's in the CTPV generated during the coking process are involved. Certain industrial populations exposed to coal tar products have a demonstrated risk of skin cancer. Substances containing PNA's which may produce skin cancer also produce contact dermatitis; examples are coal tar, pitch, and cutting oils. Although allergic dermatitis is readily induced by PNA's in guinea pigs, it is only rarely reported in humans from occupational contact with PNA's; these have resulted largely from the therapeutic use of coal tar preparations. Components of pitch and coal tar produce cutaneous photosensitization; skin eruptions are usually limited to areas exposed to the sun or ultraviolet light. Most of the phototoxic agents will induce hypermelanosis of the skin; if chronic photodermatitis is severe and prolonged, leukoderma may occur. Some oils containing PNA's have been associated with changes of follicular and sebaceous glands which commonly take the form of acne. There is evidence that exposures to emissions at coke ovens and gas retorts may be associated with an increased occurrence of chronic bronchitis. Coal tar pitch volatiles may be associated with benzene, an agent suspected of causing leukemia and known to cause aplastic anemia.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data—Anthracene**
  1. Molecular weight: 178.2
  2. Boiling point (760 mm Hg): 340 C (644 F)
  3. Specific gravity (water = 1): 1.24
  4. Vapor density (air = 1 at boiling point of anthracene): 6.15
  5. Melting point: 217 C (423 F)
  6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
  7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
  8. Evaporation rate (butyl acetate = 1): Not applicable
- **Physical data—Phenanthrene**
  1. Molecular weight: 178.2
  2. Boiling point (760 mm Hg): 340 C (644 F)
  3. Specific gravity (water = 1): 1.18
  4. Vapor density (air = 1 at boiling point of phenanthrene): 6.15
  5. Melting point: 100.5 C (213 F)
  6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
  7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
  8. Evaporation rate (butyl acetate = 1): Not applicable
- **Physical data—Pyrene**
  1. Molecular weight: 202.3
  2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)

3. Specific gravity (water = 1): 1.28
4. Vapor density (air = 1 at boiling point of pyrene): 6.9
5. Melting point: 150.4 C (303 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Carbazole**

1. Molecular weight: 167.2
2. Boiling point (760 mm Hg): 355 C (671 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of carbazole): 5.8
5. Melting point: 246 C (475 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Benzo(a)pyrene**

1. Molecular weight: 252.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of benzo(a)pyrene): 8.7
5. Melting point: 179 C (354 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• **Reactivity**

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None
4. Special precautions: None

• **Flammability**

1. Flash point: Anthracene: 121 C (250 F) (closed cup); Others: Data not available
2. Autoignition temperature: Anthracene: 540 C (1004 F); Others: Data not available
3. Flammable limits in air, % by volume: Anthracene: Lower: 0.6; Others: Data not available
4. Extinguishant: Foam, dry chemical, and carbon dioxide

• **Warning properties**

Grant states that "coal tar and its various crude fractions appear principally to cause reddening and squamous eczema of the lid margins, with only small erosions of the corneal epithelium and superficial changes in the stroma, which disappear in a month following exposure. Chronic exposure of workmen to tar fumes and dust has been reported to cause conjunctivitis and discoloration of the cornea in the palpebral fissure, either near the limbus or, in extreme cases, across the whole cornea. Occasionally, epithelioma of the lid margin has been attributed to contact with coal tar."

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Coal tar products may be sampled by collection on a glass fiber filter with subsequent ultrasonic extraction and weighing. An analytical method for coal tar pitch volatiles is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 1, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00267-3).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with condensed coal tar pitch volatiles, where skin contact may occur.

• If employees' clothing may have become contaminated with coal tar pitch volatiles, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with coal tar pitch volatiles

should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of coal tar pitch volatiles from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar pitch volatiles, the person performing the operation should be informed of coal tar pitch volatiles's hazardous properties.

• Employees should be provided with and required to use splash-proof safety goggles where condensed coal tar pitch volatiles may contact the eyes.

SANITATION

• Workers subject to skin contact with coal tar pitch volatiles should wash with soap or mild detergent and water any areas of the body which may have contacted coal tar pitch volatiles at the end of each work day.

• Employees who handle coal tar pitch volatiles should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

• Areas in which exposure to coal tar pitch volatiles may occur should be identified by signs or other appropriate means, and access to these areas should be limited to authorized persons.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to coal tar pitch volatiles may occur and control methods which may be effective in each case:

Operation	Controls
Liberation from extraction and packaging from coal tar fraction of coking	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a binding agent in manufacture of coal briquettes used for fuel; use as a dielectric in the manufacture of battery electrodes, electric-arc furnace electrodes, and electrodes for alumina reduction	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of roofing felts and papers and roofing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use for protective coatings for pipes for underground conduits and drainage; use as a coating on concrete as waterproofing and corrosion-resistant material; use in road paving and sealing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture and repair of refractory brick; use in production of foundry cores; use in manufacture of carbon ceramic items	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Eye Exposure**

If condensed coal tar pitch volatiles get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with these chemicals.

• **Skin Exposure**

If condensed coal tar pitch volatiles get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands before eating or smoking and to wash thoroughly at the close of work.

• **Breathing**

If a person breathes in large amounts of coal tar pitch volatiles, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of releases until cleanup has been completed.

• If coal tar pitch volatiles are released in hazardous concentrations, the following steps should be taken:

1. Ventilate area of spill.

2. Collect released material in the most convenient and safe manner for reclamation or for disposal in sealed containers in a secured sanitary landfill.

• Waste disposal method:

Coal tar pitch volatiles may be disposed of in sealed containers in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR COAL TAR PITCH VOLATILES

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m³
Particulate and Vapor Concentration	
2 mg/m³ or less	A chemical cartridge respirator with an organic vapor cartridge(s) and with a fume or high-efficiency filter. Any supplied-air respirator. Any self-contained breathing apparatus.
10 mg/m³ or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s) and with a fume or high-efficiency filter. A gas mask with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
200 mg/m³ or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode. A powered air-purifying respirator with an organic vapor cartridge and a high-efficiency particulate filter.
400 mg/m³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 400 mg/m³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

* * * Section 1 - PRODUCT AND COMPANY IDENTIFICATION * * *

Manufacturer Information

KOPPERS INC.

436 Seventh Avenue

Pittsburgh, PA 15219-1800

Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)

Emergencies (Medical in USA): 877-737-9047

Emergencies (Medical Outside of USA): 651-632-9269

Email: naorgmsds@koppers.com

Material Name: CARBON PITCH TYPE A

Chemical Family

hydrocarbons, coal-tar

Synonyms

INDUSTRIAL PITCH / COAL TAR PETROLEUM; CARBON PITCH TYPE A - SOLID; CARBON PITCH TYPE A - LIQUID; CARBON PITCH CO-DISTILLED TYPE A; COAL TAR PITCH; PENCIL PITCH TYPE A

Product Use

process chemical

* * * Section 2 - HAZARDS IDENTIFICATION * * *

EMERGENCY OVERVIEW

Physical Form: changes from solid to liquid as temperature increases

Color: black

Odor: coal tar odor

Signal Word: WARNING!

Major Health Hazards: respiratory tract irritation, skin irritation, eye irritation, lung cancer, skin cancer, bladder cancer, scrotal cancer, (See Section 11 for additional information on potential hazards of constituents of the product.)

Precautionary Statements: Do not breathe vapor or fumes. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Observe good hygiene and safety practices when handling this product. Do not use this product until the MSDS has been read and understood.

POTENTIAL HEALTH EFFECTS

Inhalation

Short Term: irritation

Long Term: changes in body temperature, vomiting, difficulty breathing, headache, drowsiness, dizziness, loss of coordination, convulsions, lung cancer, bladder cancer

Skin

Short Term: irritation, sensitivity to sunlight, skin discoloration, skin disorders, thermal burns from heated material

Long Term: skin disorders, sensitivity to sunlight, skin cancer, scrotal cancer

Eye

Short Term: irritation, sensitivity to sunlight, eye damage, thermal burns from heated material

Long Term: irritation, sensitivity to sunlight, eye damage

Ingestion

Short Term: irritation, nausea, vomiting, stomach pain

Long Term: no information on significant adverse effects

* * * Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS	Component	Percent
65996-93-2	HIGH TEMPERATURE COAL TAR PITCH	70 - 100
68187-58-6	PETROLEUM PITCH	0 - 30
50-32-8	BENZO(A)PYRENE	1.11 - 1.42
191-24-2	BENZO(G,H,I)PERYLENE	0.88 - 1.30
193-39-5	INDENO(1,2,3-CD)PYRENE	0.97 - 1.15
206-44-0	FLUORANTHENE	0.77 - 1.27
Not Available	POLYCYCLIC AROMATIC HYDROCARBONS	>1

129-00-0	PYRENE	0.67 - 1.19
218-01-9	1,2-BENZPHENANTHRENE	0.72 - 1.03
56-55-3	1,2-BENZANTHRACENE	0.71 - 1.04
205-99-2	BENZO(B)FLUORANTHENE	0.72 - 0.92
189-64-0	DIBENZO(A,H)PYRENE	0.50 - 0.81
205-82-3	BENZO(J)FLUORANTHENE	0.51 - 0.66
207-08-9	BENZO(K)FLUORANTHENE	0.48 - 0.62
192-65-4	DIBENZO(A,E)PYRENE	0.26 - 0.50
189-55-9	DIBENZO(A,I)PYRENE	0.16 - 0.44
53-70-3	DIBENZ(A,H)ANTHRACENE	0.22 - 0.30
86-74-8	CARBAZOLE	0.02 - 0.10

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Aromatic hydrocarbons, polycyclic (130498-29-2).

* * * Section 4 - FIRST AID MEASURES * * *

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin

For thermal burns, cool affected areas as quickly as possible by drenching or immersing in water. Wash skin with soap and water for at least 15 minutes, or use a waterless handcleaner, while removing contaminated clothing and shoes. Get immediate medical attention, if needed.

Eyes

Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

DO NOT induce vomiting. If a large amount is swallowed, get medical attention. Do not give anything by mouth to unconscious or convulsive person. If vomiting occurs, keep head lower than hips to help prevent aspiration.

* * * Section 5 - FIRE FIGHTING MEASURES * * *

See Section 9 for Flammability Properties

NFPA Ratings: Health= 2 **Fire=** 1 **Reactivity=** 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Flammable Properties

During fire conditions, vapors and decomposition products may be released, forming flammable/explosive mixtures in air. Containers may rupture or explode if exposed to heat.

Sensitivity to Mechanical Impact

No

Sensitivity to Static Discharge

Yes (dust)

Extinguishing Media

regular dry chemical, carbon dioxide, regular foam, water spray

Protective Equipment and Precautions for Firefighters

Full fire fighting turn-out gear (bunker gear).

Fire Fighting Measures

Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Directly spraying water or foam onto hot burning product may cause frothing. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.

* * * Section 6 - ACCIDENTAL RELEASE MEASURES * * *

Water Release

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

Occupational Spill / Release

Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. Due to the concentration of Benzo(a)pyrene and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 70 pounds of this product requires National Response Center notification.

* * * Section 7 - HANDLING AND STORAGE * * *

Handling Procedures

Avoid breathing vapors of heated materials. Avoid contact with eyes, skin and clothing. When using, do not eat, drink or smoke. Wash exposed areas thoroughly with soap and water, or a waterless handcleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion (SPF 15+) can also be applied prior to application of a protective cream. Contaminated clothing should be removed and laundered before reuse.

Storage Procedures

Store and handle in accordance with all current regulations and standards. Label all containers. Keep container in a well-ventilated place. Keep away from heat, sparks and flame. Protect from physical damage. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355 Part B).

* * * Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Exposure Guidelines

Component Exposure Limits

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

OSHA (US): 0.2 mg/m3 TWA (benzene soluble fraction)

ACGIH: 0.2 mg/m3 TWA (as benzene soluble aerosol)

NIOSH: 0.1 mg/m3 TWA (cyclohexane-extractable fraction)

Mexico: 0.002 mg/m3 TWA; 0.02 mg/m3 TWA (as Particulate polycyclic aromatic hydrocarbons)

0.015 ppm STEL; 0.03 mg/m3 STEL

BENZO(A)PYRENE (50-32-8)

OSHA (US): 0.2 mg/m3 TWA

1,2-BENZPHENANTHRENE (218-01-9)

OSHA (US): 0.2 mg/m3 TWA

Ventilation

Ensure adequate ventilation. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eyes / Face

ANSI Z87.1-1989 approved safety glasses with side shields. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. At elevated temperatures: A faceshield is recommended.

Protective Clothing

Wear protective clothing to prevent contact. Use protective skin cream on exposed skin before and during work shift. Contaminated clothing should be removed and laundered before reuse. When material is at an elevated temperature, wear appropriate heat resistant clothing.

Glove Recommendations

Wear appropriate gloves. When material is at an elevated temperature, wear appropriate heat resistant gloves.

Protective Material Types

protective skin creams, chemical resistant material, heat resistant material

Respiratory Protection

If the applicable TLVs and/or PELs are exceeded, use canister or cartridge respirators, which are MSHA/NIOSH-approved, with organic vapor cartridges.

* * * Section 9 - PHYSICAL AND CHEMICAL PROPERTIES * * *

Physical State:	Solid	**Color:**	black
Physical Form:	changes from solid to liquid as temperature increases	**Odor:**	coal tar odor
pH:	Not available	**Freezing / Melting Point:**	>21 °C
Boiling Point:	>240 °C	**Flash Point:**	>190 °C (PMCC)
Decomposition Temperature:	Not available	**Evaporation Rate:**	Not available
Lower Explosive Limit:	Not available	**Upper Explosive Limit:**	Not available
Vapor Pressure:	0 mmHg @ 20 °C	**Vapor Density:**	>1
Specific Gravity (water=1):	1.26 - 1.34 @ 15.5 °C	**Water Solubility:**	almost insoluble
Coefficient of Water/Oil Dist:	Not available	**Autoignition:**	>399 °C
Viscosity:	Not available	**Volatility:**	Not available

* * * Section 10 - STABILITY AND REACTIVITY * * *

Chemical Stability

Stable at normal temperatures and pressure.

Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials.

Materials to Avoid (Incompatibilites)

oxidizing materials

Decomposition Products

carbon monoxide, carbon dioxide, oxides of nitrogen, sulfur compounds, polynuclear aromatic hydrocarbons

Possibility of Hazardous Reactions

Will not polymerize.

* * * Section 11 - TOXICOLOGICAL INFORMATION * * *

Irritation / Corrosive Information

RTECS Irritation

The components of this material have been reviewed and RTECS publishes no applicable data as of the date on this document.

Local Effects

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

Irritant: skin, eye.

Acute and Chronic Toxicity

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

PETROLEUM PITCH (68187-58-6)

Oral LD50 Rat 4320 mg/kg; Dermal LD50 Rat >2000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

RTECS Acute Toxicity (selected)

The components of this material have been reviewed and RTECS publishes no applicable data as of the date on this document.

Carcinogenicity (Product)

OSHA: No

NTP: Yes

IARC: Yes

(See below for additional information on component carcinogen status)

Component Carcinogenicity

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

ACGIH: A1 - Confirmed Human Carcinogen

NIOSH: potential occupational carcinogen

NTP: Known Human Carcinogen (Select Carcinogen)

IARC: Supplement 7 [1987]; Monograph 35 [1985] (Group 1 (carcinogenic to humans))

RTECS Tumorigenic

The components of this material have been reviewed, and RTECS publishes data for one or more components.

Mutagenic Data (Product)

Ames Salmonella with Activation - Positive.

RTECS Mutagenic

The components of this material have been reviewed, and RTECS publishes data for one or more components.

RTECS Reproductive Effects

The components of this material have been reviewed, and RTECS publishes data for one or more components.

Target Organs (Product)

respiratory system, skin, eyes, bladder, scrotum

Medical Conditions Aggravated by Exposure Based on Product and Component Information

respiratory disorders, skin disorders, eye disorders, central nervous system disorders (i.e. headache, drowsiness, dizziness, loss of coordination)

Additional Information (Product)

This product contains coal tar pitch. Volume 35 of the IARC monograph states that there is sufficient evidence that coal tar pitches are carcinogenic in humans. IARC's conclusion is based upon studies suggesting an association between skin cancer and chronic occupational dermal exposure to coal tar pitches and upon other historical studies and anecdotal reports showing an association between dermal exposure to coal tar pitch and scrotal cancer in the absence of good hygiene practices.

Epidemiological studies of aluminum reduction workers showed an excess risk of developing bladder cancer for workers with chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. Studies also suggest an association between lung cancer and chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. A recent animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches. It is not anticipated, however, that use of this product in liquid form will create a respirable dust.

In addition to containing information about the product as a whole, this data sheet also contains information about individual components of the product. Information of this nature may not have been derived from studies or data relating to this product and/or may have been derived from studies or data that did not involve human exposure and involved animal exposure only.

Additional Information Based on Component Data

Some polycyclic aromatic hydrocarbons (PAHs), found in coal tar complex substances, have been reported to cause lung and skin cancer in humans under conditions of poor personal hygiene, prolonged/repeated contact, and exposure to sunlight. The National Toxicology Program (NTP) and IARC have independently classified various PAH compounds present in coal tar substances as reasonably anticipated to be human carcinogens (NTP), probably carcinogenic to humans (IARC Group 2A), possibly carcinogenic to humans (IARC Group 2B), and not classifiable as to carcinogenicity to humans (IARC Group 3). The cancers reported in the studies upon which IARC based its conclusions involved lung, skin, liver, stomach, kidney and blood cancers in animals. Based on the results of animal experiments PAHs may cause injury to the liver, kidneys, lungs, blood and lymph systems. Some PAH's have also been associated with impaired fertility, heritable genetic damage and birth defects in mice.

* * * Section 12 - ECOLOGICAL INFORMATION * * *

Component Analysis - Aquatic Toxicity

PETROLEUM PITCH (68187-58-6)

Fish: 96 Hr LC50 Brachydanio rerio: 48 mg/L [semi-static]

PYRENE (129-00-0)

Invertebrate: 48 Hr EC50 water flea: 1.8 mg/L

1,2-BENZANTHRACENE (56-55-3)

Invertebrate: 96 Hr LC50 Daphnia magna: 0.01 mg/L [Static]; 48 Hr EC50 Daphnia magna: 0.0042 mg/L

1,2-BENZPHENANTHRENE (218-01-9)

Invertebrate: 2 Hr EC50 water flea: 1.9 mg/L

CARBAZOLE (86-74-8)

Fish: 48 Hr LC50 Mugil cephalus: 1 mg/L [static]

Algae: 60 Hr EC50 Tetrahymena pyriformis: 6.7 mg/L

* * * Section 13 - DISPOSAL CONSIDERATIONS * * *

Disposal Methods

Dispose in accordance with all applicable regulations.

Component Waste Numbers

There are no applicable U.S. EPA waste numbers for this product's components.

* * * Section 14 - TRANSPORT INFORMATION * * *

US DOT Information

Shipping Name: Other regulated substances, solid, n.o.s. (Contains: HIGH-TEMP. COAL TAR PITCH), RQ

UN/NA #: NA3077 **Hazard Class:** 9 **Packing Group:** III

Other Information: Applicable shipping classification depends on temperature of product. Product in Tank Car or Tank Truck is shipped as 'Elevated temperature liquid, n.o.s.' 'Other regulated substances, solid, n.o.s.' applies for all container sizes.

US DOT Reportable Quantities

BENZO(A)PYRENE (50-32-8)

1 lb RQ; 0.454 kg RQ

INDENO(1,2,3-CD)PYRENE (193-39-5)

100 lb RQ; 45.4 kg RQ

FLUORANTHENE (206-44-0)

100 lb RQ; 45.4 kg RQ

1,2-BENZANTHRACENE (56-55-3)

10 lb RQ; 4.54 kg RQ

1,2-BENZPHENANTHRENE (218-01-9)

100 lb RQ; 45.4 kg RQ

BENZO(B)FLUORANTHENE (205-99-2)

1 lb RQ; 0.454 kg RQ

TDG Information

Shipping Name: Elevated temperature liquid, n.o.s.

UN #: UN3257 **Hazard Class:** 9 **Packing Group:** III

Required Label(s): 9

* * * Section 15 - REGULATORY INFORMATION * * *

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Sections 302/304 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), TSCA 12(b), and/or require an OSHA process safety plan.

BENZO(A)PYRENE (50-32-8)

SARA 313: 0.1 % Supplier notification limit

BENZO(G,H,I)PERYLENE (191-24-2)

SARA 313: 1.0 % Supplier notification limit

INDENO(1,2,3-CD)PYRENE (193-39-5)

SARA 313: 0.1 % Supplier notification limit

FLUORANTHENE (206-44-0)

SARA 313: 1.0 % Supplier notification limit

PYRENE (129-00-0)

SARA 302: 1000 lb lower TPQ; 10000 lb upper TPQ

SARA 304: 5000 lb EPCRA RQ

1,2-BENZANTHRACENE (56-55-3)

SARA 313: 0.1 % Supplier notification limit

1,2-BENZPHENANTHRENE (218-01-9)

SARA 313: 1.0 % Supplier notification limit

BENZO(B)FLUORANTHENE (205-99-2)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,H)PYRENE (189-64-0)

SARA 313: 0.1 % Supplier notification limit

BENZO(J)FLUORANTHENE (205-82-3)

SARA 313: 0.1 % Supplier notification limit

BENZO(K)FLUORANTHENE (207-08-9)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,E)PYRENE (192-65-4)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,I)PYRENE (189-55-9)

SARA 313: 0.1 % Supplier notification limit

DIBENZ(A,H)ANTHRACENE (53-70-3)

SARA 313: 0.1 % Supplier notification limit

SARA 311/312 Hazardous Categories (40 CFR 370 Subparts B and C)

Acute Health: Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS#	CA	MA	MN	NJ	PA	RI
HIGH TEMPERATURE COAL TAR PITCH	65996-93-2	Yes	Yes	Yes	Yes	Yes	No
BENZO(A)PYRENE	50-32-8	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(G,H,I)PERYLENE (¹related to: Aromatic hydrocarbons, polycyclic)	191-24-2	Yes	Yes	Yes¹	Yes	Yes	Yes¹
INDENO(1,2,3-CD)PYRENE (¹related to: Aromatic hydrocarbons, polycyclic)	193-39-5	Yes	Yes	Yes	Yes	Yes	Yes¹
FLUORANTHENE (¹related to: Aromatic hydrocarbons, polycyclic)	206-44-0	Yes	Yes	Yes¹	Yes	Yes	Yes¹
PYRENE (¹related to: Aromatic hydrocarbons, polycyclic)	129-00-0	Yes	Yes	Yes¹	Yes	Yes	Yes¹
1,2-BENZANTHRACENE	56-55-3	Yes	Yes	Yes	Yes	Yes	Yes
1,2-BENZPHENANTHRENE	218-01-9	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(B)FLUORANTHENE	205-99-2	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZO(A,H)PYRENE	189-64-0	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(J)FLUORANTHENE	205-82-3	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(K)FLUORANTHENE (¹related to: Aromatic hydrocarbons, polycyclic)	207-08-9	Yes	Yes	Yes	Yes	Yes	Yes¹
DIBENZO(A,E)PYRENE	192-65-4	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZO(A,I)PYRENE	189-55-9	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZ(A,H)ANTHRACENE	53-70-3	Yes	Yes	Yes	Yes	Yes	Yes
CARBAZOLE	86-74-8	Yes	No	No	No	No	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Canadian Regulations

WHMIS Classification

D2A.

WHMIS Ingredient Disclosure List

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

0.1 %

BENZO(A)PYRENE (50-32-8)

0.1 %

INDENO(1,2,3-CD)PYRENE (193-39-5)

0.1 %

FLUORANTHENE (206-44-0)

1 %

1,2-BENZANTHRACENE (56-55-3)

0.1 %

1,2-BENZPHENANTHRENE (218-01-9)

0.1 %

BENZO(B)FLUORANTHENE (205-99-2)

0.1 %

DIBENZO(A,H)PYRENE (189-64-0)

0.1 %

DIBENZO(A,I)PYRENE (189-55-9)

0.1 %

DIBENZ(A,H)ANTHRACENE (53-70-3)

0.1 %

Canada Inventory Information (Product)

One or more components of this product are not listed on either the DSL or the NDSL.

U.S. Inventory (TSCA) Information (Product)

One or more components of this product are not listed.

Inventory Status (Components)

Component Analysis - Inventory

Component	CAS#	US	CA
HIGH TEMPERATURE COAL TAR PITCH	65996-93-2	Yes	DSL
PETROLEUM PITCH	68187-58-6	Yes	DSL
BENZO(A)PYRENE	50-32-8	Yes	DSL
BENZO(G,H,I)PERYLENE	191-24-2	No	No
INDENO(1,2,3-CD)PYRENE	193-39-5	Yes	NSL
FLUORANTHENE	206-44-0	Yes	NSL
PYRENE	129-00-0	Yes	DSL
1,2-BENZANTHRACENE	56-55-3	Yes	NSL
1,2-BENZPHENANTHRENE	218-01-9	Yes	DSL
BENZO(B)FLUORANTHENE	205-99-2	No	No
DIBENZO(A,H)PYRENE	189-64-0	No	No
BENZO(J)FLUORANTHENE	205-82-3	No	No
BENZO(K)FLUORANTHENE	207-08-9	No	No
DIBENZO(A,E)PYRENE	192-65-4	No	No
DIBENZO(A,I)PYRENE	189-55-9	No	No
DIBENZ(A,H)ANTHRACENE	53-70-3	Yes	NSL
CARBAZOLE	86-74-8	Yes	DSL

* * * Section 16 - OTHER INFORMATION * * *

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Other Information

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.

End of Sheet 00228333

SAFETY DATA SHEET

Version 6.0
Revision Date 09/21/2017
Print Date 11/29/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3

CAS-No. : 108-88-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_7H_8
Molecular weight	:	92.14 g/mol
CAS-No.	:	108-88-3
EC-No.	:	203-625-9
Index-No.	:	601-021-00-3
Registration number	:	01-2119471310-51-XXXX

Hazardous components

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H315, H336, H361, H373, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.0200 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.0300 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to last shift of workweek			

		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Exposure routes	Health effect	Value
Workers	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Marine water	0.68 mg/l
Fresh water	0.68 mg/l
Marine sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	aromatic
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -93 °C (-135 °F)
f)	Initial boiling point and boiling range	110 - 111 °C (230 - 232 °F)
g)	Flash point	4.0 °C (39.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapour pressure	29.1 hPa (21.8 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.865 g/mL at 25 °C (77 °F)
n)	Water solubility	0.5 g/l at 15 °C (59 °F)
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	535.0 °C (995.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 5,580 mg/kg

LC50 Inhalation - Rat - 4 h - 12,500 - 28,800 mg/m3

LD50 Dermal - Rabbit - 12,196 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Rat
Liver
DNA damage

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Damage to fetus possible
Suspected human reproductive toxicant

Reproductive toxicity - Rat - Inhalation
Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Experiments have shown reproductive toxicity effects in male and female laboratory animals.

Developmental Toxicity - Rat - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: XS5250000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h
	EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h

12.2 Persistence and degradability

Biodegradability — Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation — Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l

Bioconcentration factor (BCF): 90

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA
UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene	108-88-3	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation

HMIS Rating
Health hazard: 2

Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.0 Revision Date: 09/21/2017 Print Date: 11/29/2017

SAFETY DATA SHEET

Version 5.12
Revision Date 04/20/2017
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Ethylbenzene

Product Number : 296848
Brand : Sigma-Aldrich
Index-No. : 601-023-00-4

CAS-No. : 100-41-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H332 Harmful if inhaled.
H351 Suspected of causing cancer.
H373 May cause damage to organs through prolonged or repeated exposure.
H401 Toxic to aquatic life.

Precautionary statement(s)
P201 Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_8H_{10}
Molecular weight	:	106.17 g/mol
CAS-No.	:	100-41-4
EC-No.	:	202-849-4
Index-No.	:	601-023-00-4

Hazardous components

Component	Classification	Concentration
Ethylbenzene		
	Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H332, H351, H373, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

hygroscopic

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethylbenzene	100-41-4	TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	125.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100.000000 ppm 435.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125.000000 ppm 545.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm 545 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.7g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Ethylbenzene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Not critical			
		Sum of mandelic acid and phenyl glyoxylic acid	0.15g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -95 °C (-139 °F) - lit.
f)	Initial boiling point and boiling range	136 °C (277 °F) - lit.
g)	Flash point	15.0 °C (59.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6.7 %(V) Lower explosion limit: 1 %(V)
k)	Vapour pressure	13.3 hPa (10.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.867 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.2 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.6 at 20 °C (68 °F)
p)	Auto-ignition temperature	432.0 °C (809.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	0.773 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.2 mN/m at 23 °C (73 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,500 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 15,433 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Hamster
ovary
Result: negative

Mouse - male and female
Result: negative

Carcinogenicity

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information

Repeated dose toxicity	Rat - male and female - NOAEL : 75 mg/kg - OECD Test Guideline 407

RTECS: DA0700000

Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h
Toxicity to algae	static test EC50 - Skeletonema costatum (marine diatom) - 4.9 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 70 - 80 % - Readily biodegradable.

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE

IATA

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12 Revision Date: 04/20/2017 Print Date: 10/19/2018

GASCO0052713

SAFETY DATA SHEET

Xylene

Section 1. Identification

GHS product identifier : Xylene

Chemical name : Xylene

Synonyms : Xylol; Mixed Xylenes; Xylene Isomers and Ethylbenzene; Dimethylbenzenes and Ethylbenzene; Industrial-grade Xylene (meets ASTM D-364 Specifications); Nitration-grade Xylene (meets ASTM D-843 Specifications); CITGO® Material Code: 07306

Code : 07306

Supplier's details : CITGO Petroleum Corporation
135th and New Avenue
Lemont, IL 60439
sdsvend@citgo.com

Emergency telephone number (with hours of operation) : Technical Contact: (630) 257-4081
Medical Emergency: (630) 257-4318
CHEMTREC Emergency: (800) 424-9300
(United States Only)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 2
AQUATIC HAZARD (LONG-TERM) - Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapor.
Harmful if inhaled.
Causes serious eye irritation.
Causes skin irritation.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure. (hearing organs)
Toxic to aquatic life with long lasting effects.

Precautionary statements

Section 2. Hazards identification

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Do not breathe vapor. Wash hands thoroughly after handling.

Response : Collect spillage. Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and receiving equipment. These alone may be insufficient to remove static electricity. Avoid contact with skin and clothing. Wash thoroughly after handling.

Hazards not otherwise classified : Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor may cause flash fire or explosion. Prolonged or repeated contact may dry skin and cause irritation. Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Xylene

Other means of identification : Xylol; Mixed Xylenes; Xylene Isomers and Ethylbenzene; Dimethylbenzenes and Ethylbenzene; Industrial-grade Xylene (meets ASTM D-364 Specifications); Nitration-grade Xylene (meets ASTM D-843 Specifications); CITGO® Material Code: 07306

CAS number/other identifiers

CAS number : 1330-20-7

Ingredient name	%	CAS number
Xylene	>80	1330-20-7
Ethylbenzene	<20	100-41-4
Cumene	<0.2	98-82-8

* = Various ** = Mixture *** = Proprietary

Any concentration shown as a range is to protect confidentiality or is due to process variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. Breathing high concentrations can cause irregular heartbeats which can be fatal.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Breathing high concentrations can cause irregular heartbeats which may be fatal. Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.
Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Section 4. First aid measures

Notes to physician : This material (or a component) may sensitize the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrthymias in individuals exposed to this material. If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

Specific treatments : Treat symptomatically and supportively.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that gas or vapor is still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use caution when applying carbon dioxide in confined spaces. SMALL FIRE: Steam, CO_2, dry chemical or inert gas (e.g., nitrogen). LARGE FIRE: Use foam, water fog or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, ignition or explosion.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static accumulation may be significantly increased by the presence of small quantities of water or other contaminants. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container. Handling operations that can promote accumulation of static charges include but are not limited to: mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. Restrict flow velocity according to API 2003 (2008), NFPA 77 (2007), and Laurence Britton, “Avoiding Static Ignition Hazards in Chemical Operations”. To reduce potential for static discharge, ensure that all equipment is properly grounded and bonded and meets appropriate electrical classification requirements.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 7. Handling and storage

Bulk Storage Conditions: Maintain all storage tanks in accordance with applicable regulations. Use necessary controls to monitor tank inventories. Inspect all storage tanks on a periodic basis. Test tanks and associated piping for tightness. Maintain the automatic leak detection devices to assure proper working condition.

Head spaces in tanks and other containers may contain a mixture of air and vapor in the flammable range. Vapor may be ignited by static discharge. Storage area must meet OSHA requirements and applicable fire codes. Additional information regarding the design and control of hazards associated with the handling and storage of flammable and combustible liquids may be found in professional and industrial documents including, but not limited to, the National Fire Protection Association (NFPA) publications NFPA 30 ("Flammable and Combustible Liquid Code"), NFPA 77 ("Recommended Practice on Static Electricity") and the American Petroleum Institute (API) Recommended Practice 2003, ("Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents").

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Xylene	**ACGIH TLV (United States, 3/2016).** TWA: 100 ppm 8 hours. TWA: 434 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 651 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 10/2013).** TWA: 100 ppm 10 hours. TWA: 435 mg/m³ 10 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
Cumene	**NIOSH REL (United States, 10/2013).** **Absorbed through skin.** TWA: 50 ppm 10 hours. TWA: 245 mg/m³ 10 hours. **ACGIH TLV (United States, 3/2016).** TWA: 50 ppm 8 hours. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, vapor controls, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Avoid skin contact with liquid. Chemical-resistant gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: Heavy duty, industrial grade chemically resistant gloves constructed of nitrile, neoprene, polyethylene, fluoroelastomer rubber or polyvinyl chloride as approved by glove manufacturer. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. Leather gloves are not protective for liquid contact.

Body protection : Avoid skin contact with liquid. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Avoid skin contact with liquid. Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Leather boots are not protective for liquid contact.

Respiratory protection : Avoid inhalation of gases, vapors, mists or dusts. Use a properly fitted, air-purifying or supplied-air respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If an air purifying respirator is appropriate, use one equipped with cartridges rated for organic vapors.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Transparent, colorless.

Odor : Sweet, pungent aromatic hydrocarbon.

pH : Not available.

Melting point : -48°C (-54.4°F)

Boiling point : 138°C (280.4°F)

Flash point : Closed cup: 27°C (80.6°F)

Evaporation rate : 0.8 (n-butyl acetate. = 1)

Lower and upper explosive (flammable) limits : Lower: 1%
Upper: 7%

Vapor pressure : 0.93 kPa (7 mm Hg) [room temperature]

Vapor density : 3.7 [Air = 1]

Relative density : 0.87

Density lbs/gal : 7.25 lbs/gal

Density gm/cm^3 : Not available.

Gravity, °API : Estimated 31 @ 60 F

Solubility : Very slightly soluble in the following materials: cold water.

Auto-ignition temperature : 432°C (809.6°F)

Section 9. Physical and chemical properties

Flow time (ISO 2431) : Not available.

Conductivity : ≤50 picosiemens/meter (unadditized)

Section 10. Stability and reactivity

Reactivity : Not expected to be Explosive, Self-Reactive, Self-Heating, or an Organic Peroxide under US GHS Definition(s).

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas. Do not store with strong oxidizing agents.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Xylene	LC50 Inhalation Vapor	Rat	5000 ppm	4 hours
	LC50 Inhalation Vapor	Rat	6700 ppm	4 hours
	LD50 Oral	Mouse	2119 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
	LD50 Oral	Rat	4300 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
Cumene	LC50 Inhalation Vapor	Mouse	10 g/m³	7 hours
	LD50 Dermal	Rabbit	12300 uL/kg	-
	LD50 Oral	Rat	2.9 g/kg	-
	LD50 Oral	Rat	4000 mg/kg	-

Conclusion/Summary : **xylene**: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Xylene	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
Ethylbenzene	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-
Cumene	Eyes - Mild irritant	Rabbit	-	86 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-

Skin : **xylene**: May cause skin irritation.

Section 11. Toxicological information

Eyes : **xylene**: May cause eye irritation.

Respiratory : **xylene**: May cause respiratory irritation.

Sensitization

Not available.

Skin : No additional information.

Respiratory : No additional information.

Mutagenicity

Not available.

Conclusion/Summary : No additional information.

Carcinogenicity

Not available.

Conclusion/Summary : **ethylbenzene**: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B).

Classification

Product/ingredient name	OSHA	IARC	NTP
Xylene	-	3	-
Ethylbenzene	-	2B	-
Cumene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

Not available.

Conclusion/Summary : **ethylbenzene**: Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time.

Teratogenicity

Not available.

Conclusion/Summary : No additional information.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Ethylbenzene	Category 3	Not applicable.	Respiratory tract irritation
Cumene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Xylene	Category 2	Not determined	hearing organs

Aspiration hazard

Name	Result
Ethylbenzene	ASPIRATION HAZARD - Category 1
Cumene	ASPIRATION HAZARD - Category 1

Section 11. Toxicological information

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. Breathing high concentrations can cause irregular heartbeats which can be fatal.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Breathing high concentrations can cause irregular heartbeats which may be fatal.
Repeated or prolonged overexposure to solvents can cause brain or other nervous system damage. The symptoms can include the loss of memory, the loss of intellectual capacity and the loss of coordination.
Repeated or prolonged overexposure to certain chemicals in this product may exacerbate the hearing loss effects associated with noise exposure.

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : Adverse symptoms may include the following:
nausea or vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Xylene	Acute EC50 90 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute LC50 8.5 ppm Marine water	Crustaceans - Palaemonetes pugio - Adult	48 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 15700 µg/l Fresh water	Fish - Lepomis macrochirus - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute LC50 19000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute LC50 16940 µg/l Fresh water	Fish - Carassius auratus	96 hours
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 6530 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 2930 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Cumene	Acute EC50 2600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 7400 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 10600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2700 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours

Conclusion/Summary : Not available.

Persistence and degradability

Conclusion/Summary : Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Xylene	3.12	8.1 to 25.9	low
Ethylbenzene	3.6	-	low
Cumene	3.55	35.48	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues.

Section 13. Disposal considerations

Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

RCRA classification : D001, D018

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Xylene	1330-20-7	Listed	U239

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1307	UN1307	UN1307
UN proper shipping name	Xylenes	Xylenes	Xylenes
Transport hazard class(es)	3 	3 	3 
Packing group	III	III	III
Environmental hazards	No.	No.	No.

Additional information

DOT Classification : **Reportable quantity** 123.76 lbs / 56.188 kg [17.061 gal / 64.584 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Quantity limitation Passenger aircraft/rail: 60 L. Cargo aircraft: 220 L.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 60 L. Cargo Aircraft Only: 220 L.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Water Act (CWA) 307: ethylbenzene; toluene; benzene; naphthalene

Clean Water Act (CWA) 311: Xylene

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

Section 15. Regulatory information

SARA 302/304

Composition/information on ingredients

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2
ASPIRATION HAZARD - Category 1
HNOC - Defatting irritant

Composition/information on ingredients

Name	%	Classification
Xylene	>80	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2
Ethylbenzene	<20	FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1
Cumene	<0.2	FLAMMABLE LIQUIDS - Category 3 EYE IRRITATION - Category 2A CARCINOGENICITY (inhalation) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 ASPIRATION HAZARD - Category 1

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	xylene ethylbenzene	1330-20-7 100-41-4	<90 <30
Supplier notification	xylene ethylbenzene	1330-20-7 100-41-4	<90 <30

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: XYLENE

New York : The following components are listed: Xylene (mixed)

New Jersey : The following components are listed: XYLENES; BENZENE, DIMETHYL-

Pennsylvania : The following components are listed: BENZENE, DIMETHYL-

California Prop. 65 Clear and Reasonable Warnings (2018)

⚠ **WARNING**: This product can expose you to Benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. This product can expose you to chemicals including Ethylbenzene, Cumene, Naphthalene, which are known to the State of California to cause cancer, and Toluene, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Section 15. Regulatory information

Ingredient name	%	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
ethylbenzene	<30	Yes.	No.	Yes.	-
toluene	<0.1	No.	Yes.	-	Yes.
benzene	<0.01	Yes.	Yes.	Yes.	Yes.
cumene	<0.3	Yes.	No.	-	-
naphthalene	<0.0001	Yes.	No.	Yes.	-

International regulations

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Inventory list

United States : All components are listed or exempted.
Australia : All components are listed or exempted.
Canada : All components are listed or exempted.
China : All components are listed or exempted.
Europe : All components are listed or exempted.
Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): All components are listed or exempted.
Malaysia : All components are listed or exempted.
New Zealand : All components are listed or exempted.
Philippines : All components are listed or exempted.
Republic of Korea : All components are listed or exempted.
Taiwan : All components are listed or exempted.
Thailand : Not determined.
Turkey : All components are listed or exempted.
Viet Nam : Not determined.

Section 16. Other information

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Section 16. Other information

Classification	Justification
FLAMMABLE LIQUIDS - Category 3	On basis of test data
ACUTE TOXICITY (inhalation) - Category 4	Calculation method
SKIN IRRITATION - Category 2	Calculation method
EYE IRRITATION - Category 2A	Calculation method
CARCINOGENICITY - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (hearing organs) - Category 2	Calculation method
ASPIRATION HAZARD - Category 1	Expert judgment
AQUATIC HAZARD (ACUTE) - Category 2	Calculation method
AQUATIC HAZARD (LONG-TERM) - Category 2	Calculation method

History

Date of printing : 3/2/2018

Date of issue/Date of revision : 3/2/2018

Date of previous issue : 9/22/2017

Version : 2

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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Material Safety Data Sheet
Sodium Cyanide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Cyanide

Catalog Codes: SLS2314, SLS3736

CAS#: 143-33-9

RTECS: VZ7525000

TSCA: TSCA 8(b) inventory: Sodium Cyanide

CI#: Not available.

Synonym:

Chemical Name: Sodium Cyanide

Chemical Formula: NaCN

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium Cyanide	143-33-9	100

Toxicological Data on Ingredients: Sodium Cyanide: ORAL (LD50): Acute: 6.44 mg/kg [Rat]. DERMAL (LD50): Acute: 10.4 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of acids, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Dangerous on contact with acids, acid fumes, water or stream. It will produce toxic and flammable vapors of CN-H and sodium oxide. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas. When heated to decomposition it emits toxic fumes hydgrogen cyanide and oxides of nitrogen

Special Remarks on Explosion Hazards: Fusion mixtures of metal cyanides with metal chlorates, perchlorated or nitrates causes a violent explosion

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 5 (mg/m3) from ACGIH (TLV) [United States] SKIN CEIL: 4.7 from NIOSH CEIL: 5 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Granular solid. Flakes solid.)

Odor:
Faint almond-like odor. Odorless when perfectly dry. Emits odor of hydrogen cyanide when damp.

Taste: Not available.

Molecular Weight: 49.01 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 1496°C (2724.8°F)

Melting Point: 563°C (1045.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.595 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Vapor Density of Hydrogen Cyanide gas: 0.941

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Soluble in cold water. Slightly soluble in Ethanol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, moisture, incompatibles.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity:
Corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent reaction with fluorine gas, magnesium, nitrates, nitric acid. Dangerous on contact with acids, acid fumes, water or stream. It wil produce toxic and flammable vapors of CN-H and sodium oxide. Cyanide may react with CO2 in ordinary air to form toxic hydrogen cyanide gas. Strong oxidizers such as acids, acid salts, chlorates, and nitrates. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

Special Remarks on Corrosivity: Corrosive to aluminum

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 6.44 mg/kg [Rat]. Acute dermal toxicity (LD50): 10.4 mg/kg [Rabbit].

Chronic Effects on Humans: May cause damage to the following organs: skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects (maternal and paternal fertility) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health effects: Skin: May cause itching and irritation. May be fatal if absorbed through injured skin with symtpoms similar to those noted for inhalation and ingestion. Eyes: May cause eye irritation and eye damage. Inhalation: May cause respiratory tract irritation. May be fatal if inhaled. The substance inhibits cellular respiration causing metabolic asphyxiation. May cause headache, weakness, dizziness, labored breathing, nausea, vomiting. May be followed by cardiovascular effects, unconciousness, convulsions, coma, and death Ingestion: May be fatal if swallowed. May cause

gastrointestinal tract irritation with nausea, vomiting. May affect behavior and nervous systems(seizures, convulsions, change in motor activity, headache, dizziness, confusion, weakness stupor, aniexity, agitation, tremors), cardiovascular system, respiration (hyperventilation, pulmonary edema, breathing difficulty, respiratory failure), cardiovascular system (palpitations, rapid heart beat, hypertension, hypotension). Massive doses by produce sudden loss of conciousness and prompt death from respiratory arrest. Smaller but still lethal doses on the breath or vomitus. Chronic Potential Health Effects: Central Nervous system effects (headaches, vertigo, insomnia, memory loss, tremors, fatigue), fatigue, metabolic effects (poor appetite), cardiovascular effects (chest discomfort, palpitations), nerve damage to the eyes, or dermatitis, respiratory tract irritation, eye irritation, or death can occur. may prolong the illness for 1 or more hours. A bitter almond odor may be noted

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Sodium cyanide UNNA: 1689 PG: I

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Sodium Cyanide Illinois chemical safety act: Sodium Cyanide New York release reporting list: Sodium Cyanide Rhode Island RTK hazardous substances: Sodium Cyanide Pennsylvania RTK: Sodium Cyanide Minnesota: Sodium Cyanide Massachusetts RTK: Sodium Cyanide Massachusetts spill list: Sodium Cyanide New Jersey: Sodium Cyanide New Jersey spill list: Sodium Cyanide Louisiana RTK reporting list: Sodium Cyanide Louisiana spill reporting: Sodium Cyanide California Director's List of Hazardous Substances: Sodium Cyanide TSCA 8(b) inventory: Sodium Cyanide TSCA 4(a) final test rules: Sodium Cyanide TSCA 8(a) PAIR: Sodium Cyanide TSCA 8(d) H and S data reporting: Sodium Cyanide TSCA 12(b) one time export: Sodium Cyanide SARA 302/304/311/312 extremely hazardous substances: Sodium Cyanide CERCLA: Hazardous substances.: Sodium Cyanide: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R27/28- Very toxic in contact with skin and if swallowed. R41- Risk of serious damage to eyes. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S36/37- Wear suitable protective clothing and gloves. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Appendix D
Respiratory Protection Program

Respiratory Protection Program

Sevenson Environmental Services, Inc.
2749 Lockport Road
Niagara Falls, NY 14305

This respiratory protection program has been written to comply with the applicable OSHA regulations and contract specifications, to provide the basis for the administration of the respirator program, and to serve as a training tool for the affected workers. Specifics of the program such as brands of respirators used, cartridges or filters, and type of monitoring equipment will be provided upon mobilization.

Since respiratory protection, in many instances, will be the primary method for protecting a worker's health, it is Sevenson's policy that all portions of this program be followed and that any deficiencies in the administration and enforcement of this program will be immediately corrected.

The overall responsibility for documenting and administering the respirator program rests with the Project Manager. This responsibility will be delegated to the Senior Site Safety Officer. The Site Safety Officer will be responsible for the purchasing, maintenance, and cleaning of respiratory protective equipment as well as providing "refresher" training for affected personnel. The Certified Industrial Hygienist (CIH) will be responsible for the preparation and evaluation of this program.

The type of respirators that will be used will be selected on the basis of either legally mandated requirements or on the professional judgment of the CIH. OSHA standard 1910.134 and the contract specifications are explicit in the types of respirators that are permitted to be worn when contaminants are handled. Those requirements are based on the airborne concentration of the various types of contaminants. Since monitoring is a requirement of the OSHA standard and contract specifications, sufficient data will be generated to determine the proper type of respiratory protection. The type of respirators to be worn will be chosen from the following types:

1. Half mask air purifying equipped with high efficiency particulate, organic vapor, and acid gas cartridges.
    a. Limited to use in non-IDLH atmospheres where contaminants are effectively removed by purifying cartridges and have good indicator properties.
    b. This style of respirator has an assigned protection factor of 10.
2. Full face air purifying equipped with high efficiency particulate, organic vapor, and acid gas cartridges.
    a. Limited to use in non-IDLH atmospheres where contaminants are effectively removed by purifying cartridges and have good indicator properties.
    b. This style of respirator has an assigned protection factor of 10 or 50. The assigned protection factor of 50 may only be assigned if a quantitative fit test was performed and the wearer achieves a fit factor greater than 500 for the fit test.
3. Powered air purifying air helmet equipped with high efficiency particulate, organic vapor, and acid gas cartridges.
    a. Limited to use in non-IDLH atmospheres where contaminants are effectively removed by purifying cartridges and have good indicator properties.

b. This style of respirator has an assigned protection factor of 25.

4. Powered air purifying respirator equipped with high efficiency particulate, organic vapor, and acid gas cartridges.
    a. Limited to use in non-IDLH atmospheres where contaminants are effectively removed by purifying cartridges and have good indicator properties.
    b. This style of respirator has an assigned protection factor of 1,000.
5. Full face piece supplied-air respirator operated in the pressure demand mode.
    a. Limited to use in atmospheres from which the wearer can escape unharmed without the aid of the respirator. The wearer is restricted in movement by the hose and must return to a respirable atmosphere by retracing his route or entry. The hose is subject to being severed or pinched off.
    b. This style of respirator has an assigned protection factor of 1,000.

It is important that a worker understands the proper use and limitations of the various respirators. Therefore, all workers who are required to wear respirators will undergo a training program that consists of:

1. Nature of the hazards
2. Explanation of why other control methods are not feasible
3. Explanation of the selection criteria for the respirators that are to be used
4. Limitations
5. Inspection
6. Proper donning and wearing
7. Positive and negative pressure fit tests
8. Maintenance
9. Emergency situations

In addition, all respirator users will be given a qualitative fit test.

All respirators will be cleaned and disinfected at the end of each day's use. The following procedure will be used:

1. Cartridges, filters, and canisters will be removed and discarded.
2. Wash respirator in warm water (approx. 120°F) and cleaner/disinfectant solution.
3. Rinse in clean, warm water and then in a 50% isopropyl alcohol solution.
4. Air dry or use a hair dryer.
5. Inspect all parts of respirator and replace any that are missing or defective.
6. Place face piece in plastic bag.

All respirators will be stored in a separate plastic bag and stored in the decontamination trailer.

It will be the responsibility of the site safety officer to assure that all respirators have been

properly inspected and maintained.

The inspection will consist of:

1. Tightness of connections.
2. Condition of face piece, straps, connecting tubes, and canisters.
3. Condition of exhalation and inhalation valves.
4. Pliability and flexibility of rubber parts.
5. Condition of lenses of full face piece respirators.
6. Charge of compressed air cylinder of self contained breathing apparatus.
7. Proper functioning of regulators and warning devices.

As outlined in the air monitoring section of the health and safety plan, personal air samples will be taken to determine the extent of worker exposure. The results of this sampling will be reviewed and evaluated and the proper type of respiratory protection will then be determined by the CIH.

As the work progresses, the type and extent of the health hazards will become more fully documented. Also there is the potential for the development of new hazards. Therefore, this respiratory protection program will be continually evaluated by the on-site safety and health personnel in consultation with the CIH.

All personnel who will be required to wear respirators must participate in the medical surveillance program outlined in the health and safety plan. A certificate stating that the employee is physically able to wear a respirator will be obtained and made available to the owner's representative.

All respiratory protective equipment used on this project will be approved by the National Institute for Occupational Safety and Health.

Air Supplied Breathing Apparatus Standards contains specific requirements for supplied air systems.

Respirator Fit

An employee wearing a respirator can be protected against airborne contaminants only if there is successful sealing of the respirator on his or her face. All employees may not obtain a successful fit for a specific respirator, since facial dimensions vary considerably from person to person. A half face piece must contact a rather complex facial surface and the possibility of leakage is greater than in the case of the full face piece. Studies have shown that temples on glasses, absence of dentures, full beards, handlebar mustaches or wide sideburns can reduce respirator performance by as much as 25 percent.

The respirator face piece-to-face seal will be tested each time the employee enters a contaminated atmosphere. Most respirator manufacturers provide instructions for wearing and leak testing and these instructions will be followed. The training program will cover these procedures. Face piece-to-face fit tests include the following:

A. Positive Pressure Test - close or "block off" the exhalation valve and exhale gently into the face piece. If a slight positive pressure is built up with no apparent outward leakage

around the seal, then the facepiece-to-face seal is satisfactory. Note that this test only applies to those respirators that have an exhalation valve that can be blocked (the exhalation valve cover may have to be removed for the test).

B. Negative Pressure Test - Close the inlet opening or hose of the respirator facepiece with the hand(s), tape or other means, inhale gently so that the facepiece collapses slightly and hold the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage occurs, then the facepiece-to-t\face seal is probably satisfactory.

C. The respirator fit test will be performed according to the Qualitative Fit Test (QLFT) protocols as outlined in Appendix D of OSHA Standard 1910.1025, which are detailed below. Positive and negative pressure tests will be performed by the employee before each wearing of his respirator.

The isoamyl acetate protocol is as follows:

a. **Odor Threshold Screening**

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.
2. Odor-free water (e.g. distilled or spring water) at approximately 25°C will be used for the solutions.
3. The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor-free water in a 1-liter jar and shaking for 30 seconds. This solution will be prepared new at least weekly.
4. The screening test will be conducted in a room separate from the room used for actual fit testing. The two rooms will be well ventilated but may not be connected to the same recirculating ventilation system.
5. The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor-free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.
6. A test blank is prepared in a third jar by adding 500 cc of odor-free water.
7. The odor test and test blank jars will be labeled 1 and 2 for jar identification. If the labels are put on the lids they can be periodically dried off and switched to avoid people thinking the same jar always has the IAA.
8. The following instructions will be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2);

"The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of

the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test will be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA QLFT may not be used.

11. If the test subject correctly identifies the jar containing the odor test solution, he may proceed to respirator selection and fit testing.

b. **Respirator Selection**

1. The test subject will be allowed to select the most comfortable respirator from a large array of various sizes and manufacturers that include at least three sizes of elastomeric half face pieces and units of at least two manufacturers.

2. The selection process will be conducted in a room separate from where the fit test will take place.

3. The test subject should understand that he is being asked to select the respirator which provides the most comfortable fit for him. Each respirator represents a different size and shape and, if fit properly, will provide adequate protection.

4. The test subject holds each facepiece up to his face and eliminates those which are obviously not giving a comfortable fit. Normally, selection will begin with a half-facepiece and if a fit cannot be found here, the subject will be asked to go to the full face piece respirators. (A small percentage of users will no be able to wear any half-facepiece respirator).

5. The more comfortable face pieces are recorded; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in #6 below. If the test subject is not familiar with using a particular respirator, he will be directed to don the mask several times and to adjust the straps each time, so that he becomes adept at setting proper tension on the straps.

6. Assessment of comfort will include reviewing the following points with the test subject:

- Chin properly placed
- Positioning of mask on nose
- Strap tension
- Fit across nose bridge
- Room for safety glasses

- Distance from nose to chin
- Room to talk
- Tendency to slip
- Cheeks filled out
- Self-observation in mirror
- Adequate time for assessment

7. The test subject will conduct the conventional negative and positive pressure fit checks (e.g. see ANSI Z88.2-1980). Before conducting the negative or positive-pressure checks, the subject will be told to "seat" his mask by rapidly moving the head side-to-side and up and down, taking a few deep breaths.
8. The test subject is now ready for fit testing.
9. After passing the fit test, the test subject will be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator will be tried.
10. The employee will be given the opportunity to select a different facepiece and be retested if during the first two weeks of on-the-job wear the chosen facepiece becomes unacceptably uncomfortable.

c. **Fit Test**

1. The fit test chamber will be substantially similar to a clear 55 gallon drum liner suspended inverted over a two foot diameter frame, so that the top of chamber is about six inches above the test subject's head. The inside top center of the chamber will have a small hook attached.
2. Each respirator used for the fitting and fit testing will be equipped with organic vapor cartridges to offer protection against organic vapors. The cartridges or masks will be changed at least weekly.
3. After selecting, donning, and properly adjusting a respirator himself, the test subject will wear it to the fit testing room. This room will be separate from the room used for odor threshold screening and respirator selection, and will be well ventilated, as by an exhaust fan or lab hook, to prevent general room contamination.
4. A copy of the following test exercises and rainbow (or equally effective) passage will be taped to the inside of the test chamber:

Test Exercises

i. Normal breathing.

ii. Deep breathing. Be certain breaths are deep and regular.

iii. Turning head from side-to-side. Be certain movement is complete. Alert the test subject not to bump the respirator on the shoulders.

Have the test subject inhale when his head is at either side.

iv. Nodding head up and down. Be certain motions are complete and made about every second. Alert the test subject not to bump the respirator on the chest. Have the test subject inhale when his head is in the fully up position.

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

vi. Normal breathing.

5. Each test subject will wear his respirator for at least ten minutes before starting the fit test.

6. Upon entering the test chamber, the test subject will be given a six inch by five inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject will hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of his cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. Each exercise described in No. 4 above will be performed for at least one minute.

9. If at any time during the test, the subject detects the banana-like odor of IAA, he will quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

10. Upon returning to the selection room, the subject will remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject will wait about five minutes before retesting. Odor sensitivity will usually have returned by this time.

11. If a person cannot be fitted with the selection of half-facepiece respirators, include full facepiece models in the selection process.

12. When the test subject leaves the chamber he will remove the saturated towel, returning it to the conductor. To keep the area from becoming contaminated, the used towels will be kept in a self-sealing bag. There should be no significant IAA concentration buildup in the test chamber from subsequent tests.

13. Persons who have successfully passed this fit test may be assigned the use of the tested respirator in atmospheres with up to ten times the PEL of airborne lead. In other works this IAA protocol may be used to assign a protection factor no higher than ten.

Appendix E
Fall Protection Program

Sevenson Environmental Services, Inc.

FALL PROTECTION PROGRAM

Table of Contents

Attachments

1.0 Introduction

The objective of this Fall Protection Program is to identify and evaluate fall hazards to which employees will be exposed and to provide specific training as required by the Occupational Safety and Health Administration (OSHA) Fall Protection Standard, 29 CFR 1926, Subpart M and the USACE Health and Safety Manual EM 385-1-1, Section 21.

2.0 Policy

It is the policy of Sevenson Environmental Services, Inc. (Sevenson) to protect its employees and sub contractors from occupational injuries by implementing and enforcing safe work practices and appointing a competent person(s) to manage the Fall Protection Program. This Fall Protection Program shall comply with OSHA and USACE requirements. A copy of the EM 385-1-1 and OSHA Fall Protection Standards shall be made available to all employees, and may be obtained from the Site Safety and Health Officer(s) (SSHO).

This Fall Protection Program covers the use of Personal Fall Arrest Systems at a number of areas at the Site. These areas are:

1. Working at heights greater than 6 feet or leading edge work
2. Working in aerial/man lifts
3. Securing of ladders

3.0 Definitions

Anchorage – means a secure point of attachment for lifelines, lanyards or deceleration devices.

Basic rescue – means providing rescue services for a fallen employee(s) who does not require immediate emergency medical services and can be performed with a ladder or aerial lift man basket.

Body harness – means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Deceleration device – means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Deceleration distance – means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body harness attachment point at the moment of activation (at the onset of fall arrest forces)

of the deceleration device during a fall, and the location of the attachment point after the employee comes to a full stop.

Guardrail system – means a barrier erected to prevent employees from falling to lower levels.

Infeasible – means that it is impossible to perform the construction work using conventional fall protection systems (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of the these systems to provide fall protection.

Lanyard – means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body harness to a deceleration device, lifeline, or anchorage.

Personal Fall Arrest System – means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Positioning device system – means a body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

Self-retracting lifeline/lanyard – means a deceleration device contained in a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Unprotected sides and edges – means any side or edge (except entrances to point of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches high.

4.0 Duties and Responsibilities

1. Sevenson

   It is the responsibility of Sevenson to provide fall protection to affected employees, and to ensure that all employees understand and adhere to the procedures of this plan and follow the instructions of Site Safety and Health Officer (SSHO) or Competent Person.

2. Program Manager – TBD

   It is the responsibility of SSHO as the Fall Protection Program Manager to implement this program by:

   1. Performing routine safety checks of work operations;
   2. Enforcing Site safety policy and procedures;
   3. Correcting any unsafe practices or conditions immediately;
   4. Training employees and supervisors in recognizing fall hazards and the use of fall protection systems;

5. Maintaining records of employee training, equipment issue, and fall protection systems used at the Site; and
6. Investigating and documenting all incidents that result in employee injury.

3. Competent Person

   Is it the responsibility of the Competent Person to:

   1. Understand the hazards posed by falls.
   2. Calculate fall forces.
   3. Understand the methods of fall protection.
   4. Assist in the implementation of the Fall Protection Program.
   5. Select, inspect and maintain the fall arrest equipment.
   6. Ensure Site personnel are properly trained in the use and limitation of fall protection.

4. Employees

   It is the responsibility of all employees to:

   1. Understand and adhere to the procedures outlined in this Fall Protection Program;
   2. Follow the instructions of the SSHO or Competent Person;
   3. Bring to management's attention any unsafe or hazardous conditions or practices that may cause injury to either themselves or any other employees; and
   4. Report any incident that causes injury to an employee, regardless of the nature of the injury.

5.0 Description of Tasks

(Examples – Specific tasks to be entered once idenditified)

1. Working at heights greater than 6 feet for construction activities or leading edge work

   Workers may be exposed to falling greater than six feet from either working at heights or working near the edge of a drop off.

2. Working in aerial/man lifts

   Workers may utilize aerial lifts at the Site to perform maintenance on equipment or systems. Any time a person is in the basket of an aerial lift they will utilize a restraining system.

3. Securing ladders

   Workers may have to utilize ladders at the Site to perform assigned job tasks. Any time a person utilizes a straight ladder that must be secured a Fall

Protection Plan will be completed to ensure a safe plan has been developed to protect workers.

6.0 Training Requirements

All employees who may be exposed to fall hazards are required to receive training on how to recognize such hazards, and how to minimize their exposure to them. Employees shall receive training as soon after employment as possible, and before they are required to work in areas where fall hazards exist.

A record of employees who have received training and training dates shall be maintained by the SSHO. Training of employees shall include:

1. Nature of the fall hazards employees may be exposed to.
2. Correct procedures for erecting, maintaining, disassembling, and inspecting fall protection systems.
3. Use and operation of controlled access zones, guardrails, personal fall arrest systems, safety nets, warning lines, and safety monitoring systems.
4. Limitations of the use of mechanical equipment during roofing work on low-slope roofs (if applicable).
5. Correct procedures for equipment and materials handling, and storage and erection of overhead protection.
6. Requirements of the OSHA Fall Protection Standard, 29 CFR 1926, Subpart M and the USACE EM 385-1-1 Section 21, "Fall Protection".
7. Sevenson and USACE requirements for reporting incidents that cause injury to an employee.
8. Documented training for personnel utilizing an aerial lift.

Additional training shall be provided on an annual basis, or as needed when changes are made to this Fall Protection Program, the EM 385-1-1 (pertaining to fall protection), or the OSHA Fall Protection Standard.

7.0 Anticipated Hazards

Prior to the use of a personal fall arrest system a Fall Protection Plan, a Fall Hazard Analysis (FHA), and an Activity Hazard Analysis (AHA) will be completed for the associated task. The Fall Protection Plan (Attachment 1) will be completed by the SSHO or his designee. The Fall Protection Plan, FHA, and AHA will identify the anticipated hazards and the controls to be implemented to reduce or eliminate these hazards.

Some of the anticipated hazards at the Site include leading edge work at the Reservoir, the use or aerial lifts, erection of the sediment treatment equipment, and work from ladders.

8.0 Fall Hazard Prevention and Control

<u>Engineering Controls</u>

This should always be the first option for selection whenever possible (i.e., light bulb changing, telescoping arm, changing valve, relocate at ground level).

Guardrails

For all work areas, only guardrails made from steel, wood, and wire rope will be acceptable. All guardrail systems will comply with the current OSHA and EM 385-1-1 standards (i.e., withstand 200 pounds of force, 42-inch high hand rail, midrail, and toeboard). These guardrails will be placed in the following areas if necessary or feasible based on job location or requirements:

1. On all open sided floors.
2. Around all open excavations or pits.
3. On leading edges of roofs or decking.

Personal Fall Protection Systems

All employees that will be required to wear a personal fall arrest or restraint system will follow these guidelines:

1. A full body harness will be used at **all** times.
2. **All personal fall arrest systems will be inspected before each use by the employee.** Any deteriorated, bent, damaged, impacted and/or harness showing excessive wear will be removed from service.
3. Connectors will be inspected to ensure they are drop forged, pressed, or formed steel or are made of equivalent materials **and** that they have a corrosion resistant finish as well as that all surfaces and edges are smooth to prevent damage to interfacing parts of the system.
4. Verify that D rings and snap hooks have a minimum tensile strength of 5,000 lbs and that the D rings and snap hooks are proof tested to a minimum tensile load of 3,600 lbs without cracking, breaking, or taking permanent deformation.
5. Only shock absorbing lanyards or retractable lanyards are to be used so as to keep impact forces at a minimum on the body (fall arrest systems).
6. Only nylon rope or nylon straps with locking snaphooks are to be used for restraints.
7. All lanyards will have self-locking snaphooks.
8. Snap hooks are not engaged in the following manners:
    a. To a tie off adapter D ring to which another snap hook or other connector is attached;
    b. In a manner that would result in a load on the gate;
    c. In a false engagement, where features that protrude from the snap hook or carabiner catch on the anchor and without visual confirmation seems to be fully engaged to the anchor point;
    d. To each other;

e. Directly to webbing or rope lanyard or tie-back unless the manufacturer's instructions for both the lanyard and the connector specifically allow such a connection;

f. To any object which is shaped or dimensioned such that the snap hook or carabiner will not close and lock, or that rollout could occur.

9. The maximum free fall distance is not to exceed **6 feet**. Consideration must be given to the total fall distance. The following factors can affect total fall distance:

    a. Length of connecting means (i.e., lanyard length, use of carabiners, snaphooks, etc.).

    b. Position and height of anchorage relative to work platform/area (always keep above head whenever possible).

    c. Position of attachment and D-ring slide on the full body harness.

    d. Deployment of shock absorber (max 42-inches).

    e. Movement in lifeline.

    f. Initial position of worker before free fall occurs (i.e., sitting, standing, etc.).

Calculating Total Fall Distance

Knowing how to calculate Total Fall Distance is as important as picking the proper harness, lanyard, and anchorage system. Total Fall Distance (TFD) is defined as the sum of the Free Fall Distance (FFD), Deceleration Distance (DD), Harness Effect (HEFF), Vertical Elongation (VEL), and Safety Factor (SF) of at least one foot. The TFD can be calculated by:

TFD = FFD+DD+HEFF+VEL+SF

Where:

- TFD Total Fall Distance or the vertical distance a worker travels between the onset of a fall till the fall event is completed.
- FFD Free Fall Distance or the vertical distance a worker travels between the onset of a fall until just prior to the point where the Fall Arrest System begins to arrest the fall.
- DD Deceleration Distance or the vertical distance a worker travels between the activation of the Fall Arrest System and the final fall arrest. (Federal OSHA limits this distance to 3.5-feet or less. This distance is determined by the manufacturer and can be found on the product label.)
- HEFF Harness Effect Distance or the stretch of a harness during a fall arrest. (This is typically one foot or less for a properly fitted harness. However, some harnesses use elastic-type webbing that

can increase the harness effect to two feet or more. Check manufacturer's information to determine this distance.)

- VEL Vertical Elongation Distance or the stretch in the lifeline of the Personal Fall Arrest System. Vertical Elongation is measured on the part of the lifeline that is under tension during deceleration and final fall arrest. This variable will change drastically depending upon the type of Fall Arrest System. For example, most shock-absorbing lanyards are designed to have a maximum deceleration distance of 3.5 feet, which includes the vertical elongation of the lanyard. However, if you are using a rope grab system or a horizontal lifeline, vertical elongation must be calculated based on the stretch of the vertical or horizontal lifelines in those systems. You will need to check the specific manufacturers' product information for exact stretch percentages.
- SF Safety Factor Distance is an additional factor of safety to ensure that you have the required clearance below your working surface. This should be at least one foot but can reflect any number with which you feel comfortable.

Example:

- Full body harness
- 6-foot shock absorbing lanyard
- Fixed, ridged anchor point (such as a D-plate bolted to a structural I-beam)
- Figure , provides visual for example

Figure 1- Example for Calculating Fall Distance

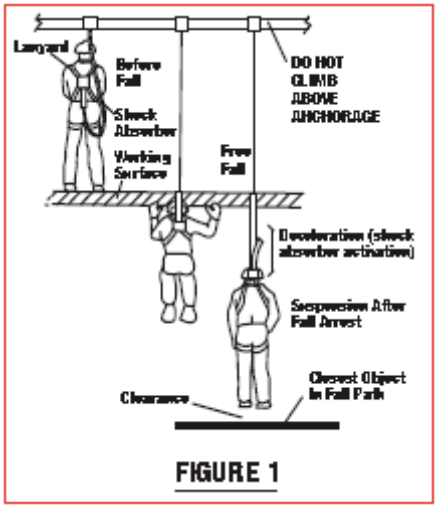

FIGURE 1

In Figure 1 we see a worker with a 6-foot shock absorbing lanyard on an elevated platform. In this example, let's assume the anchor point is 2-feet about the back D-ring of the harness. For every 1-foot the lanyard attachment point is above the harness back D-ring, 1-foot is deducted from the FFD. For every 1-foot the

lanyard attachment point is below the harness back D-ring, 1-foot is added to the FFD. In this example, if the worker falls, the FFD will equal 4-feet since the lanyard attachment point is 2-feet above the back D-ring of the harness. So the formula looks like this:

- TFD = 4 feet + DD + HEFF + VEL + SF

The next value to consider is Deceleration Distance or the DD. Federal OSHA requires that this distance not exceed 3.5-feet. Since all manufacturers' products are slightly different, you will have to read the label or product specification sheet to determine the maximum DD that a product will permit and use that value for your calculation. In this example, the maximum deceleration distance will be 3.5-feet.

- TFD = 4 feet + 3.5 feet + HEFF + VEL + SF

The Harness Effect or HEFF variable is relatively constant at less than 1-foot. This will vary slightly due to the adjustment of the harness, so we generally use 1-foot to account for these slight differences. However, elastic type harnesses can have more than 1-foot of stretch, possibly 2-feet or more, and that additional distance must be accounted for in your calculation. In this example, we are using a non-elastic harness.

- TFD = 4 feet + 3.5 feet + 1 foot + VEL + SF

Most manufacturers design their shock absorbing lanyards so that the vertical elongation of the lanyard is included in the OSHA mandated 3.5-feet maximum DD. However, if we were using a rope grab or vertical life line, or if you were attaching to a non-ridged anchorage connector, the VEL would need to be based on the specifications of those components in the Fall Arrest System. Since this example uses a ridged anchor point and a 6-foot shock absorbing lanyard and the VEL is already considered in the lanyard design the VEL for our equation will be zero (0).

- TFD = 4 feet + 3.5 feet + 1 foot + 0 feet + SF

The final variable of the formula is the safety factor or SF. It is always a good idea to include at least 1-foot, however, that safety factor could reflect any number that makes you comfortable with your calculation. If you are using a non-ridged system it would not be uncommon to see a SF of 3-feet or more.

- TFD = 4 feet + 3.5 feet + 1 foot + 0 feet + 1-foot

We can now solve for Total Fall Distance or TFD. The TFD for this example would be 9.5-feet. So, you will need a minimum of 9.5-feet clearance from the workers feet to the next level or object below.

NOTE: Some people calculate the TFD from the anchor point, to modify this equation to reflect the distance from the anchor point you would add the distance from the working surface to the workers D-ring and add it to the equation.

Example: Let's use the same example from above. The distance from the working level (the level the worker is standing on) to the distance the harness D-ring is from

that surface is 5-feet. You would add 5-feet to 9.5 feet for a total distance of 14.5-feet from the anchor point to the lower level or object.

Engineered Lifeline

Lifeline systems must be designed and approved by an engineer or qualified person.

Lifeline systems must be engineered to have appropriate anchorages, strength of line designed to hold X number of individuals connected to it, line strength to aid in the arrest of a fall, and durability to hold a fallen employee(s) suspended until rescue can occur.

Warning Line System

All flat roofs greater than 50 feet wide (i.e., roof with less than 4/12 slope) where work is performed 6 feet or further back from the edge of the roof can be completed by installing a Warning Line and using a safety monitor. Warning Lines will consist of the following:

1. Will be erected 6 feet from the edge of the roof.
2. Be constructed of stationary stanchions capable of resisting without tipping over a force of at least 16 pounds applied horizontally against the stanchion.
3. Wire, chain, or rope shall be rigged and supported in such a way that at its lowest point (including sag) is no less than 34 inches from the walking/working surface and its highest point is no more than 39 inches for the walking/working surface.
4. Wire, chain, or rope will be flagged at no more than 6-foot intervals with high visibility material. The rope, wire or chain shall have a minimal tensile strength of 500 pounds.
5. The warning line will guard the entire perimeter of the roof where work is being performed.

If an employee must access an area within 6 feet of the roof edge for reasons *other than* exiting the roof via a ladder or fixed industrial ladder, another employee must monitor that individual and warn him/her of any dangers. If another employee is not available to act as a safety monitor, then the employee must don a full body harness and attach a fall restraint lanyard to an anchor point to prevent reaching the edge of the roof.

9.0 Rescue Plan and Procedure

The height of the work to be performed at the Site requiring the use of personal fall arrest systems is less than 20 feet.

An employee who falls must be rescued within 15 minutes to avoid permanent physical harm. Site personnel will be responsible for performing basic rescue for persons involved in a fall arrest situation when no life threatening injuries are present. If a situation occurs where the fallen person receives injuries that require immediate emergency medical attention, local emergency services will be summons via 911.

The following basic rescue equipment will be made available at the Site where personal fall arrest systems are employed:

- A straight or folding ladder tall and strong enough to reach the maximum height an individual may be suspended from.
- In the absence of a suitable ladder, an aerial lift with a man basket may be used.

Basic rescue equipment shall be located and inspected prior to work being performed. During the rescue, ladders will be properly positioned and either held in place or secured in place to prevent the ladder from sliding or falling. If a fallen worker cannot access the ladder under their own power, 911 will be immediately called for rescue assistance. At no time will the ladder weight restriction be compromised to perform a basic rescue.

If injuries are involved where the worker cannot be moved or should not be moved, 911 will be immediately called for rescue assistance.

A medical professional must evaluate and clear any worker involved in a fall arrest stop for suspension trauma before being allowed to resume work duties.

10.0 Designs of Personal Fall Arrest Systems

Personal fall arrest systems will be designed by a professional engineer and installed as directed by the manufacturer. All equipment used in a personal fall arrest system shall meet the requirements set forth in ANSI/ASSE Z359.1-2007. Full body harnesses labeled to meet the requirements of ANSI A10.14 shall not be used. The SSHO shall ensure all personal fall arrest system equipment meets these standards by showing proof from the manufacturer. The proof can be presented by the manufacturer in either as built drawings/specifications or affixed tags to the system parts.

11.0 Inspection, Maintenance, and Storage of Fall Protection Equipment

The following criteria will be utilized to maintain all equipment in good working condition.

Full Body Harnesses

1. Inspect before each use.
    - Closely examine all of the nylon webbing to ensure there are no burn marks, which could weaken the material.
    - Verify there are no torn, frayed, broken fibers, pulled stitches, or frayed edges anywhere on the harness.
    - Examine D-ring for excessive wear, pits, deterioration, or cracks.
    - Verify that buckles are not deformed, cracked, and will operate correctly.
    - Check to see that all grommets (if present) are secure and not deformed from abuse or a fall.
    - Harness should never have additional punched holes
    - All rivets should be tight, not deformed.
    - Check tongue/straps for excessive wear from repeated buckling.

2. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.
3. Storage will consist of hanging in an enclosed cabinet, to protect from damage.
4. All harnesses that are involved in a fall will be destroyed.

Lanyards/Shock Absorbing Lanyards

1. Inspect before each use.
    - Check lanyard material for cuts, burns, abrasions, kinks, knots, broken stitches and excessive wear.
    - Inspect the snaphooks for hook, locks, and eye distortion.
    - Check carabiner for excessive wear, distortion, and lock operation.
    - Ensure that all locking mechanisms seat and lock properly.
    - Once locked, locking mechanism should prevent hook from opening.
    - Visually inspect shock absorber for any signs of damage, paying close attention to where the shock absorber attaches to the lanyard.
    - Verify that points where the lanyard attaches to the snaphooks are free of defects.
2. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.
3. Storage will consist of hanging in an enclosed cabinet, to protect from damage.
4. All lanyards that are involved in a fall will be destroyed.

Snaphooks

1. Inspect before each use.
    - Inspect snaphooks for any hook and eye distortions.
    - Verify there are no cracks, pitted surfaces, and eye distortions.
    - The keeper latch should not be bent, distorted, or obstructed.
    - Verify that the keeper latch seats into the nose without binding.
    - Verify that the keeper spring securely closes the keeper latch.
    - Test the locking mechanism to verify that the keeper latch locks properly.
2. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.
3. All snaphooks involved in a fall will be destroyed.

Self-Retracting Lanyards

1. Inspect before each use.
    - Visually inspect the body to ensure there is no physical damage to the body.
    - Make sure all back nuts or rivets are tight.
    - Make sure the entire length of the nylon strap is free of any cuts, burns, abrasions, kinks, knots, broken stitches, and excessive wear and retracts freely.
    - Test the unit by pulling sharply on the lanyard to verify that the locking mechanism is operating correctly.
    - If manufacturer requires, make certain the retractable lanyard is returned to the manufacturer for scheduled annual inspections.
2. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.
3. Service per manufacturer specifications.
4. Inspect for proper function after every fall.

Tie-off Adaptors/Anchorages

1. Inspect for integrity and attachment to solid surface.
2. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.
3. All tie-offs adapters will be destroyed and replaced after a fall.

Articulating Man Lift

1. Inspect before each use.
2. Inspect/service per manufacturer guidelines. Forklift, scissors lifts, and safety nets will be inspected at the beginning of each shift in use. Structural integrity or forklift basket will be checked per same schedule.
3. Semi-annual inspection of all harnesses will be completed by the SSHO; documentation will be maintained on file.

Maintenance will be performed as specified by the manufacturer.

Personal fall arrest equipment will be stored as follows:

1. Never store the personal fall arrest equipment in the bottom of a tool box, on the ground, or outside exposed to the elements (i.e., sun, rain, snow, etc.).
2. Hang equipment in a cool dry location in a manner that retains its shape.
3. Always follow manufacturer recommendations for inspection.
4. Clean with a mild, nonabrasive soap, and hang to dry.
5. Never force dry or use strong detergents in cleaning.
6. Never store equipment near excessive heat, chemicals, moisture, or sunlight.

7. Never store in an area with exposures to fumes or corrosives elements.
8. Avoid dirt and build-up on equipment.
9. Never use this equipment for any purpose other than personal fall arrest.
10. Once exposed to a fall, remove equipment from service immediately.

A designated storage area will be established for personal fall arrest equipment. An inspection sheet will be posted at the storage area to allow site personal to document their inspection prior to use. The inspection sheet will also provide direction and requirements for ensuring the equipment is in satisfactory condition.

12.0 Incident Investigation Procedures

All incidents that result in injury to workers, as well as near misses, regardless of their nature, shall be reported and investigated. The SSHO and Site Superintendent shall conduct investigations as soon after an incident as possible to identify the cause and means of prevention to eliminate the risk of reoccurrence.

In the event of such an incident, the Fall Protection Program shall be reevaluated by the SSHO and Safety and Health Manager to determine if additional practices, procedures, or training are necessary to prevent similar future incidents.

13.0 Evaluation of Program Effectiveness

This fall protection program will be evaluated periodically to determine effectiveness. The following criteria will be used to evaluate its performance:

1. Accident reports, number of accidents.
2. Management/staff compliance with program components.
3. Periodic on-site audits.
4. Safety Observation Reports
5. Staff feedback, interviews.

14.0 Inspection and Oversight Methods Employed

The SSHO, Site Superintendent, and the Construction Quality Control Systems Manager will be responsible for performing Safety Observation Reports for personnel performing tasks that involve the use of personal fall arrest systems. These observations will be done on a random basis and will be used in to aid in the evaluation of the Fall Protection Programs effectiveness. The Fall Protection Program will also be audited on a quarterly basis by the Safety and Health Manager or a member Sevenson's corporate health and safety staff.

Fall Protection Plan

Project Information

Project Location:		Plan Effective Dates
Specific Equipment Involved		Start:
Project Description		End:
Fall Protection Plan Author (Print)		Office or Cell Phone Number
Fall Protection Plan Author (Sign)		
Competent Person (Print)		Office or Cell Phone Number
Competent Person (Sign)		
Site Superintendent (Print)		Office or Cell Phone Number
Site Superintendent (Sign)		

Fall Protection Plan

Elevated Surface Work Plan

Questions to Consider	Answers or Solutions
Has an Activity Hazard Analysis (AHA) and a Fall Hazard Analysis (FHA) been performed to identify the hazards and controls to be used to eliminate hazards for work at unprotected elevations?	
What is the job to be performed?	
What is the location and the height of the work?	
What is the working or walking surface like (flat steel, textured steel, wood planking, dirt, etc.)?	
Are there any environmental factors to consider (i.e., heat, cold, slippery, wet, wind, glare, etc.)?	
Are there any hazards nearby or underneath that are exposed or could become exposed in an impact (i.e., plumping lines, electrical exposures, protruding or impalement hazards, etc.)?	
Will the work require special PPE (besides fall protection)?	
Will workers be utilizing the buddy system or will someone be monitoring the worker?	
How will the tools and equipment get to the work location (bucket with rope, tool belt, manlift, etc.)?	

Fall Protection Plan

Questions to Consider	Answers or Solutions
Does the lower level work area need to be barricaded to keep non-essential personnel away from the work area?	
Can the work be performed from the ground with extendable tools?	
Can the work be performed from a secured ladder?	
Can an aerial lift or scissor lift be used? Is the operator qualified to use this equipment?	
If not, can portable guardrails be installed?	
If not, can a fall arrest system be used?	
If yes, has a Fall Hazard Analysis and Rescue Plan been developed?	
Other?	

Fall Protection Plan

Fall Hazard Analysis for Fall Arrest

Are there any existing approved anchorage points that can be used? Where?	
Is the anchorage point labeled or obviously capable of holding 5000 pounds or more as determined by a qualified person?	
If not, can approved pre-engineered or manufactured anchorages be installed?	
Is the right equipment (full body harness, minimum length lanyard, shock absorber, connecting hardware, I-beam strap, self-retracting life line, etc.) available to affected employees?	
What is the distance a person may fall?	
Is there at least 6 feet of clear space from anchorage point before the next level down? (Calculate fall distance.)	
Will the worker hit anything on the way down during a fall?	
Has a Fall Rescue Plan been developed to determine how a fallen person will be rescued if suspended in the harness?	

Fall Protection Plan

Rescue Plan

A rescue plan must be developed whenever fall arrest systems are in use and when personnel may not be able to self-rescue if a fall occurs.

What is the emergency rescue service contact information (Emergency phone number and name of agency)?	
Are there any special instructions to give to the emergency rescue service when requesting assistance?	
Is basic (non-emergency) rescue equipment (i.e., ladders, aerial lifts, additional harnesses) immediately available at the work area for this task?	
Are there any obstructions in the way of reaching the suspended worker? If so, what.	
How will the rescue be assured within 15 minutes of the occurrence of the fall to minimize the risk of further injury or death due to suspension trauma?	
How will the safety of the rescuers be assured as well as that of the suspended worker?	
What communication systems will be used between the suspended worker and the rescue team?	

Appendix F
Control of Hazardous Energy

1. PURPOSE

It is Sevenson Environmental Services, Inc. (Sevenson) policy that before any work or maintenance is performed on any machine, equipment, tool, or electrical system, that they are made totally safe before work starts by removing any source of energy or power to them. The Control of Hazardous Energy Program also referred to as the Lockout/Tagout Program provides for a safe method of working on, near, or in machinery or equipment that can cause serious injury.

This Safety Management Procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It will be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

NOTE: This program will be available to all employees for review and a copy will be in the following area(s):

1. Director of Health and Safety electronic files
2. Health and Safety Office
3. Main Office Trailer

2. AUTHORITY AND REFERENCE

Occupational Safety and Health Administration (OSHA) 29 CFR 1910.147.

This standard covers the servicing and maintenance of machines and equipment in which the unexpected energizing or start up of the machines or equipment, or release of stored energy could cause injury to employees.

3. APPLICATION

This program applies to the control of energy during servicing and/or normal maintenance of machines and equipment if:

1. An employee is required to remove or bypass a guard or other safety device.
2. An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is being performed at or upon the point of operation, or when an associated danger zone exists during a machine operating cycle.

EXCEPTION: Minor tool changes and adjustments which take place during normal production operations are not covered by the OSHA Standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection.

NOTE: The OSHA Lockout/Tagout Standard (See 29 CFR 1910.147) does not apply to work on cord-and-plug-connected electrical equipment when the employee performing the service or maintenance controls energizing by unplugging the equipment from the energy source. The standard also does not apply to hot tap operations involving transmission systems from substances such as gas, steam, water, or petroleum, when they are performed on pressurized pipelines. However, it must be demonstrated that the continuity of service is essential, shut off of the system is impractical, and special equipment is used which provides effective protection.

3.1. Affected Employees

Job Classification(s) required following Lockout/Tagout procedures include:

1. Mechanics
2. Service Technicians
3. Equipment Operators
4. Laborers
5. Electricians

3.2. Authorized Employees

Job classifications that have the authority and responsibility to perform lockout operations:

1. Mechanics
2. Service Technicians
3. Equipment Operators
4. Electricians
5. Laborers

3.3. Other Employees

Job classifications whose work operations are or may be in an area where energy control procedures may be utilized:

1. Health and Safety personnel
2. Site Superintendent
3. Project Manager

3.4. Sources of Energy and Stored Energy Requiring Lockout

1. Electrical: service panels, outlets, transformers, motors, and capacitors
2. Mechanical: spring-loaded equipment, tensioning devices
3. Hydraulic: rams, oil-powered equipment

4. Pneumatic: compressed-air equipment
5. Kinetic/Gravity: counterweights, flywheels
6. Fluids/Steam: heating pipes, steam lines

4. Compliance with this Program

4.1. All Employees

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout procedures. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment, which is locked out to perform servicing, or maintenance will not attempt to start, energize, or use that machine or equipment. Any employee who does not follow this lockout/tagout program will be subject to disciplinary action including written warning, suspension, or dismissal from the company. If a particular assignment makes it impractical to follow all the provisions of this program, the supervisor directing the work activities will be notified immediately and before work starts.

4.2. Site Safety Professional

The Site Safety Professional or approved alternate will be responsible for the following:

1. Development of a facility-specific energy control policy.
2. Definition and procurement of authorized lockout and tagout devices.
3. Training of supervisors and employees on facility policy and procedures for hazardous energy control.
4. Implementation of the Energy Control Policy and review of supervisory/employee performance.
5. Assurance that newly acquired equipment or overload equipment can accommodate locks.
6. Master file maintenance of specific policies, lockout procedures review and training records.

The Site Safety Professional or approved alternate shall:

1. Identify specific hazards and develop hazard isolation procedures within the facility.
2. Assure that the facility's hazardous energy control policy and procedures are communicated to employees in the work unit.
3. Monitor hazard isolation procedures for effectiveness.
4. Enforce hazard isolation procedures within his/her work unit and between work units or employers in the case of outside contractors.

5. Maintain work unit files documenting employee training.
6. Specify controls capable of being locked out when replacing or updating equipment controls.

5. Transfer of Lock/Tagout Responsibility

No employee shall remove a lockout or tagout device affixed by another employee unless authorized. Responsibility for lockout or tagout remains that of the authorized employee who affixes the lockout or tagout device subject to the following exception.

When an incoming authorized employee is to assume lock/tagout responsibilities on a piece of equipment from a departing employee due to shift or personnel changes, the incoming employee shall affix his/her properly labeled locks and/or tag devices to the equipment. If it is intended that the equipment remain securely locked out until the departing employee returns, responsibility does not need to be passed on to the incoming employee.

6. Definitions

6.1. Affected Employee

An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which servicing or maintenance is being performed.

6.2. Authorized Person

A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

6.3. Energy Isolating Device

A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

6.4. Energy Source

Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal or other potential energy source that could have potential to endanger personnel.

6.5. ENTRY POINT OF POWER

The point at which energy enters the system, machine or unit, such as the main electrical disconnect. Changes in power routing at the entry point should be shown on the circuit diagrams for the machines.

6.6. LOCKOUT

The placement of a lockout device on an energy-isolating device, in accordance with an established procedure, ensuring that the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

6.7. OTHER EMPLOYEES

All other employees whose work operations are or may be in an area where control procedures may be utilized.

6.8. POWER

Any type of energy that can operate equipment, cause movement, or cause injury directly from the energy source. Common types of power are electricity, air or gas under pressure, gravity, springs, oil or water under pressure and steam.

6.9. RESIDUAL ELECTRICAL POWER:

Electrical energy, which is retained in a system, machine or unit when the supply line disconnect, is placed on the "OFF" position. Power capacitors and electric or magnetic fields are examples that may have residual power if not properly dissipated.

6.10. RESIDUAL PRESSURE:

The differential pressure remaining within a component after the pressure source is closed off.

6.11. TAGOUT:

The placement of a tagout device on an energy-isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

7. ENERGY CONTROL PROCEDURES

Procedures will be developed and documented when employees are engaged in activities that potentially could be hazardous, due to exposure from an energy source. The following exceptions to required documentation include:

1. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees.
2. The machine or equipment has a single energy source, which can be readily identified and isolated.
3. The isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment.

4. The machine or equipment is isolated from that energy source and locked during servicing or maintenance.
5. A single lockout device will achieve a locked-out condition
6. The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance.
7. The servicing or maintenance does not create hazards for other employees.
8. The employer, in utilizing this exception, has had no accidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.

Energy control procedures shall clearly and specifically outline the purpose, rules and techniques to be utilized for the control of hazardous energy. (See Form #1) These procedures must include the following:

1. A specific statement of the intended use of the procedures.
2. Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy.
3. Specific procedural steps for the placement, removal and transfer of lockout or tagout devices and the responsibility for them.
4. Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

8. Equipment for Lockout/Tagout

For the purpose of achieving lockout/tagout, employees will be provided with appropriate lockout equipment. Equipment shall include, but not be limited to:

8.1. Padlocks

One or more padlocks will be issued to each authorized employee. Each employee will have an individual key. Only one key per lock shall be issued. These locks may be used only for lockout purposes. Locks will be identified by a number assigned to each employee and/or by the use of a nametag. Only the authorized person may apply and remove the lock, and the key may never be given to another person.

Note: A second or master key for each lock will be issued to designated supervisors to enable them to open and remove a padlock after taking the required precautions.

8.2. Lockout Tags

Authorized employees will be issued warning tags, which must be used whenever a padlock cannot be applied. The tag must be affixed as closely as possible to the energy disconnect with a single purpose 50-pound strength plastic tie. Extra caution must be exercised since there is no physical restraint when only a tag is used and energy can be restored without removing a padlock. In addition, where possible, energy source

components should be altered, removed, or obstructions should be placed to restrict access to energy disconnects. Electricians may remove fuses but must attach a tag to the panel involved and remove it when the machine is ready for service and the fuse is replaced.

Tag legends may include, but are not limited to:

DANGER Do Not Start
DANGER Do Not Energize
DANGER Do Not Open
DANGER Do Not Operate
DANGER Do Not Close

Warning tags shall bear the name of the authorized person and the date of application. Tags must be durable, weather proof and not easily damaged

8.3. Lockout Hasps

These devices are designed to accommodate more than one lockout padlock when more than one person is working on de-activated equipment. Each person, to assure his or her safety, will apply a lock and warning tag and remove it when the task is completed.

8.4. Circuit Breaker Lockout Devices

These devices are designed to attach to circuit breakers inside a panel box. Once attached a lock and tag may be applied to the device to prevent the breaker from being energized.

9. Sequence of Lockout

1. The authorized employee shall notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance. It is the responsibility of the equipment operator to notify all affected supervision and employees when a piece of equipment is to be repaired.
2. The authorized employee will refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.
3. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
4. De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source. (Examples: main switch, circuit breaker, flow/control valve, etc).
5. Lock out the energy isolating device(s) with assigned individual lock(s). If more than one person is exposed to the hazard or is working on the machine or equipment, each person must attach his or her individual lock. Only the person who attaches the lock is authorized to remove their lock.

6. Dissipate or restrain any stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam or water pressure, etc.) by such actions as grounding, repositioning, blocking, bleeding down, etc.
7. Ensure that the machine or equipment is disconnected from the energy source(s) by first checking that no persons are exposed, then verify the machine or equipment is isolated by operating the push/on button or other normal operating control(s) or by testing to make certain the machine or equipment will not operate. Cautions: Return operating control(s) to neutral or "off" position after verifying the isolation of the machine or equipment. For any electrical work, voltage checks will be made of any circuit elements and electrical parts on which work is to be performed and any exposed adjacent parts.
8. The machine or equipment is now locked out, and servicing or maintenance may proceed.

10. Procedures Involving More Than One Person (Group Lockout)

In the preceding steps, if more than one individual is required to lock the energy-isolating device(s), they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device. When an energy-isolating device cannot accept multiple locks, a multiple lockout or tagout device (hasp) may be used.

11. Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps will be taken.

1. Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact, and all guards are installed.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area. Notify all affected employees that the lockout/tagout is going to be removed.
3. Verify that the controls are in the neutral position.
4. Remove the lockout/tagout device and reenergize the equipment. Except in emergencies, only the person who attached the lockout device may remove it!

   Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.
5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

12. Abandoned Lock Removal Procedures

If an employee who has departed the building has left a safety lock in place, it shall be removed only by adherence to the following procedure:

Before the lock is removed:

1. A thorough inspection of the equipment is to be made by the supervisor responsible for the area.
2. The supervisor must confirm that the authorized employee who applied the lockout device is not at the facility.
3. The supervisor shall make all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed.
4. The supervisor shall remove the lock providing he/she has determined starting up the equipment will not endanger other personnel.
5. Each time it is necessary to remove/cut a safety lock, the person authorized to remove the lock shall prepare a written report and a copy will be sent to the H&S Officer (Position designated).
6. The supervisor shall ensure that the authorized employee has knowledge of this release before he/she resumes work at the facility.

13. TRAINING

Lockout/Tagout training will be conducted for all employees who are required to perform work on any equipment as referenced in this program. The training will address all components and procedures of this program. It will include methods to ensure employees understand the purpose and function of the program, that they can recognize applicable lockout/tagout situations, and that they have acquired the knowledge and skills required for applying, using, and removing the locks and tags.

1. Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control. The training will be documented on Form #2.
2. Each affected employee will be instructed in the purpose and use of the energy control procedure. The training/instruction will be documented on Form #3.
3. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, will be instructed about the procedure and about the prohibition relating to attempts to restart or re-energize machines or equipment which are locked out. The instruction will be documented on Form #4.
4. When employees are assigned to work in or on equipment that could potentially endanger personnel should it be activated, the supervisor assigning employees to this work is responsible for ensuring that these workers are provided with specific equipment and instructions to comply with this power lockout procedure.
5. Authorized and affected employees will be retrained whenever there is a change in their job assignments that could affect their lockout responsibilities, a change in the

machines that presents a hazard or when there is a change in energy control procedures.

6. Additional retraining will be conducted whenever the periodic inspection reveals that there are deviations from or inadequacies in the employee's knowledge or use of energy control procedures.
7. The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

14. Periodic Inspection/ Assessment

The SSHO or approved alternate will be conduct a comprehensive inspection/audit of the energy control procedures at least annually to ensure that the facility is in compliance with the OSHA Power Lockout/Tagout Standard 29 CFR 1910.147 and the procedures outlined in this policy. The results of the annual inspection will be recorded on the Annual Power Lockout/Tagout Certified Inspection Worksheet. (See Form #5) Each machine/equipment-specific lockout procedure must be assessed at least annually to ensure that the procedure remains valid or if any changes are warranted. This assessment must be machine-procedure specific and be documented.

15. Outside Personnel (Contractors, etc.)

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures. The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program. The exchange of this information shill be documented on Form #6.

LIST OF SAMPLE FORMS

Form 1: Specific Energy Control Procedures

Form 2: Authorized Employee Training Certification

Form 3: Affected Employee Training Certification

Form 4: Other Employee Training Certification

Form 5: Annual Power Lockout/Tagout Certified Inspection Worksheet

Form 6: Documentation of Information Given to Contractors Pertaining to Lockout/Tagout Procedures

Form 7: Lockout/Tagout Inventory Form

Form 8: Lockout/Tagout Inspection Form

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Lockout/Tagout Form #1

SPECIFIC ENERGY CONTROL PROCEDURES FOR EACH PIECE OR TYPE OF MACHINE OR EQUIPMENT

Procedure Number/ Name: _____ Date: _____

Completed By: _____

Machine(s) or Equipment utilizing this procedure: _____

_____

Number of Locks required: _____

Other Lockout Devices required: _____

PROCEDURES FOR CONTROLLING HAZARDOUS ENERGY

1. Sources of Hazardous Energy (examples)
   - Electrical Natural Gas Springs
   - Hydraulic Gravity Steam
   - Chemical Pneumatic Thermal
   - Other: _____

2. Notify affected employees that the machine is about to be shut down and locked out. Specific Instructions

_____

_____

_____

_____

_____

3. Shut down the machine using normal stopping procedures.
Specific Instructions:

_____

_____

_____

_____

_____

4. Isolate all energy sources listed above.
Specific Instructions:

5. A) Apply locks to all isolate devices operated in Step Four.
Specific Instructions:

B) If a tag is used in lieu of a lock when the energy-isolating device is incapable of lockout, the following additional safety precaution will be taken:
Specific Instructions:

6. Block or dissipate all stored energy in rams, flywheels, springs, pneumatic or hydraulic systems, etc.
Specific Instructions:

7. Verify that the machine is locked out by testing the machine operating controls.
RETURN ALL CONTROLS TO THE "NEUTRAL" OR "OFF" POSITION AFTER TESTING.
Specific Instructions:

PROCEDURE FOR REMOVING LOCKS/TAGS

1. Check the machine to be sure it is operationally intact, tools have been removed, and guards have been replaced.
Specific Instructions:

2. Check to be sure all employees are safely positioned.
Specific Instructions:

3. Notify all affected employees that locks/tags are going to be removed and the machine is ready for operation.
Specific Instructions:

4. Remove all locks, blocks, or other energy restraints.
Specific Instructions:

5. Restore all energy to the machine/equipment.
Specific Instructions:

Other Comments/Special Precautions:

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Lockout/Tagout Form #2

"AUTHORIZED" EMPLOYEE TRAINING CERTIFICATION

Date of Training: _____

Instructor's Name: _____

Instructor's Signature: _____

The following employees have received "AUTHORIZED" employee training on lockout/tagout procedures:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Employee Name (Please Print):_____

Employee Signature:_____

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Lockout/Tagout Form #3

"AFFECTED" EMPLOYEE TRAINING CERTIFICATION

Date of Training:_____

Instructor's Name: _____

Instructor's Signature: _____

The following employee have received "AFFECTED" employee training on lockout/tagout procedures:

Employee Name (Please Print):_____

Employee Signature: _____

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SAFETY MANAGEMENT PROCEDURES

Lockout/Tagout Form #4

"OTHER" EMPLOYEE TRAINING CERTIFICATION

Date of Training:_____

Instructor's Name: _____

Instructor's Signature: _____

The following employees have received "OTHER" employee training on lockout/tagout procedures:

Employee Name (Please Print):_____

Employee Signature: _____

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Lockout/Tagout Form #5

ANNUAL POWER LOCKOUT/TAGOUT CERTIFIED INSPECTION WORKSHEET

DATE: _____ DEPT.: _____

MACHINE/EQUIPMENT NAME: _____

REVIEW WITH EMPLOYEE (S) PERFORMING SERVICE OR MAINTENANCE ON THE FOLLOWING:

HAVE YOU HAD LOCKOUT TRAINING? ☐ YES, ☐ NO

DO YOU HAVE A SAFETY LOCK? ☐ YES, ☐ NO

ARE LOCKOUT PROCEDURES FOR ABOVE MACHINE/ EQUIPMENT AVAILABLE AND/OR POSTED? ☐ YES, ☐ NO

DOES EMPLOYEE (S) UNDERSTAND HIS/HER LOCKOUT RESPONSIBILITIES?
☐ YES, ☐ NO

OBSERVATION:
WERE LOCKOUT PROCEDURES FOLLOWED? ☐ YES, ☐ NO

NONE REQUIRED:
LIST DEVIATION (S) OR INADEQUACIES OBSERVED: _____

_____

_____

CORRECTIONS/CHANGES/COMMENTS:
EMPLOYEE (S) INSPECTED:

NAME: _____ DEPT.: _____

NAME: _____ DEPT.: _____

NAME: _____ DEPT.: _____

NAME: _____ DEPT.: _____

INSPECTED BY:

NAME: _____ POSITION: _____

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SAFETY MANAGEMENT PROCEDURES

Lockout/Tagout Form #6

DOCUMENTATION OF INFORMATION GIVEN TO CONTRACTORS PERTAINING TO LOCKOUT/TAGOUT PROCEDURES

Date	Contractor	Information Given

Contractor's Signature: _____ Date: _____

Authorized Employee Signature: _____ Date: _____

Authorized Supervisor's Signature: _____ Date: _____

Lockout/Tagout Form #7

LOCKOUT - TAGOUT INVENTORY FORM

Location: _____

1. Machine/Equipment: _____

2. Maintenance or service performed on this machine/equipment in this work area?

☐ YES, ☐ NO

3. Type of Power/Energy Source(s)
Electrical_____

Hydraulic_____

Gas_____

Pneumatic_____

Water_____

Gravity _____

Other _____

4. Energy Source Type
Main Source/Location_____

Source on Machine/Equipment_____

5. What type of lockout processes can be used on this equipment?
(Check all available)
Keyed locks with tags _____Blocks _____
Tags only _____Wedges _____
Chains _____
Other (list) _____
_____
_____
_____

6. What steps should be taken to secure this machine/equipment from accidental start-up?
_____

_____

_____

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Lockout/Tagout Form #8

LOCKOUT - TAGOUT INSPECTION FORM

Agency/Institution: _____

Department: _____

Type of Machine Locked Out: _____

Employee: _____ Job Title: _____

Employee Observed by: _____ Job Title: _____

Date and Time of Inspection: _____

Employee obeying safe procedures for locking and tagging:

_____

_____

Unsafe procedures or practices observed:

_____

_____

Recommendations:

_____

_____

Corrective actions taken:

_____

_____

Inspection reviewed with employee observed: _____

Date/Time: _____

Observed Employee's signature: _____ Date: _____

Inspection Performed by: _____ Date: _____

Appendix G
Confined Space Program

1. PURPOSE

The purpose of Safety Management Procedure (SMP)-42, *Confined Space Program* is to protect the health and safety of employees who are exposed to or enter confined spaces and/or are assigned to serve as attendants or rescue personnel. This program is also intended to ensure compliance with 29 CFR 1910.146 and EM 385-1-1 Section 34 (USACE 2014).

2. APPLICATION

This program applies to:

- All employees, who are authorized to enter a confined space
- All employees assigned to serve as attendants
- Provide assistance during a confined space emergency rescue
- Employees who serve as Confined Space Entry Supervisors or Confined Space Entry Program Administrators.

3. DEFINITIONS

3.1. ACCEPTABLE ENTRY CONDITIONS

Conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit required confined space can safely enter and perform work.

3.2. ATTENDANT

An individual stationed outside the permit required confined space who had specific training and monitors the authorized entrants inside the space.

3.3. AUTHORIZED ENTRANT

Employee who is authorized to enter a permit required space.

3.4. BLANKING OR BLINDING

Absolute closure of a pipe, line, or duct by fastening across its bore a solid plate that completely covers the bore and can withstand the maximum upstream pressure.

3.5. CONFINED SPACE

A space that meets all the following criteria:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work;
2. Has limited means of entry and egress; and
3. Is not designed for continuous employee occupancy.

   Examples may include tanks, silos, boilers, pits, bins, manholes electrical vaults, degreasers, and hoppers.

3.6. ENGULFMENT

surrounding and effective capture of a person by a liquid or finely divided solid substance (i.e, sand, corn. grain, sawdust, etc.).

3.7. ENTRY

A person's intentional passing through an opening into a permit required confined space.

3.8. ENTRY PERMITS

A written or printed document that allows and controls entry into a permit space.

3.9. ENTRY SUPERVISOR

Person responsible for:

1. Determining if acceptable conditions are present before entering a permit space;
2. For authorizing entry;
3. Coordinating and supervising all entry operations; and
4. Terminating entry.

3.10. HAZARDOUS ATMOSPHERE

An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from one or more of the following causes.

1. Flammable gas, vapor, or mist in excess of 10% of its Lower Explosive Limit (LEL).
2. Airborne combustible dust at a concentration that meets or exceeds its LEL.
3. Atmospheric oxygen concentration below 19.5 percent or above 23.0 percent (22% for USACE sites).
4. Atmosphere concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environment Control, or in Subpart Z, Toxic and Hazardous Substances, of 29 CFR 1910 and which could result in employee exposure in excess of its dose or PEL.
5. Any other atmospheric condition that is immediately dangerous to life or health.

3.11. HOT WORK PERMIT

Employer’s written authorization to perform operations (for riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

3.12. IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

Any condition that poses an immediate threat to life, or a delayed threat to life, or that would cause irreversible adverse health effects, or interfere with an individual's ability to escape unaided from a permit space.

3.13. ISOLATION

Process by which a permit space is removed from service and completely protects against the release of hazardous energy or material into the space.

3.14. LOWER EXPLOSIVE LIMIT (LEL)

The lowest concentration of gas or vapor, expressed in percent by volume in air, that burns or explodes if an ignition source is present at room temperature.

3.15. LINE BREAKING

Intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas or any fluid at a volume, pressure, or temperature capable of causing death or serious physical harm.

3.16. NON-PERMIT CONFINED SPACE

A confined space that does not contain or have the potential to contain an atmospheric hazard or any other serious safety or health hazard.

3.17. OXYGEN DEFICIENT ATMOSPHERE

An atmosphere containing less than 19.5% oxygen.

3.18. OXYGEN ENRICHED ATMOSPHERE

An atmosphere containing more than 23.0% oxygen (22% for USACE sites).

3.19. PERMISSIBLE EXPOSURE LIMIT

The airborne concentration of a hazardous material that must not be exceeded over a specified time. This value is established by the Occupational Safety and Health Administration (OSHA).

3.20. PERMIT-REQUIRED CONFINED SPACE

A confined space that has one or more of the following characteristics:

1. Contains or has a reasonable potential for hazardous atmospheres.
2. Contains a material that has the potential for engulfment.
3. Is internally configured so an employee could become trapped or asphyxiated by inwardly converging walls or a floor that slopes downward into a smaller cross section.
4. Contains any other recognized serious safety or health hazard.

3.21. PROHIBITED CONDITION

Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

3.22. RESCUE SERVICE

Personnel designated to rescue employees from permit spaces.

3.23. RETRIEVAL SYSTEM

Equipment used for a non-entry rescue of persons from permit spaces (i.e., tripod).

3.24. TESTING

Process by which hazards that may affect entrants of a permit space are identified and evaluated.

3.25. THRESHOLD LIMIT VALUE (TLV)

The airborne concentration of a hazardous material that should not be exceeded over a specified time. This value is established by the American Conference of Governmental Industrial Hygienists (ACGIH).

3.26. WELDING/CUTTING PERMIT OR HOT WORK PERMIT

Written authorization to perform operations that can provide a source of ignition (e.g., welding, cutting, burning, or heating) or a hazardous atmosphere.

4. RESPONSIBLE FOR COMPLIANCE

4.1. CONFINED SPACE PROGRAM ADMINISTRATOR

The Confined Space Entry Program Administrator is the Site Safety Professional, or Superintendent if a Site Safety Professional is not assigned to the project. The responsibilities of this individual shall include:

1. Conducting/coordinating hazard assessments.
2. Determining the classification (permit required/non permit space and location of each confined space.
3. Coordinating the posting of appropriate danger/caution signs by each confined space.
4. Supervising the selection and use of respirators in conjunction with the Respiratory Protection Program Administrator.
5. Coordinating the medical screening of respirator users.
6. Conducting/coordinating supervisory and employee training (including attendants) and maintaining all training records.
7. Conducting an annual evaluation of the overall program to determine its continued effectiveness.
8. Consulting employees and their authorized union representatives on the development and implementation of the Confined Space Entry Program.

4.2. MANAGERS AND SUPERVISORS

The responsibilities for these people shall include:

1. Actively supporting the Confined Space Entry Program and providing funding to purchase equipment when needed.
2. Ensuring all assigned personnel are knowledgeable of all aspects of the Confined Space Entry Program.
3. Ensuring their employees comply with all elements of Confined Space Entry Program.
4. Ensuring appropriate PPE and equipment is properly utilized and maintained.

4.3. CONFINED SPACE ENTRY SUPERVISOR

The responsibilities of this individual shall include:

1. Providing confined space entry personnel with a copy of the most current Confined Space Entry Program and any future changes.
2. Knowing the hazards that may be encountered during entry and informing the entrants about the hazards, including information on the mode, signs, or symptoms and consequences of exposure.
3. Verifying that the proper atmospheric tests have been conducted and that all procedures and equipment, mentioned in the permit, are in place before signing the Confined Space Entry Permit.
4. Assuring that the Confined Space Entry Permit is completed prior to each entry.
5. Terminating the entry and canceling the permit when needed.
6. Verifying that rescue or other emergency personnel are available and that the means for summoning them are operable if an emergency occurs.
7. Removing unauthorized individuals who have entered or who attempt to enter the confined space.
8. Determining whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, and that entry operations remain consistent with terms of the entry permit.
9. Maintaining completed entry permits and equipment calibration records.
10. Providing employees and their authorized union representative(s) an opportunity to observe the atmospheric testing of the confined space.

    NOTE: The Confined Space Entry Supervisor may also serve as an attendant or as an authorized entrant providing that person is properly trained and equipped.

The duties of the Confined Space Entry Supervisor may also be passed from one individual to another during an entry operation as long as the alternate is qualified.

4.4. AUTHORIZED ENTRANTS

All authorized entrants shall be responsible for:

1. Knowing and recognizing the hazards that may be faced during entry including information on the mode, signs, or symptoms and consequences of exposure.
2. Using and maintaining the proper PPE and other equipment.
3. Communicating with the attendant as necessary.
4. Alerting the attendant when hazardous conditions are detected, identified, or suspected.
5. Exiting the confined space immediately whenever:
    a. Ordered to do so by other entrants, the attendant or the Confined Space Entry Supervisor.
    b. Warning signs/symptoms are identified,
    c. Prohibited conditions are identified,
    d. An evacuation alarm is activated.
6. Complying with all other aspects of the Confined Space Entry Program.

4.5. ATTENDANT(S)

All authorized attendants shall be responsible for:

1. Knowing the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
2. Knowing the possible behavioral effects of the hazard exposure in the authorized entrants.
3. Maintaining an accurate count of authorized entrants in the confined space and ensures that the means used to identify the authorized entrants accurately identifies who is in the space.
4. Remaining outside the confined space during entry operations until relieved by another attendant.

    Note: Attendants may enter a confined space to attempt a rescue if they have been trained and equipped for rescue operations and if they have been properly relieved.
5. Communicating with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the confined space.

6. Monitoring activities inside and outside the confined space to determine if it is safe for authorized entrants to remain in the space and order the authorized entrants to evacuate the space immediately under any of the following conditions:
    a. If the attendant detects a prohibited condition.
    b. If the attendant detects a behavioral effect of the hazard exposure in an authorized entrant.
    c. If the attendant detects a situation outside the confined space that could endanger the authorized entrants; or
    d. If the attendant cannot effectively and safely perform all the duties required.
7. Summoning rescue and other emergency services as soon as the attendant determines that entrants need assistance to escape from the confined space hazards.
8. Taking the following actions when an unauthorized person(s) approach or enter a confined space while entry is underway:
    a. Warn the unauthorized person(s) that they must stay away from the confined space.
    b. Advise the unauthorized person(s) that they must exit immediately if they have entered the confined space.
    c. Inform the authorized entrants and the entry supervisor if an unauthorized person(s) have entered the confined space.
    d. Performing non entry rescues as specified in *SMP-42 Confined Space Program* Section 6.8.2.
9. Performing no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

5. PERMIT SYSTEM

5.1. PERMIT

Before entry is authorized, an entry permit shall be prepared to document the completion of safety measures required (as discussed in section 6.0 of this Program). The completed permit shall be made available to all authorized entrants or their authorized representatives, at the time of entry, by posting it at the entry portal or by any other equally effective means.

1. The Confined Space Entry Supervisor shall sign a completed Confined Space Entry Permit or in his absence another member of the health and safety staff (if properly trained) to authorize entry into a permit required confined space.

2. The Confined Space Entry Supervisor shall ensure that the permit specifies the location, type of work, personal protective measures, authorized entrants, monitoring equipment, hazards of the permit space, hazard control measures and any required rescue equipment. The procedure for contacting rescue services will also be included on the permit.
3. The permit shall be dated and carry an expiration time limiting the work to one shift.
4. The duration of the permit may not exceed the time required to complete the assigned task or job.
5. The Confined Space Entry Supervisor shall terminate the permit if a potential hazardous situation occurs which exceeds the conditions authorized on the permit or the entry operations, documented on the permit have been completed.
6. Cancelled entry permits shall be retained for at least 1 year.
7. The permit must be available at the work area outside the confined space entry point.
8. All confined space entry permits must be given to the Confined Space Entry Supervisor after the work is completed.
9. Hot work (potential ignition sources) must be authorized on a separate hot work permit that is attached and noted on the confined space entry permit.
10. Individuals authorizing entry into a permit required confined space may serve as entrants or attendants if they have received the proper training.

5.2. ENTRY PROCEDURE

Supervisors, attendants and authorized employees must complete the general requirements, discussed in the next section. Entry procedure to permit required confined space are as follows:

1. The Confined Space Entry Supervisor shall be notified prior to the time that an entrant enters a permit required confined space.
2. A Confined Space Entry Permit shall be properly completed and signed by the Confined Space Entry Supervisor or in their absence another member of the health and safety staff (if properly trained) prior to entry into the permit required confined space.
3. Only properly trained and authorized individuals will be allowed to enter a permit required confined space. Authorized entrants will maintain contact with the attendant either visually or verbally.
4. Everyone entering a permit required confined space will, whenever practical, have a safety or retrieval line attached to a body harness or wristlets. The other end of the line must be secured to a secure anchor point or lifting device (i.e., tripod)

outside the entry portal. Note: The anchor point shall not be secured to a motor vehicle in a manner that would pull the line out of the space if the vehicle moved unless proper Lockout/Tagout controls are in place. A retrieval line is not required if:

a. A permit space has obstructions or turns that would prevent pull on the retrieval line from being transmitted to the entrant, or

b. A permit space from which an employee being rescued with the retrieval system has projections which would injure the employee if forcefully removed,

c. A permit space when entered by an entrant using an air supplied respirator and retrieval lines could pose an entanglement hazard, or

d. A permit required excavation other than a trench.

5. A properly trained individual shall test the atmosphere for oxygen content, flammable gases, and potential toxic air contaminants prior and during entry. Each entrant shall be required to wear an air-monitoring instrument if the confined space is large enough and/or has a potentially hazardous atmosphere, excavations are exempt from this requirement unless working with unknown drums or containers.
6. During any confined space entry, all safety rules and procedures shall be followed.
7. At least one attendant should be provided outside the permit space into which entry is authorized for the duration of entry operations.
8. Personal protective equipment, including respirators, shall be provided to entrants as necessary for safe entry into the confined space and used properly.

    a. All PPE must be approved by the Confined Space Entry Supervisor.

    b. An atmosphere supplied breathing apparatus shall be used for entry into an unknown atmosphere. The Rescue Team, with self-contained breathing apparatus (SCBA) must be present on site and immediately available if entry is into an atmosphere that is actually or potentially immediately dangerous to life or health.

9. Electrical equipment used in the confined space shall be appropriate for the hazard and meet the requirements of the National Electric Code if a hazardous atmosphere is present.
10. Any condition making removal of an entrance cover unsafe (i.e., pressured differential, physical obstacles, etc.) shall be eliminated before the cover is removed.

    a. When the cover has been removed, the opening(s) shall be promptly guarded to prevent accidental fall into the opening and prevent objects from falling into the opening.

b. Appropriate vehicle and pedestrian barriers shall be used to protect workers.

11. Metal ladders shall not be used when working around electrical equipment.

12. Any use of chemicals or welding, soldering, or cutting operations must be approved by the Confined Space Entry Supervisor.

6. General Requirements

6.1. Workplace Evaluation

The Confined Space Program Administrator will coordinate/conduct an evaluation of the workplace to determine if confined spaces are present. A detailed assessment will be made of each space to determine type and location of each space, its dimensions and number of exits, the reason(s) for entry, actual or potential health and safety hazards, and its classification (permit or non-permit). The assessment will also specify the equipment and personal protective equipment (PPE) required for entry and any special precautions that must be followed for safe entry and work in the confined space. The results of the assessment will be recorded on a Confined Space Hazard Assessment Form (See SMP-42 Form I, Parts 1 and 2). It is required that all affected employees be trained for their respective duties, prior to their entry.

6.2. Identification of Confined Spaces

Effective means of identifying confined spaces (i.e., training, etc.) may be used to prevent unauthorized entry.

1. Warning Signs and Posting

   a. When using warning signs or placards for the identification of Confined Spaces, all types shall be printed both in English and (if applicable) in the predominant language of any non-English reading employees.

   b. Where confined space entry symbols are established, they shall also be used in conjunction with a warning sign.

   c. Signs shall include, but not necessarily be limited to, the following information:

      DANGER: PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER UNLESS AUTHORIZED

   d. The following statements shall be added in large letters to the warning sign when a specific work practice must be performed or when specific safety equipment is necessary:

      i. Respirator Required For Entry

      ii. Lifeline Required For Entry

      iii. Hot Work Permit Required

e. Signs are not required at manholes, or any other entry, located in public traffic areas.

6.3. ATMOSPHERIC REQUIREMENTS PRIOR TO ENTRY

The atmosphere in the confined space within the entrant's immediate area may be continuously monitored for oxygen and combustible gas and any other hazardous substance which the employer has reason to believe may be present in the confined space.

Before entering a confined space, the following atmospheric conditions must be met:

1. The oxygen level is between 19.5% and 23.0% (22% for USACE sites).
2. The concentrations of flammable gas, vapors, or mists are below 10% of their Lower Explosive Limits (LEL).
3. The level of airborne hydrogen sulfide (H_2S) is below 10 parts per million (ppm).
4. Toxic air contaminates are less than the OSHA Permissible Exposure Limit (PEL). Note: If the substance does not have a PEL, use the Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH).
5. Atmospheric concentrations of toxic substances are below what is considered as the IDLH.
6. The level of carbon monoxide (CO) is less than 35 ppm.

Entry into a confined space is not allowed if monitoring indicates deficiency in any of these categories. Respirators or a self-contained breathing apparatus (SCBA) shall not to be used to allow entry into deficient atmospheres unless specifically approved in writing by Sevenson's Safety and Health Manager (and the USACE Contracting Officer's Representative on USACE sites).

To achieve and maintain a safe atmosphere, one or more actions may have to be taken to render the space safe for human occupancy. This could include:

1. Isolation - precautions taken to prevent release of material and/or energy into the space. This can be achieved through blinding, blanking, disconnecting, lockout/tagout, or removal of incoming pipes or related energy sources.
2. Ventilation - purging, inserting, flushing, or otherwise ventilating the space with fresh air. The replacement air will displace the contaminated air allowing for safe entry. This can be accomplished by removing ports and openings or by mechanically ventilating the vessel.
3. Separation - where there is a possibility of external hazards, the space may require barricades to protect the entrants from falling objects or from unauthorized entry.

6.4. VENTILATION

If a confined space being entered is found to contain a hazardous atmosphere, forced ventilation may be provided for a period of time in order to bring the air quality within the acceptable limits. Once the determined ventilation period expires, employees shall monitor the confined space according to subsection entitled "Air Monitoring". If the sampling shows that a hazard still exists, then additional ventilation and sampling may be required.

Note: Control of atmospheric hazards through forced ventilation does not constitute elimination of hazards.

If the hazard still exists after repeated ventilation steps, the confined space shall then be considered a permit required confined space and the Confined Space Entry Team (entrant, attendant, and Confined Space Entry Supervisor) must follow the proper procedures for permit required confined space entry.

Note: Forced ventilation may not be used in lieu of monitoring. Consideration must also be given to the possibility of static discharge that could be a source of ignition.

Forced air ventilation should be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees leave.

Whenever ventilation is used, employees shall:

1. Keep the blower controls at least 10 feet from the confined space, and out of the wind or downwind from the entrance to the confined space.
2. Use a ventilation blower that is designed to be intrinsically safe if the possibility of an explosive atmosphere could exists.
3. Ensure that the exhaust systems are designed and placed so that they protect employees in the surrounding area from being contaminated.
4. Ensure that the ventilation system is fully operational and air is supplied from a clean source.
5. Ensure that contaminated air is not recirculated into the confined space.
6. Purge the ventilation hose outlet for at least one-minute (at street or blower level if possible) before inserting the hose into the confined space.
7. Maintain continuous local ventilation when toxic atmospheres are being produced as part of a work procedure (i.e., welding, painting or cleaning operations).

6.5. LOCKOUT/ISOLATION

Each confined space (if applicable) shall have its own specific written lockout/isolation procedures. These procedures will be posted above and/or next to the entrance of the confined space, where feasible.

6.5.1. ELECTRICAL ISOLATION

In order to prevent employees from being exposed to activation of moving parts, or from being exposed to energized objects, authorized entrants shall lockout circuit breakers and/or the disconnect in the open (off) position with a key type lock. If more than one authorized entrant is to be inside the confined space, each employee must place his/her own lock on the circuit breaker or disconnect.

6.5.2. MECHANICAL ISOLATION

All equipment with moving mechanical parts that could unexpectedly rotate or move will be blocked in such a way that there can be no accidental rotation or movement. Isolation of mechanical parts can be performed by disconnecting linkages or removing drive belts and/or chains.

6.5.3. BLANKING

A solid plate or cup capable of withstanding the maximum pressure of the gas or liquid inside the pipe may be placed across a pipe or duct to prevent unexpected release of the contents.

6.5.4. LINE ISOLATION

Lines can be isolated by:

1. Double blocking and bleeding the line, or
2. By blocking two closed in line valves, or
3. Blocking or bleeding open to the outside atmosphere the drawn or the bleed in line between the two closed valves.

6.6. AIR MONITORING

Before any permit required confined space may be entered by any employee, the entry supervisor (or designee if qualified) must monitor the atmosphere of the confined space to determine that the characteristics of the air for all levels and all areas within the confined space are safe. The atmosphere within the authorized entrant's immediate area should be continuously monitored for oxygen, combustible gases, and any other hazardous substance.

When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.

Note: Authorized entrants and/or their authorized representatives shall be provided an opportunity to observe the atmospheric testing of the confined space that is conducted prior to entry and subsequent testing. Reevaluation of the permit space shall be done in presence of the authorized entrant or employee's authorized representative who requests the reevaluation.

6.6.1. SAMPLING DEVICES

1. A direct readout sampling device which can simultaneously test for oxygen, hydrogen sulfide and/or carbon monoxide and combustible gas without manual switching shall be used to sample the atmosphere of the confined space.
2. The sampling device shall be equipped with an audible and visible warning device that warns the entrant and/or attendant of the hazardous atmosphere in the permit space.
3. Sampling devices shall be calibrated relative to the oxygen content of the ambient air at the time of sampling. Calibration of the sampling device relative to the oxygen content shall be performed where the 20.9% natural content of oxygen in the air is most likely to occur.

   Note: Oxygen calibration should not be performed near a confined space opening
4. A sampling device, which has a zero set, shall be zeroed in a clean atmosphere before each sampling. Calibration of a sampling device shall be conducted daily before each use.
5. Non-sparking Equipment: When sampling the atmosphere of a confined space, the sampling device shall have an attached non sparking probe.
6. Manhole Sampling: When a confined space entry is by means of a manhole, a probe shall be inserted through the pick hole of the manhole cover, or the manhole cover shall be preyed open on the downwind side to allow just enough room for insertion of the probe or other sampling device.
7. Intrinsically Safe: When the confined space to be entered is expected to have combustible vapors present, employees shall be required to use an approved explosion proof or intrinsically safe sampling device.

6.7. Assessment of Additional Hazards

Before entering a confined space, the Confined Space Entry Supervisor or in his absence another member of the health and safety staff, shall conduct an assessment of any additional hazards which the entrant may encounter during the confined space entry. This assessment shall include, but is not limited to, a review of the following additional hazards:

1. Thermal hazards due to extremes in hot and cold temperatures.
2. Engulfment Hazards due to loose, granular materials, such as sand, coal, or ash, stored in bins or hoppers.
3. Noise hazards, which can affect hearing and emergency communications.

4. Slick/wet surfaces, which can increase the risk to slips and falls. Wet surfaces also increase the risk and effects of shocks from electrical tools, machinery, and circuitry.
5. Falling Objects from work being performed above an employee or by objects falling through open confined space entrances.
6. Mechanical equipment that is required to be operating during the entry.
7. Electrical Hazards from exposed wires, power lines, etc.
8. Fall Hazards.
9. Biological Hazards.

6.8. EMERGENCY RESCUE

The OSHA Confined Space Standard allows two options for rescue operations for Permit Required Confined Space Entries. The Confined Space Administrator and Confined Space Entry Supervisor must select one of the following types of rescues for each permit required confined space identified at the Site.

6.8.1. EMERGENCY SERVICE PERMIT REQUIRED CONFINED SPACE RESCUE

Prior to utilizing a rescue service/contractor, the Confined Space Program Administrator shall:

1. Evaluate the prospective rescuer's ability to respond to a rescue summons in a timely manner, considering the hazard(s) identified.

   Note: What is considered "timely" will vary according to the specific hazards involved in each entry;

2. Evaluate the prospective rescue service's ability, in terms of proficiency with rescue related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified;
3. Select a rescue team or service that has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified, and is equipped for and proficient in performing the needed rescue services;
4. Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site; and
5. Provide the rescue team or service selected with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

   Note: OSHA 29 CFR 1910.146 Appendix F contains examples of criteria that employers can use in evaluating prospective rescuers.

6.8.2. ON-SITE PERMIT REQUIRED CONFINED SPACE RESCUE

If a confined space related emergency is expected, all employees involved in the rescue shall be provided with the proper emergency rescue training, PPE, and rescue equipment needed to make a safe rescue attempt, at no cost to the employees.

6.8.2.1. EQUIPMENT

Before a confined space rescue attempt is made, the following equipment must be available near the entrance of the confined space:

6.8.2.1.1. PERSONAL PROTECTIVE EQUIPMENT

1. Fully charged SCBA with at least a 30-minute air supply or a Type C airline respirator with an emergency escape air tank.
2. Protective clothing/gloves, if needed
3. Head protection, if needed
4. Hearing protection, if needed
5. Eye protection
6. Communication devices

6.8.2.1.2. RETRIEVAL EQUIPMENT

1. Full body harness and lifeline

   Note: Wristlets may be used in lieu of the full body harness if the employer can demonstrate that the use of a full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest way and most effective alternative.
2. Winch/hoist fully capable of retrieving personnel from a vertical type confined space more than five feet deep.
3. Retrieval line shall be attached at the center of the entrants back near shoulder level, above the entrant's head, or at another point which presents a profile small enough for the successful removal of the entrant. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the

rescuer becomes aware that rescue is necessary.

4. Ladders.

6.8.2.1.3. EMERGENCY EQUIPMENT

1. First aid kit
2. Automated External Defibrillator
3. Fire extinguisher(s) appropriate for the situation.

6.8.2.2. DUTIES OF RESCUING ATTENDANTS (NON-FIRE EMERGENCY)

If either a permit required confined space non fire related emergency rescue occurs, rescuing attendants shall follow the following procedures:

1. Alert the employees in the confined space to immediately vacate the space and verify that the employees understood these instructions.
2. Notify the following personnel via a two-way radio or telephone with detailed information about the emergency.
   a. Rescue Service
   b. Confined Space Entry Supervisor and SSHO

   Note: The Confined Space Entry Supervisor or Area Supervisor will then request assistance from the Local Fire Department if medical attention is needed.
3. Begin emergency extraction from outside of the confined space:
   a. Verify that all employees are exiting the confined space. If not, then perform the following:
   b. Notify the Confined Space Entry Supervisor that the employee(s) are disabled.
   c. Begin winching/hoisting employee(s) from the confined space.
   d. Do not enter the confined space until help arrives, and you have been relieved of your attendant duties by another qualified attendant.

6.8.2.3. DUTIES OF RESCUING ATTENDANTS – FIRE EMERGENCY

1. No attempt should be made to enter a burning confined space.
2. Standby personnel shall immediately call 911 and will indicate that a fire emergency is involved and the location of the confined space.
3. The attendant(s) shall attempt to remove the employee or employees via the hoist/winch from outside the confined space.

6.8.2.4. RESCUE ATTEMPT

Upon arriving at the confined space, the rescue service shall:

1. Sample the air in the confined space.

   Note: Entry is not permitted if the air quality in the confined space is outside the acceptable limit for combustible gas. If the combustible gas content is more than 10% of the LEL, the confined space must be ventilated and/or the source of the combustible gas shut off or removed before entry is permitted.
2. Assess the potential hazards that rescue personnel could encounter by entering the space.
3. If entry conditions are determined safe, enter the confined space with the proper retrieval equipment, personal protective equipment, and a fully charged SCBA or a supplied airline respirator equipped with an emergency air tank.
4. Search for the disabled employee(s).
5. Assess the type of accident/injuries.
6. Administer proper first aid/CPR/AED, if needed.
7. Begin extraction procedures, taking care not to cause further injury.

6.8.2.5. SUBSTANCE INFORMATION

If an injured entrant is exposed to a substance for which a Safety Data Sheet (SDS) or other written information is required to be kept at the work site, that SDS or written information shall be made available to the medical facility treating the exposed entrant.

7. WORK INVOLVING SUBCONTRACTORS

When the Site Superintendent arranges to have employees of a subcontractor perform work that involves confined space entry, the Confined Space Entry Program Administrator or the Confined Space Entry Supervisor shall:

1. Inform the contractor that the workplace contains permit spaces and the permitted space entry is allowed only through compliance with a permit space program that complies with CFR 1910.146.
2. Inform the contractor of the hazards identified and Sevenson's experience with the confined space that made the space in question a confined space.
3. Coordinate entry operations with the subcontractor when personnel from both employers will be working in or near the confined space.
4. Verify that the subcontractor has an appropriate Confined Space Entry program.

Debrief the contractor at the conclusion of the confined space entry operation(s) regarding the permit space entry procedures that were followed (if applicable) and the hazards that were confronted or created during entry operations.

8. NON-PERMIT REQUIRED CONFINED SPACE ENTRY

No employee shall enter or work in a non-permit confined space unless the following steps have been performed:

1. Obtains permission to enter the confined space from the Confined Space Entry Supervisor, or in their absence another member of the health and safety staff.
2. Obtains and uses the proper PPE, tools, and other equipment.
3. Complies with all other applicable confined space entry procedures.
4. An Activity Analysis or Safe Plan of Action has been prepared to support entry operations, hazards, and controls.

Note: Atmospheric testing of a non-permit confined space is not required by the OSHA Confined Space standard. However, testing the atmosphere for toxic gases and oxygen deficiency prior to entering the confined space is recommended if a suitable, and properly calibrated, sampling devise is available. The OSHA Standard also does not require an attendant for entry into a non-permit required confined space, however having an attendant present (if practical) is again strongly recommended. Other OSHA standards (i.e., Personal Protective Equipment, Respiratory Protection, etc.) still apply to entry into all confined spaces.

9. RECLASSIFICATION OF A PERMIT REQUIRED CONFINED SPACE TO NON-PERMIT CONFINED SPACE

A permit required confined space may be entered as a non-permit confined space if the permit space contains no actual or potential atmospheric hazard, and all other hazards within the space can be eliminated without entry into the space. Hazards may be eliminated, for example, by:

1. Following all designated lockout/tagout procedures for the space in question;

2. Emptying a vessel to remove an engulfment or other content hazard;
3. Draining chemical tanks of their contents, purging any residual chemicals with water, and ventilating the space after purging is complete;
4. Shutting boilers down, opening all access ports to allow for temperature reduction and natural ventilation, and by taking all appropriate measures to control hazardous energy (i.e., locking out machines, etc.) or other physical hazards present.

   If the hazards arise within a permit space that has been declassified to a non-permit space, each employee in the space shall exit the space as soon as possible. The Entry Supervisor or Administrator shall then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions.

10. Other Rules and Work Practices

To protect the safety and health of all employees associated with the confined space entry, employees (and supervisors) shall comply with the following safety rules and work practices:

10.1. General Rules

1. All employees within the confined space and those employees assigned to serve, as attendants shall be in constant two way communication.
2. All employees required to wear respiratory protection must properly use and maintain properly the respirator in accordance with 29 CFR 1910.134 and the specific instructions provided to them by their supervisor and during training.
3. Smoking is not permitted within the confined space or within a 10 feet radius of the entrance of a confined space.
4. All employees shall comply with the requirements and limitations on the confined space entry permit, including the maximum number of employees permitted to work in the confined space.

10.2. Underground and Above Ground Storage Tanks

Before any employee enters a boiler or any other vessel type confined space, the following safety precautions shall be implemented:

1. Ensure there is only residual material left in the bottom of the underground storage tank (UST) before an entry.
2. Ensure that all lines leading into and away from the tank(s) are blanked, blinded, and/or double blocked and bled before an entry is allowed.
3. Ensure that all employees entering a tank are secured by a lifeline to a winch or other retrieval device outside the confined space.
4. Treat all boilers and other vessel type confined space in a manner consistent with that of other confined spaces.

Note: If a confined space entry is required for fuel oil (diesel fuel) tank the LEL must be determined with a Photoionization Detector (PID). This is due to LEL sensor[1] technology and its response to heavy hydrocarbon fuels is unreliable. The PID reading must be less then 250 ppm for entry into the tank in Level C PPE with Organic Vapor Cartridges.

10.3. TRAFFIC CONTROL

1. Entrances to confined spaces that are in streets shall be guarded in accordance with the following requirements:
    a. 1. Employees shall activate the following warning lights:
        i. Vehicle's beacon light
        ii. Four-way hazard flashers
2. Employees shall park the vehicle used to transport their confined space equipment in such a way that the vehicle does not obstruct the normal traffic flow and shall, when possible, use the vehicle to provide protection for the employees.
3. Employees shall park the vehicle in such a manner that the vehicles exhaust fumes cannot accumulate in the confined space. If this is not possible, the vehicle's exhaust pipe shall be extended away from the confined space.
4. Employees shall properly place traffic safety cones around the manhole and any vehicle in accordance with state and federal traffic ordinances to adequately warn oncoming traffic.
5. Traffic safety cones shall be visible to traffic in all directions and in such a manner as to protect the employees from the traffic flow. Traffic cones should also be placed far enough form the confined space to give drives adequate notice.

When working on the street or an easement surface, all standby and flag person employees shall always wear a traffic safety vest or the equivalent. A flag person(s) shall be added to the Confined Space Entry Team when the need arises. The flag person(s) shall not be considered as the required attendant for a permit required confined space.

10.4. CLEANING PURPOSES

When a confined space entry is required for cleaning purposes, the Confined Space Entry Supervisor or in their absence another member of the health and safety staff, shall review and authorize the procedures and processes to be used while cleaning the confined space before entry can take place.

[1] Application Note AP-219, "Using PID for 10% of LEL Decisions" Revision 1, RAE Systems, Inc., San Jose, CA.

The following specific cleaning methods shall be used depending upon the product or products in the space:

10.4.1. Flammable/Combustible Atmosphere:

The atmosphere within the confined space shall be purged with an inert gas if the atmosphere is above the upper flammable limit to remove the flammable and/or combustible substance before forced ventilation of the space. Initial cleaning shall be done, if possible, from outside the tank.

10.4.2. Cleaning Process Hazards

When additional hazards are created by the cleaning process, the Confined Space Entry Supervisor shall develop additional safety procedures to address the newly created hazards. These special procedures shall be developed before a confined space cleaning process takes place.

10.5. Use of Equipment and Tools

When the confined space entry requires the use of equipment and tools inside the space, this equipment shall be inspected and must meet the following requirements:

1. Hand tools must be in good repair and be kept clean.
2. Portable electrical tools, equipment, and lighting shall be listed Class I, Division I, Group D. All grounds must be checked before electrical equipment is used in a confined space. Note: Ground Fault Protectors should be used whenever possible to protect employees from electrical shock when working in damp or wet locations.
3. All electrical cords, tools, and equipment must be constructed of a heavy duty, double insulated cord and equipped with a 3-prong plug.

   Note: double insulated tools with a 2-prong pug may be appropriate in some cases.
4. All electrical cords, tools, and equipment must be visually inspected for defects before being used in a confined space. If found defective, they will be replaced, repaired, or destroyed before any employee enters the confined space.
5. Cylinders of compressed gases must never be taken into a confined space and will be turned off at the cylinder valve when not in use. Exempt from this rule are cylinders that are part of SCBA or resuscitation equipment.
6. Ladders must be adequately secured or of a permanent type which provides the same degree of safety. Note: Permanent ladders must be inspected for rust or corrosion and repaired or replaced if necessary.
7. All equipment that may be used in a flammable atmosphere shall be approved as either explosion proof or intrinsically safe for the atmosphere and shall be approved by a recognized testing laboratory (i.e., UL, FM).

11. RECORDKEEPING

The following records will be maintained on file for at least one year:

1. Employee Training Records - including dates and the names of attendees.
2. Confined Space Entry Equipment Inspections - including dates, results, and corrective action.
3. Monitoring Equipment Calibration/Servicing Reports - indicating calibration dates and any service conducted by the manufacturer.
4. Confined Space Permits - for all Permit Required confined space entries.

12. ANNUAL REVIEW

The Confined Space Entry Program Administrator shall review the Confined Space Program at least annually using cancelled Confined Space Permits and other available information and records to determine if:

1. Changes should be made to improve the program's overall effectiveness;
2. Additional hazards have been identified within a given space;
3. Additional measures should be taken to protect the entrants;
4. Additional confined spaces should be included within the program; and
5. Some locations can be removed from the program.

13. EMPLOYEE TRAINING

All employees who are required to enter a Permit Required Confined Space or serve as an attendant shall be trained and properly equipped to recognize, understand, and control hazards that may be encountered in the confined space. Training records (certification) shall be available for inspection by employees and their authorized representative.

13.1. TRAINING

Training shall be provided to each affected employee.

a. Before the employee is first assigned duties under this section.

b. Before there is a change in assigned duties.

c. When there is a change in the permit space operations that present a hazard about which an affected employee has not previously been trained.

d. Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

13.2. CONFINED SPACE ENTRY

All employees who are required to either enter a confined space or serve, as attendants shall receive training in the following areas:

1. Associated safety and health hazards of the confined space entry
2. Duties of entrants and attendants
3. Air monitoring and attendants
4. Respiratory protection
5. Emergency rescue procedures
6. Lockout isolation procedures'

13.3. FREQUENCY

Training shall be provided to each affected employee:

1. Before the employee is first assigned confined space entry duties.
2. Before there is a change in assigned duties.
3. Whenever there is change in confined space operations that presents a hazard about which the employee has been previously trained.

13.4. PERSONAL PROTECTIVE EQUIPMENT

All employees who are required to either enter a confined space and/or serve as attendants, shall receive training on the proper use of any PPE needed to perform the job safely, such as, protective clothing and suits, gloves, respiratory protection; confined space rescue equipment, body harnesses, hearing protection, and eye/face, hand, foot and head protection.

13.5. EMERGENCY RESCUE TRAINING

An emergency rescue employee(s) who is designated to provide permit space rescue and emergency services shall be trained in the following measures with an adequate level of proficiency shown in:

1. The use of personal protective equipment (PPE) needed to conduct permit space rescues safely.
2. The assigned rescue duties (same as entrants).
3. Basic first aid and CPR - At least one member of the rescue team or emergency service shall hold a current certification in first aid and CPR.

Emergency rescue personnel shall perform a permit space rescue at least once every 12 months by means of simulated rescue operations in which dummies, manikins, or actual persons are removed from the actual permit spaces or from representative permit spaces.

Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

CONFINED SPACE HAZARD ASSESSMENT FORM
PART I

Hazard Codes

1. Atmosphere is within acceptable limits.
2. Contains or has a potential to contain a hazardous atmosphere.
3. Contains a material that has the potential for engulfing an entrant (i.e. soil, sand)
4. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section.
5. Contains moving parts or machinery.
6. Contains any other recognized health or safety hazard.

Confined Space (Tank, Manhole, etc)	Location	Reason(s) for Entry	Classification (Permit Required/Non Permit)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

CONFINED SPACE HAZARD ASSESSMENT FORM
PART II

Confined Space (Part I)	Tools/Equipment Required for Entry	PPE Required for Entry	Special Precautions Required for Entry
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Sevenson Environmental Services, Inc.

CONFINED SPACE PERMIT

Date_____ Time of Issue_____ Length of Permit_____
Location _____ Equipment ID_____
Purpose of Entry & Description of Work _____

Authorized Entrant(s)_____
Will "HOT" Work be authorized for this Entry? ☐ No; ☐ Yes (describe)_____

HAZARDOUS IDENTIFICATION

Indicate ALL potential Hazards of this Permit Space:	YES	N/A
a. Contains or may contain a hazardous atmosphere	☐	☐
b. Contains a material for potential engulfment	☐	☐
c. Has an internal configuration for potential entrapment	☐	☐

If "Yes", describe _____

d. Contains the following serious safety or health Hazards:_____

PRE-ENTRY PREPARATION

		YES	N/A	Done			Removed		
				Date	Time	By	Date	Time	By
1. Lines broken and/or blanked:									
Line Contents	Location								
a.									
b.									
c.									
2. Drain or at a workable level									
3. Purge - flush and vent									
4. Force air to bottom & vent									
5. Lock out power feeds:									

Equip/Location of Lock out								
a.								
b.								
c.								
6. Shut-off heating systems								
7. Other:								

TEST TO BE TAKEN

	P.E.L.	Time Tester Yes	Time Tester N/A	Time Tester Results	Time Tester Results	Time Tester Results
% of Oxygen	19.5% to 23%					
% of LEL	Any % over 10					
Carbon Monoxide	25 ppm					
Hydrogen Sulfide	10 ppm					
VOC						
Temperature	< 110ºF/43ºC					

PREVENTION OF UNAUTHORIZED ENTRY

	YES
1. Have Worker(s) to enter been trained for this specific entry?	☐
2. Have Attendants been trained for this specific space?	☐
3. Post "WORKER IN CONFINED SPACE" Sign	☐

4. Set-up the following additional barriers:

_____

_____

MANDATORY SAFETY EQUIPMENT REQUIRED

	YES	N/A
1. Fire Extinguisher	☐	☐
2. Retrieval Lines	☐	☐
3. Respirator	☐	☐
4. Goggles	☐	☐

5. Hearing Protection	☐	☐
6. Protective Clothing	☐	☐
7. Special Boots or Shoes	☐	☐
8. Gloves	☐	☐
9. Other Safety Equipment Required	☐	☐

_____ _____
_____ _____
_____ _____
_____ _____

COMMUNICATION PROCEDURES AND EQUIPMENT TO BE USED FOR THIS ENTRY

(Verify that chosen equipment is in place and operation.)

Verified by:

1._____ _____

2._____ _____

RESCUE EQUIPMENT TO BE PROVIDED ON-SITE

		YES	N/A
a.	Two chest harnesses or two wristlets	☐	☐
b.	Two five-minute supplied air escape respirators	☐	☐
c.	One 30-minute S.C.B.A.	☐	☐
d.	One emergency siren	☐	☐
e.	Man basket	☐	☐
f.	Retrieval winch	☐	☐
g.	Other necessary Rescue Equipment	☐	☐

_____
_____
_____

IN CASE OF EMERGENCY

Rescue Service	Phone Number or Ext.
1._____	_____
2._____	_____
3._____	_____

Appendix H
Critical Lift Program

Critical Lift Program

A critical lift is a non-routine crane lift that requires detailed planning and additional procedures and precautions. Critical lifts include:

- Lifts made when the load weight is 75% or more of the rated capacity of the crane.
- Loads that require the load to be lifted, swung, or placed out of the operator's view.
- Lifts involving non-routine or technically difficult rigging arrangements.
- Hoisting personnel with the crane.
- The load is unique and, if damaged, would be irreplaceable or not easily repaired and is vital to the operation of the system.
- The cost to replace or repair the load or the delay in operations would have a negative impact on the operation of the system.

After a critical lift has been determined by the Superintendent, he will ensure that a pre lift plan is developed which contains the following:

- Identification of the items to be lifted, the weight, dimensions, and center of gravity of the load, and any hazardous or toxic materials which may be present.
- Identification of the crane and its rated capacity.
- Rigging sketches which may include:
    - Identification and rated capacity of slings, lifting bars, rigging, accessories, and below the hook lifting devices.
    - Load-indicating devices.
    - Load vectors.
    - Lifting points.
    - Sling angles.
    - Boom and swing angles.
    - Methods of attachment.
    - Crane orientation.
    - Other factors affecting equipment capacity.
- Only qualified and experienced operators who have been trained will be assigned to make the lift.
- Only designated, qualified signalers will give signals to the operator. However, the operator will obey a STOP signal at all times, no matter who gives the signal.
- The procedure and rigging sketches will be reviewed and approved by the Superintendent and the Safety Manager.

Critical Lift Program

- A pre-lift meeting will be held with the affected personnel, and the plan and procedures will be reviewed. Any questions will also be resolved at this time.
- After the conclusion of the pre-lift meeting, the lift will be accomplished.

Sevenson Environmental Services, Inc.
CRITICAL LIFT PLAN

Lift Identification	
Job Number:	Location:
Lift Supervisor Name:	
Date of Lift:	Time:
Lift Description:	
Approvals (Signatures Required)	
Site Manager:	Date:
Project Manager (if over 50 tons):	Date:
Lift Supervisor:	Date:
Rigging Superintendent:	Date:
Qualified Person:	Date:
Operator(s):	Date:
If engineering Designs Are Used	
Drawing Numbers:	
Attachments (Insert Page Numbers)	
1. Operator Certifications	
2. Capacity Certificates and Inspection Reports for all Lifting Equipment	
3. Inspection Reports for all Rigging Equipment	
4. Insurance Certificates	
5. Applicable capacity charts and chart notes for lifting equipment	
6. Load and Capacity Calculations	
7. Rigging Diagram(s)	
8. Lift Geometry and Free Body Diagram(s)	
9. Other:	
10 Other:	

Sevenson Environmental Services, Inc.

CRITICAL LIFT PLAN

Critical Lift Load and Capacity Calculations

Lift Description: _____

Section A Weight of Load (Equipment) – Live Load		
1. Load/Equipment condition	New: ☐	Used: ☐
2. Weight of Load/Equipment Empty		Lbs
3. Weight of Attachments		Lbs
a. Platforms and Ladders		Lbs
b. Piping and Accessories		Lbs
c. Liquids Inside		Lbs
d. Dirt and Debris		Lbs
e. Internal Trays or Liners		Lbs
f. Other:		Lbs
g. Other:		Lbs
4. Total Amount of Load/Equipment Weight (A2 through A3g)		Lbs

Section B Total Lifted Weight (Weight of Load/Equipment + Rigging + (Main) Crane Deductions)					
1.	Load/Equipment weight plus contingency*	%	7.	Weight of Jib Erected	Lbs
2.	Amount of Equipment Weight	Lbs	7a.	Weight of Jib Stowed	Lbs
3.	Weight of Headache Ball	Lbs	8.	Weight of Jib Headache Ball	Lbs
4.	Weight of Main Block	Lbs	9.	Weight of Cable (Load Fail)	Lbs
5.	Weight of Spreader Bar	Lbs	10.	Auxiliary Boom Head	Lbs
6.	Weight of Slings and Shackles	Lbs	11.	Other:	Lbs

* Use 100% plus some percentage (example +10%) to multiply times number in Section A4 to allow for contingency to compute Section B2.

TOTAL LIFTED WEIGHT
(Sum B2 through B11) Lbs

Source of Load Weight (A2):

(Name Plate, Drawings, Calculated, Weight Ticket, Etc.)

Weight and Calculations

Print Name	Signature	Date
By:		
Verified By:		

(See Page 2)

Sevenson Environmental Services, Inc.

CRITICAL LIFT PLAN

Critical Lift Load and Capacity Calculations

Section C Capacities of the (Main) Crane				
1.	Make and Model of Crane:			
2.	Counter Weight Size:		Type of Boom:	
3.	Lifting Arrangement			
a.	Max. Radius During Lift	Feet		
b.	Length of Boom	Feet		
c.	Angle of Boom at Pick	Degree		
d.	Angle of Boom at Set	Degree		
	Rated Capacity Under Most Severe Conditions			
	1. Over Rear	Lbs		
	2. Over Front	Lbs		
	3. Over Side	Lbs		
f.	Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or rear)			Lbs
4.	Jib			
a.	Is the Jib to be used	Yes ☐	No ☐	
b.	Length of Jib	Feet		
c.	Jib Angle	Degree		
d.	Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or rear)			Lbs
5.	Load Line/Fall Cable			
a.	Is Main Block to be used	Yes ☐	No ☐	
b.	Number of Parts of Cable			
c.	Size of Cable	Inches		
d.	Maximum Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or rear)			Lbs

Section D Percent of Cranes Capacity		
1.	$\frac{Total\ Lifted\ Weight}{Rated\ Capacity} * 100$	%

Section E Size of Slings				
1.	Sling Selection			
a.	Type of Arrangement		(Spreader, Vertical Slings, etc.)	
b.	Number of Slings to Hook		Capacity	Lbs
c.	Sling Size	Inches		
d.	Sling Length	Feet		
e.	Sling Capacity (at angle used)	Lbs		
f.	Number of Slings to Load	#		
g.	Total Rigging Capacity (E1e x E1f)			Lbs

Comments: _____

Sketch of rigging arrangements available Yes ☐ No ☐ See page:

(See Page 3)

Sevenson Environmental Services, Inc.

CRITICAL LIFT PLAN

Critical Lift Load and Capacity Calculations

Section F Total Lifted Weight to be Lifted by Tailing Crane			
1.	Percent of Total Equipment Weight **	%	(** Generally 50+% based on CG and movement during up righting)
2.	Amount of Equipment Weight (A4 x F1)	Lbs	
3.	Weight of Headache Ball	Lbs	
4.	Weight of Block	Lbs	
5.	Weight of Lifting Bar	Lbs	
6.	Weight of Slings and Shackles	Lbs	
7.	Weight of Jib Erected	Lbs	
8.	Weight of Jib Headache Ball	Lbs	
9.	Weight of Cable Load (Load Fall)	Lbs	
10.	Auxiliary Boom Head	Lbs	
11.	Other	Lbs	
12.	Total Weight of Load/Equipment Lifted by Tailing Crane (F2 through F11)	Lbs	
Source of Load Weight:			
(Name Plate, Drawings, Calculated, Scale Ticket)			

Weight and Calculations		
Print Name	Signature	Date
By:		
Verified By:		

Section G Capacities for Tailing Crane Based on Configuration			
1.	Make and Model of Crane:		
2.	Counter Weight Size:	Type of Boom:	
3.	Lifting Arrangement		
a.	Max. Radius During Lift	Feet	
b.	Length of Boom	Feet	
c.	Angle of Boom at Pick	Degree	
d.	Angle of Boom at Set	Degree	
	Rated Capacity Under Most Severe Conditions		
	1. Over Rear	Lbs	
	2. Over Front	Lbs	
	3. Over Side	Lbs	
f.	Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or rear)		Lbs
4.	Jib		
a.	Is the Jib to be used Yes ☐ No ☐		
b.	Length of Jib	Feet	
c.	Jib Angle	Degree	
d.	Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or rear)		Lbs
5.	Cable		
a.	Number of Parts	#	
b.	Size of Cable	Inches	
c.	Maximum Capacity	Lbs	

(See Page 4)

Sevenson Environmental Services, Inc.

CRITICAL LIFT PLAN

Critical Lift Load and Capacity Calculations

Section H Percent of Cranes Capacity Tailing Crane			
1.	$\frac{Total\ Lifted\ Weight}{Rated\ Capacity} * 100$		%

Section I Size of Slings for Tailing Crane			
1.	Sling Selection		
a.	Type of Arrangement		(Spreader, Vertical Slings, etc.)
b.	Number of Slings to Hook	Capacity	Lbs
c.	Sling Size	Inches	
d.	Sling Length	Feet	
e.	Sling Capacity (at angle used)	Lbs	
f.	Number of Slings to Load	#	
g.	Total Rigging Capacity (Ie x If)		Lbs

Comments:

Sketch of rigging arrangements available	Yes ☐	No ☐	See page:

Sevenson Environmental Services, Inc.
CRITICAL LIFT PLAN

Pre –Lift Checklist

		Yes	No
1.	Crane operator meets company qualification requirements?	☐	☐
2.	Lift Calculations and rigging plan completed?	☐	☐
3.	Are all required approvals/permits signed?	☐	☐
4.	Crane inspections up to date (Annual/Monthly/Daily)?	☐	☐
5.	Weather conditions and wind speed acceptable?	☐	☐
6.	Has the stability of the ground been assured?	☐	☐
7.	Matting and/or outrigger pads inspected and approved?	☐	☐
8.	Electrical equipment and power lines at required distance?	☐	☐
9.	Rigging inspected for defects?	☐	☐
10.	Engineering lifting lugs fabricated and installed correctly?	☐	☐
11.	Connecting/disconnecting means been developed?	☐	☐
12.	Have the safety precautions been reviewed?	☐	☐
13.	Is survey equipment required?	☐	☐
14.	The total lifted weight is below 95% capacity?	☐	☐
15.	Signal person(s) assigned?	☐	☐
16.	Safe Plan of Action (SPA) completed?	☐	☐
17.	Pre-lift meeting/Activity Hazard Analysis held?	☐	☐
18.	Hoist area and load path cleared of non-essential personnel?	☐	☐
19.	Crane set up per the lift plan (radius, configuration, etc.)?	☐	☐
20	Rigging equipment and tag line(s) installed per plan?	☐	☐

Personnel Completing Check List			
Print	Signature	Title	Date

Appendix I
Environmental Protection Plan

Appendix J
Spill Prevention and Control Plan

Appendix K

Protection from Wildfire Smoke Plan

1. PURPOSE

The purpose of this safety management procedure (SMP) is to outline the steps to be taken when project sites are impacted by smoke and other air pollutants caused by wildfires.

2. SCOPE

This program applies to all Sevenson projects and operations where:

- The current Air Quality Index (AQI) for PM2.5 is 101 or greater, regardless of the AQI for other pollutants, and
- There is reasonable expectation that employees are exposed to wildfire smoke.

The following workplaces and operations are exempt from this SMP.

- Enclosed buildings or structures in which the air is filtered by a mechanical ventilation system and the employer ensures that windows, doors, bays, and other openings are kept closed, except when it is necessary to open doors to enter or exit.
- Enclosed vehicles in which the air is filtered by a cabin air filter and the employer ensures that windows, doors, and other openings are kept closed, except when it is necessary to open doors to enter or exit the vehicle.
- The site safety professional can demonstrate that the concentration of PM2.5 in the air does not exceed a concentration that corresponds to a current AQI of 101 or greater by measuring PM2.5 levels at the worksite in accordance with Section 8.
- Employees exposed to a current AQI for PM2.5 of 101 or greater for a total of one hour or less during a shift.

3. INTRODUCTION

Wildfires can produce hazardous smoke that can be potentially windblown to project sites. Wildfire smoke is a complex mixture of carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons and other organic chemicals, nitrogen oxides, and trace minerals. The individual compounds present in smoke number in the thousands.

Particulate matter (PM2.5) is the principal pollutant of concern from wildfire smoke for the relatively short-term exposures (hours to weeks). PM2.5 can be inhaled into the deepest recesses of the lung and may be a potential health concern. Another pollutant of concern during smoke events is carbon monoxide, which is a colorless, odorless gas produced by incomplete combustion of wood or other organic materials. Carbon monoxide levels are highest during the smoldering stages of a fire, especially in very close proximity to the fire.

The guidance in this SMP was developed from guidance in CalOSHA and Oregon OSHA's rules for protecting workers from wildfire smoke.

4. DEFINITIONS

4.1. AIR QUALITY INDEX

The method used by the U.S. Environmental Protection Agency (U.S. EPA) to report air quality on a real-time basis. Current AQI is also referred to as the "NowCast," and represents data collected over time periods of varying length to reflect present conditions as accurately as possible.

The current AQI is divided into six categories as shown in the table below, adapted from Table 2 of Title 40 Code of Federal Regulations, Part 58, Appendix G.

Air Quality Index (AQI) Category for PM2.5	Levels of Health Concern
0 to 50	Good
51 to 100	Moderate
101 to 150	Unhealthy for Sensitive Groups
151 to 200	Unhealthy
201 to 300	Very Unhealthy
301 to 500	Hazardous

4.2. GOOD

Air quality is satisfactory, and air pollution poses little or no risk. AQI green, 0 to 50.

4.3. HAZARDOUS

Health warning of emergency conditions: everyone is more likely to be affected. AQI maroon, 301 and higher.

4.4. HEAVY WORK

Heavy work involves lifting no more than 100 pounds at a time with frequent lifting or carrying of objects weighing up to 50 pounds.

4.5. LIGHT WORK

Light work involves lifting no more than 20 pounds at a time with frequent lifting or carrying of objects weighing up to 10 pounds. Even though the weight lifted may be very little, a job is in this category when it requires a good deal of walking or standing, or when it involves sitting most of the time with some pushing and pulling of arm or leg controls. To be considered capable of performing a full or wide range of light work, you must have the ability to do substantially all of these activities.

4.6. MEDIUM WORK

Medium work involves lifting no more than 50 pounds at a time with frequent lifting or carrying of objects weighing up to 25 pounds.

4.7. MODERATE

Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution. AQI yellow, 51 to 100.

4.8. PM2.5

Solid particles and liquid droplets suspended in air, known as fine particulate matter, with an aerodynamic diameter of 2.5 micrometers or smaller and measured in micrograms per cubic meter ($\mu g/m^3$).

4.9. Sedentary Work

Sedentary work involves lifting no more than 10 pounds at a time and occasionally lifting or carrying articles like docket files, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required occasionally, and other sedentary criteria are met.

4.10. Sensitive Groups

Individuals with pre-existing health conditions and those who are sensitive to air pollution are among those likely to experience health problems from exposure to wildfire smoke. Examples of sensitive groups include: people with lung disease such as asthma or chronic obstructive pulmonary disease (COPD), including bronchitis and emphysema, and those who smoke; people with respiratory infections, such as pneumonia, acute bronchitis, bronchiolitis, cold, flu, or those recovering from severe respiratory illness; people with existing heart or circulatory problems, such as irregular heartbeat, congestive heart failure, coronary artery disease, angina, and those who have had a heart attack or stroke; children under 18 years old, and adults over age 65; pregnant women; people with diabetes; and people with other medical or health conditions which can be exacerbated by exposure to wildfire smoke as determined by a physician or other licensed healthcare provider.

4.11. Unhealthy

Some members of the public may experience health effects; members of sensitive groups may experience more serious health effects. AQI red, 151 to 200

4.12. Unhealthy for Sensitive Groups

Members of sensitive groups may experience health effects. The public is less likely to be affected. AQI orange, 101 to 150.

4.13. Very Heavy Work

Very heavy work involves lifting objects weighing more than 100 pounds at a time with frequent lifting or carrying of objects weighing 50 pounds or more.

4.14. Very Unhealthy

Health alert: The risk of health effects is increased for everyone. AQI purple, 201 to 300.

4.15. Wildfire Smoke

Emissions from unplanned fires in wildlands, which may include adjacent developed and cultivated areas to which the fire spreads or from where it originates.

4.16. WILDLANDS

Uncultivated and sparsely populated geographical areas covered primarily by grass, brush, trees, slash, or a combination thereof.

5. RESPONSIBILITIES

5.1. MANAGEMENT AND SUPERVISION

- Determine if there is harmful exposure to wildfire smoke or pollutants.
- Supervisors are responsible for ensuring workers are educated and protected from wildfire smoke and pollution when the AQI exceeds 101.

5.2. EMPLOYEES

- Employees are responsible notify management and supervision if they are sensitive population to wildfire smoke or its pollutants. Employees are not required to disclose the medical condition making them susceptible to poor air quality.
- Follow the guidelines established for controlling or minimizing exposure to wildfire smoke or its pollutants.

6. EXPOSURE ASSESSMENT AND CONTROLS

6.1. ASSESSMENT

The AQI is an index for reporting daily air quality and tells you how clean or polluted the air is and what associated health effects might be a concern for you. The AQI focuses on health affects you may experience within a few hours or days after breathing polluted air. When a federal or state agency issues an air quality health advisory due to wildfire smoke, the AQI for PM2.5 shall be checked prior to starting work for the day at an affected site and periodically thereafter. To check the AQI in your specific region is with the EPA's Air Now tool at https://www.airnow.gov/).

Monitoring locations from the EPA's AirNow tool may be of considerable distance from the job site locations and may not reflect the actual conditions present. Direct reading particulate monitors set up to measure PM2.5 may be used to determine a more accurate AQI for the site as outlined in Section 8.

6.2. CONTROLS

6.2.1. ENGINEERING

Appropriate engineering controls may include, but are not limited to, temporarily relocating outdoor workers to available indoor areas or vehicles where the air is adequately filtered or using portable air purifiers equipped with HEPA filters (or similar high-efficiency air filters) that are sufficient in number and performance for the size of the enclosed area where used.

6.2.2. ADMINISTRATIVE

Prior to allowing work outdoors or in buildings, structures, or equipment without air filtration an assessment of the work to be performed shall be conducted by the project manager, site safety professional, and superintendent when the AQI exceeds 200 to identify work as sedentary, light, medium, heavy, or very heavy work.

6.2.2.1. SEDENTARY AND LIGHT WORK

Follow Section 8 Protocols as AQI increases.

6.2.2.2. MEDIUM WORK

Follow Section 8 Protocols as AQI increases. No work permitted when AQI exceeds 500 without concurrence from Director of Health and Safety as well as Sevenson's Corporate Officer In Charge of the project or Owner.

6.2.2.3. HEAVY AND VERY HEAVY WORK

Follow Section 8 Protocols as AQI increases No work permitted when AQI Exceeds 250.

6.2.3. VOLUNTARY USE OF RESPIRATORY PROTECTION

Voluntary use of filtering facepiece respirators (i.e., N95, P95, N99, P99, P100) whenever employee exposure to PM2.5 is at or above 35.5 µg/m^3 (AQI 101), even after the implementation of engineering and administrative controls, ensure that appropriate NIOSH-approved filtering facepiece respirators are provided to employees for voluntary use, strictly for protection against wildfire smoke, when such use would not expose the wearer to a hazard associated with a substantially more serious injury or illness than the potential acute health effects of wildfire smoke exposure. Ensure that such respirators are:

- Provided and replaced as needed at no cost to employees by either:
  - Distributing filtering facepiece respirators directly to each exposed employee; or
  - Maintaining a sufficient supply of filtering facepiece respirators that is readily accessible and known to any exposed employee at each work location. This respirator supply must be in a location that does not restrict or hinder employee access to respirators or discourage the replacement of a respirator when needed.
- Stored and maintained so that they do not present a health hazard to the user.
- Voluntary use of respiratory protection does not require medical authorization or fit testing.

6.2.4. REQUIRED USE OF RESPIRATORY PROTECTION

Required use of filtering facepiece respirators (i.e., N95, P95, N99, P99, P100) in accordance with Sevenson *SMP-24 Respiratory Protection Program*. Whenever

employee exposure to PM2.5 is at or above 200.9 µg/m^3 (AQI 251), even after the implementation of engineering and administrative controls, ensure that employees wear appropriate NIOSH-approved filtering facepiece respirators when such use would not expose the wearer to a hazard associated with a substantially more serious injury or illness than the potential acute health effects of wildfire smoke exposure.

Whenever employee exposure to PM2.5 is at or above 500.4 µg/m3 (AQI 501), even after the implementation of engineering and administrative controls, ensure that employees wear appropriate NIOSH-approved air purifying respirators (negative pressure or powered air purifying in half-face or full-face with P100 cartridges) that protects wearers from PM2.5 when such use would not expose the wearer to a hazard associated with a substantially more serious injury or illness than the potential acute health effects of wildfire smoke exposure in accordance with Sevenson *SMP-24 Respiratory Protection Program*.

7. PROTOCOLS

7.1. AQI 100 OR LESS

If the AQI is 100 or less, continue to monitor AQI hourly or if there are significant visual changes in sight distance, see SMP-73 Table 1, *Air Quality Index (AQI) Values and Equivalent Concentrations for PM2.5, and 5-3-1 Visibility Index Values*.

7.2. AQI 101 TO 250

If the AQI exceeds 101 and is less than 251, inform employees the AQI is greater than 101 but less than 250 and provide a NIOSH approved filtering facepiece respirator such as a N95, to all exposed employees for voluntary use.

7.3. AQI 251 TO 500

If the AQI exceeds 251 and is less than 500, inform employees the AQI exceeds 251 but is less than 500 and require all exposed personnel working outdoors or in buildings or equipment without air filtration to wear NIOSH approved respirators, such as a N95 or an air purifying respirator with P100 cartridges.

7.4. AQI 501 TO 2,500

If the AQI exceeds 501 and is less than 2,500, inform employees the AQI exceeds 501 and an air purifying respirator with P100 cartridges is required to work outdoors or in buildings or equipment without air filtration.

7.5. AQI 2,501 OR GREATER

If the AQI exceeds 2,501, the use of full-face tight-fitting air purifying respirator with P100 cartridges is required. The only work types permitted during these conditions are those that involve critical systems that cannot be shut down due to permit requirements issued by government order.

SMP-73 Table 1*
Air Quality Index (AQI) Values and Equivalent Concentrations for PM2.5, and 5-3-1 Visibility Index Values

AQI Values	PM2.5 Conc in µg/m^3	Visibility Index Values (How far you can see)
0 – 50	0.0 – 12.0	Over 15 miles
51 – 100	12.1 – 35.4	5 – 15 miles
101 – 150	35.5 – 55.4	3 – 5 miles
151 – 200	55.5 – 150.4	1 – 3 miles
201 – 300	150.5 – 250.4	1 mile
301 and higher	250.5 and higher	less than 1 mile
*Table 1: Air Quality Index (AQI) Values and Equivalent Concentrations for PM2.5, and 5-3-1 Visibility Index Values, OAR 437-002-1081, *Protection from Wildfire Smoke*, Appendix B: Information for Wildfire Smoke Protection.		
Note: The AQI, as used in this standard, is a recognized proxy to identify worker exposure to PM2.5 for which traditional occupational exposure limits have not been established. The EPA AQI risk category labels were specifically developed to advise the public of the community health risk levels associated with air quality conditions in a general population setting. The AQI calculation allows for a measurement that is easily accessible to both employers and employees		
Note: When estimating the current AQI value by using the 5-3-1 Visibility Index, determine the limit of your visual range by looking for distant targets or familiar landmarks such as mountains, mesas, hills, or buildings at known distances (miles). The visual range is that point at which these targets are no longer visible. Ideally, the viewing of any distance target should be made with the sun behind you. Looking into the sun or at an angle increases the ability of sunlight to reflect off the smoke, and thus making the visibility estimate less reliable.		

8. MEASURING PM2.5 LEVELS AS THE WORKSITE

If readily available a real time particulate meter set up to measure fugitive particles with an aerodynamic diameter 0.3 µm or less up to and including 2.5 µm may be used to establish the localized AQI. The results of this sampling shall be compared to the PM2.5 Conc in µg/m^3 column in SMP-73 Table 1, *Air Quality Index (AQI) Values and Equivalent Concentrations for PM2.5, and 5-3-1 Visibility Index Values* to determine the job site AQI.

The person supervising, directing, or evaluating job site monitoring for PM2.5 shall have the training and experience necessary to apply this section and to ensure the correct use of the monitor and interpretation of the results, so that exposures are not underestimated.

9. TRAINING

Training shall be provided to employees in a language and manner readily understandable by employees.

9.1. THE HEALTH EFFECTS OF WILDFIRE SMOKE

Although there are many hazardous chemicals in wildfire smoke, the main harmful pollutant for people who are not very close to the fire is “particulate matter,” the tiny particles suspended in the air.

Particulate matter can irritate the lungs and cause persistent coughing, phlegm, wheezing, or difficulty breathing. Particulate matter can also cause more serious problems, such as reduced lung function, bronchitis, worsening of asthma, heart failure, and early death.

People over 65 and people who already have heart and lung problems are the most likely to suffer from serious health effects.

The smallest -and usually the most harmful -particulate matter is called PM2.5 because it has a diameter of 2.5 micrometers or smaller.

9.2. The Right to Obtain Medical Treatment Without Fear of Reprisal

Employers shall allow employees who show signs of injury or illness due to wildfire smoke exposure to seek medical treatment and may not punish affected employees for seeking such treatment. Employers shall also have effective provisions made in advance for prompt medical treatment of employees in the event of serious injury or illness caused by wildfire smoke exposure.

9.3. How Employees Can Obtain the Current AQI for PM2.5

Various government agencies monitor the air at locations throughout California and report the current AQI for those places. The AQI is a measurement of how polluted the air is. An AQI over 100 is unhealthy for sensitive people and an AQI over 150 is unhealthy for everyone.

Although there are AQIs for several pollutants, this guidance only uses the AQI for PM2.5.

The easiest way to find the current and forecasted AQI for PM2.5 is to go to AirNow.gov and enter the zip code, town, or city where you will be working. The current AQI is also available at fire.AirNow.gov, an interactive map which also provides information about some fires and smoke plumes. You can also visit the website of your local air district. Employees who do not have access to the internet can contact their employer for the current AQI. The EPA website enviroflash.info can transmit daily and forecasted AQIs by text or email for particular cities or zip codes.

The AQI for PM2.5 may also be determined by the use of real time particulate instrumentation set up to measure PM2.5 or less particulate as out lined is section 8.0 of the SMP.

9.4. The Requirements of This SMP

If employees may be exposed to wildfire smoke, then Sevenson is required to find out the current AQI applicable to the worksite. If the current AQI for PM2.5 is 151 or more, the employer is required to:

- Check the current AQI at the start of each shift and periodically thereafter.
- Provide training to employees.
- Lower employee exposures.

- Provide respirators and encourage/require their use.

9.5. THE TWO-WAY COMMUNICATION SYSTEM

Sevenson shall alert employees when the air quality is harmful and what protective measures are available to employees.

Sevenson shall encourage employees to inform their employers if they notice the air quality is getting worse, or if they are suffering from any symptoms due to the air quality, without fear of reprisal.

The employer's communication system is: [specify means of communication for the site, i.e., radio, text message, email, phone call, etc.].

9.6. METHODS TO PROTECT EMPLOYEES FROM WILDFIRE SMOKE

Sevenson shall take action to protect employees from PM2.5 when the current AQI for PM2.5 is 101 or greater. Examples of protective methods include:

- Locating work in enclosed structures or vehicles where the air is filtered.
- Changing procedures such as moving workers to a place with a lower current AQI for PM2.5.
- Reducing work time in areas with unfiltered air.
- Increasing rest time and frequency and providing a rest area with filtered air.
- Reducing the physical intensity of the work to help lower the breathing and heart rates.

Sevenson's engineering and administrative controls and protocols at this worksite are: [explain the engineering and administrative controls established for the worksite as well as the protocols in section 7.0].

9.7. THE IMPORTANCE, LIMITATIONS, AND BENEFITS OF USING A RESPIRATOR WHEN EXPOSED TO WILDFIRE SMOKE

Respirators can be an effective way to protect employee health by reducing exposure to wildfire smoke when they are properly selected and worn. Respirator use can be beneficial even when the AQI for PM2.5 is less than 151, to provide additional protection.

When the current AQI for PM2.5 is 101 or greater, employers shall provide their workers with proper respirators for voluntary use. If the current AQI is greater than 251, respirator use is required, except in emergencies.

A respirator should be used properly and kept clean.

The following precautions shall be taken:

- Employers shall select respirators certified for protection against the specific air contaminants at the workplace. Respirators must be certified by NIOSH, the National Institute for Occupational Safety and Health of the U.S. Center for Disease Control and Prevention. A label or statement of certification should appear

on the respirator or respirator packaging. It will list what the respirator is designed for (particulates, for example).

- Surgical masks or items worn over the nose and mouth such as scarves, T-shirts, and bandannas will not provide protection against wildfire smoke. An N95 filtering facepiece respirator, shown in the image below, is the minimum level of protection for wildfire smoke.

- Read and understand the manufacturer's instructions on the respirator's use, care, and replacement, along with any warnings regarding the respirator's limitations. If the respirator is reusable, read and understand the instructions for cleaning and maintenance. The manufacturer's instructions must be followed except for medical evaluations, fit testing, and shaving of facial hair, which are recommended but not required for voluntary use of filtering facepiece respirators.
- Do not wear respirators in areas where the air contains contaminants for which the respirator is not designed. A respirator designed to filter particles will not protect employees against gases or vapors, and it will not supply oxygen.
- Employees should keep track of their respirator so that they do not mistakenly use someone else's respirator.
- Employees who have a heart or lung problem should ask their health care provider before using a respirator.

9.8. When Fit Testing and Medical Clearance For Use of Respiratory Protection Is Required.

Fit testing and medical clearance are only required when respiratory protection becomes mandatory. Voluntary use of respirators does not require fit testing or medical clearance.

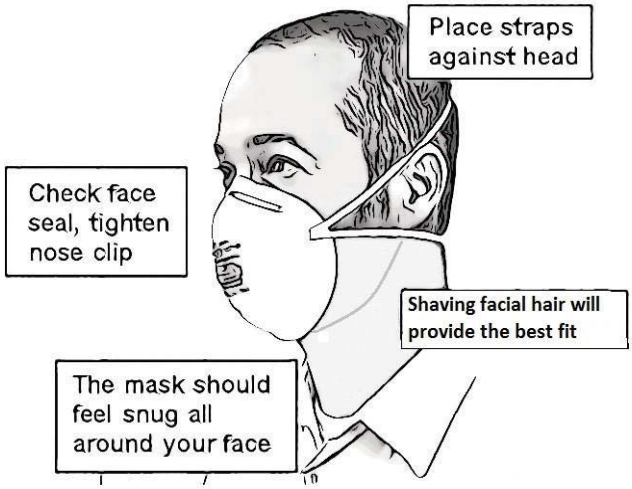
9.9. How To Properly Put On and Use the Respirators Provided By Their Employer.

To get the most protection from a respirator, there must be a tight seal around the face. A respirator will provide much less protection if facial hair interferes with the seal. Loose-fitting powered air purifying respirators may be worn by people with facial hair since they do not have seals that are affected by facial hair.

The proper way to put on a respirator depends on the type and model of the respirator.

For those who use an N95 or other filtering facepiece respirator mask that is made of filter material:

- Place the mask over the nose and under the chin, with one strap placed below the ears and one strap above.
- Pinch the metal part (if there is one) of the respirator over the top of the nose so it fits securely.



For a respirator that relies on a tight seal to the face, check how well it seals to the face by following the manufacturer's instructions for user seal checks. Adjust the respirator if air leaks between the seal and the face. The more air leaks under the seal, the less protection the user receives.

Respirator filters should be replaced if they get damaged, deformed, dirty, or difficult to breathe through. Filtering facepiece respirators are disposable respirators that cannot be cleaned or disinfected. A best practice is to replace filtering facepiece respirators at the beginning of each shift.

If you have symptoms such as difficulty breathing, dizziness, or nausea, get medical help immediately.

10. RESOURCES

- California Code of Regulations, title 8, section 5141.1, *Protection from Wildfire Smoke.* https://www.dir.ca.gov/title8/5141_1.html
- California Code of Regulations, title 8, section 5141.1, *Protection from Wildfire Smoke,* Appendix B. https://www.dir.ca.gov/title8/5141_1b.html
- Rules to Address Employee Exposure to Wildfire Smoke, Adopted Rules, Oregon OSHA Administrative Order 4-2022. https://osha.oregon.gov/OSHARules/adopted/2022/ao4-2022-text-smoke-exposure.pdf#appendixA
- Oregon OSHA Health and wildfire smoke rules – summary. https://osha.oregon.gov/OSHARules/adopted/2022/heat-wildfire-smoke-rule-summary-2022.pdf
- AirNow web site. https://www.airnow.gov
- OSHA resources for wildfires. https://www.osha.gov/wildfires/osha-resources
- Sevenson *SMP-24 Respiratory Protection Program*