

**SITE WIDE SAFETY AND HEALTH PLAN**  
**FOR THE**  
**TVA KINGSTON FOSSIL PLANT**  
**ASH RELEASE RESPONSE**

*Prepared for:*



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### APPROVALS

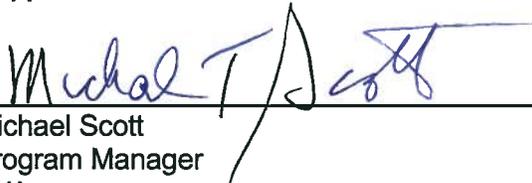
By their signature, the undersigned hereby certify that this Site Wide Safety and Health Plan has been reviewed and approved for use at the TVA Fly Ash Response Site in Kingston, TN.



Leo Francendese  
On-Scene Coordinator  
EPA



Date



Michael Scott  
Program Manager  
TVA



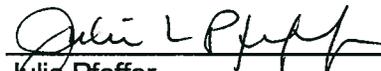
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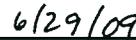
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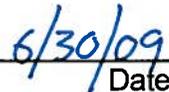
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Date

## **1.0 INTRODUCTION**

### **1.1 Background**

This Jacobs Engineering (Jacobs) Site Wide Safety and Health Plan (SWSHP) addresses the safety and health management and practices for the Tennessee Valley Authority's (TVA) Kingston Fossil Plant Ash Release Response Project.

This revision as well as subsequent revisions of the SWSHP incorporates the specific requirements of 29 Code of Federal Regulations (CFR) 1910.120; Hazardous Waste Operations and Emergency Response (HAZWOPER). Plans written prior to this revision were not required to address the HAZWOPER requirements; however they were adequately protective of employee safety and health. The major changes in this and future revisions primarily address terminology, work zones, worker training and medical monitoring requirements as required by HAZWOPER.

The SWSHP addresses the identified hazards and presents procedures to be followed by site personnel to protect their health and safety. Activities performed under this SSHP will comply with Occupational Safety and Health Administration (OSHA) Regulations 29 Code Parts 1910 and 1926, US Army Corps of Engineers EM385 (as applicable), TVA Safety Program and Jacobs Procedures, Guidelines, and Programs. See Appendix A for a list of programs, procedures, and guidelines that will be applicable on this project. The electronic format ensures currency and consistency of these documents, and they are available for examination by project participants if requested.

The SWSHP will be revised periodically as determined by the project team and changes will be communicated to all holders of controlled copies of the SWSHP.

### **1.2 Activities**

The components that are covered by this SWSHP are 1) dredging of ash from rivers and auxiliary water bodies; 2) ash processing which will include drying and volume reduction by movement of ash and windrow management, loading of processed ash for transfer to disposal areas; 3) support activities which will include dust control, water management environmental sampling and site maintenance; 4) dike construction; and 5) recovery activities which will include cenosphere collection, debris removal, community outreach and dock reconstruction.

#### **1.2.1 Dredging**

Dredging, both mechanical and hydraulic, will occur throughout the response project. Mechanical dredging will be used to remove larger debris from the river channels before the hydraulic dredge begins. Excavators and cranes fitted with "clamshell" buckets will be situated on floating barges. Hydraulic dredges will follow to remove the ash from the river bodies at a prescribed depth. Dredging has been segregated into three phases:

The primary objective of dredging is to clear the Emory River channel to minimize ash migration and the potential for upstream flooding.

A second priority is to dredge the remaining ash within the river channel and mouth of the embayment while minimizing disturbance of legacy, native sediments.

## **1.2.2 Ash Processing and Load-Out**

Current plans are for the ash processing site to be subdivided into at least two areas. The Ash Recovery Area is located on the east side of the triangle. Dredge slurry will be discharged into an ash disposal channel, the slurry will flow at a rate which will allow the solids to fall out where they will be removed from the ash disposal channel using excavators. The material will then be subjected to a drying and volume reduction by windrowing. The water will continue and discharge into the plant sluice channel to allow further settling. Solids will be removed from the sluice channel in the same manner as the ash disposal channel and will be trucked over to the processing area using articulating dump trucks.

The Ash Temporary Storage Area will be reserved primarily for short term storage and additional drying. From these piles, ash will be loaded into rail cars and / or trucks for transport to off-site disposal locations.

## **1.2.3 Infrastructure and Support Activities**

The site facilities, grounds and common use equipment will be constructed and maintained as necessary. Dust control will be implemented continuously on site using water trucks and hydro-seed trucks spraying flexterra. The ash will also be re-contoured to limit the chance for dust generation and erosion. Water management will include controlling the flow of surface runoff through the slide area and managing water in the windrow areas. Site maintenance will involve site facilities, roads and ancillary facilities.

## **1.2.4 Environmental Sampling**

Environmental sampling activities will occur on and off site involving air, water, soil, flora and fauna. These activities will at times occur on the Emory and Clinch Rivers.

## **1.2.5 Dike Construction**

Dike areas will be reconstructed or strengthened as required on site. This will primarily involve the placement of materials around existing dike areas.

## **1.2.6 Recovery Activities**

Numerous activities will be conducted on and off the TVA property in areas impacted by the slide. This will include debris removal from rivers, cenosphere collection and private dock repair / reconstruction. In addition, a portion of the community outreach program will involve activities to respond to complaints and concerns from local residents as well as area enhancements to the surrounding community.

## **1.3 Summary of Major Hazards**

These activities present the following major hazards.

- Chemical hazards associated with handling fly ash;
- Physical hazards associated with working on or near water;
- Working around heavy equipment, railroad and rail equipment used for materials handling, transfer and movement;

- Operation of watercraft and associated hazards of the marine environment;
- Dredging operations;
- Crane operations;
- Diving operations; and
- Exposure to temperature extremes.

#### **1.4 Beyond Zero**

Beyond Zero Performance describes Jacobs approach and expectations for both safety and project execution. We will achieve this level of performance excellence through teamwork and partnering with our client and our Subcontractors, and through the participation of every person on this project.

All site personnel are entitled to a safe working environment, individually and collectively; we are responsible for our own safety and that of our fellow employees.

We (and our client) believe the following:

All incidents are preventable through proper planning, tasking, and execution of plans as written.

Any goal less than Zero Incident Performance is unacceptable and sends the message that incidents cannot be prevented.

Active participation by all personnel is required to achieve Beyond Zero Performance. This includes Jacobs, the client, and all Subcontractor personnel.

If any incident does occur, it must be reported and investigated to identify root causes, take corrective actions, and communicate the lessons learned.

Various Beyond Zero initiatives will be developed and rolled out with support and approval of key Jacobs staff on site.

#### **1.5 Initial Site Specific Training**

Initial site specific training will be conducted per the requirements of 29 CFR 1910.120 (b)(4)(iii). All personnel being provided access to the site to perform work in restricted areas such as exclusion zones and / or contamination reduction zones will complete a pre-entry briefing. The pre-entry briefing will address the anticipated site hazards associated with assigned tasks as well as work methodologies and control measures used to mitigate those hazards. If conditions or procedures change, pre-entry briefings will be repeated as necessary.

Those workers in offices and support zones who do not enter controlled areas will be required to attend a site specific health and safety orientation before being allowed unescorted site access. The orientation will focus on the general site layout, locations of restricted / controlled areas, emergency procedures and HSE program elements.

## **1.6 Subcontractor Adherence Policy**

Jacobs uses a Subcontractor Adherence Policy as described in HSEP 2.9. The process; which only applies to Jacobs subcontractors, is a tiered approach in maintaining subcontractor safety compliance. Jacobs realizes that not all companies understand the inherent need to operate safely under all conditions or may not be experienced in Jacobs' procedures. The subcontractor shall be mentored through a series of written notifications when health, safety, or environmental discrepancies are noted. Rarely does the policy need to be exercised, however this contract method of compliance is readily available to ensure a safe work site.

By attending site orientation, being trained on the specifics of this plan and in writing agreeing to comply with its requirements, all personnel affirm their belief in and commitment to the Zero Incident Process. The site safety and health professionals will continually evaluate planning and project execution to ensure that safety is embedded in the work process.

All contractors on site will be required to comply with the requirements of this SWSHP.

## **2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**

This section specifies the Jacobs Project Organization HSE responsibilities. Changes in personnel or roles may occur during the course of the project. Changes to the SSHP will be made accordingly.

### **2.1 Program Manager**

The Program Manager (PM) HSE role follows:

- Ensures implementation of this program through coordination with the Program Health and Safety Manager (PHSM).
- Conducts periodic site inspections.
- Participates in major incident investigations/safety briefings.
- Ensures the SWSHP has all of the required approvals before any site work is conducted.
- Ensures that the PHSM or Site Safety and Health Officer (SSHO) is informed of project changes which require modifications of the site safety plan.
- Has overall project responsibility for Program Health and Safety.

### **2.2 Deputy Program Manager**

The Deputy Program Manager (DPM) HSE role follows:

- Assists the PM in executing his HSE responsibilities,
- Maintains primary HSE responsibility in the absence of the PM,
- Serves as a key liaison between the HSE staff, project managers and functional managers.

### **2.3 Project Construction Manager**

The Project Construction Manager (CM) HSE role follows:

- Ensures that HSE requirements are implemented in conjunction with the PHSM and SSHO,
- Ensures that field work is scheduled with adequate personnel and resources to complete the job safely,
- Ensures that adequate communication between field crews and emergency response personnel is maintained,
- Ensures field site personnel are adequately trained and qualified to work at the site,
- Enforces site health and safety rules,

- Investigates major incidents,
- Assists in conducting daily safety meetings,
- Conducts periodic site inspections,
- Acts as the Emergency Coordinator (EC).

## **2.4 Program Health and Safety Manager**

The Program Health and Safety Manager (PHSM) HSE role follows:

- Oversees development and approval of the Site Wide Safety and Health Plan;
- Oversees development and approval of the task specific addendums;
- Serves as the primary contact to review health and safety matters that may arise;
- Maintains availability for project emergencies and staffing support;
- Approves revised or new safety protocols for field operations;
- Approves individuals who are assigned SSHO responsibilities;
- Approves SSHO to fulfill other project roles;
- Coordinates revisions of this SSHP with field personnel;
- Coordinates changes in levels of personal protective equipment with the SSHO;
- Evaluates exposure monitoring data and adjusts the SSHP as necessary;
- Assists in the investigation of major accidents;
- Conducts periodic inspections for compliance with the SSHP;
- Provides periodic safety briefings and training to staff personnel.

## **2.5 Site Safety and Health Officer**

The Site Safety and Health Officer HSE role follows:

- Maintain availability on site during field activities to implement the SSHP;
- Conducts project specific training and initial worker site orientation;
- Work as part of the project team to ensure implementation of site safety; ensure that all health and safety activities identified in site safety plans are conducted and/or implemented and correct any deficiencies;

- Identify operational changes that require modifications to health and safety procedures and site safety plans, and ensure that the procedure modifications are implemented and documented through changes to the site safety plan;
- Direct and coordinate health and safety monitoring activities;
- Ensure that proper personal protective equipment (PPE) is utilized by field teams;
- Assist in conducting and documenting daily safety briefings;
- Monitor compliance with this SSHP;
- Notify PM, CM, and PHSM of all accidents/incidents;
- Coordinate with the program management staff in any incident investigation;
- Maintain Accident/Incident Report Forms;
- Determine upgrade or downgrade of PPE based on site conditions and/or real-time monitoring results;
- Ensure that monitoring instruments are calibrated;
- Report to PHSM to provide summaries of field operations and progress;
- Maintain health and safety field log books;
- Has stop work authority.

## **2.6 Health and Safety Technician**

The Health and Safety Technician (HST) assists the SSHO in worker exposure monitoring per the requirements of the SSHP.

The HST role follows:

- Assists in ensuring that PPE is utilized by field teams;
- Calibrates and utilizes monitoring instruments;
- Provides safety support activities as deemed necessary by the SSHO;
- Maintains air monitoring records in the established database on site;
- Reports information on field activities to the SSHO; and
- Maintains health and safety logs as necessary.

## **2.7 Occupational Medical Consultant**

An occupational medical consultant will be used as necessary to establish medical monitoring protocols for site workers when conditions warrant. The occupational medical consultant for this program is Dr. Hugh H. Macaulay. Dr. Macaulay is the founder of Injury Care of Colorado, 3535 S. Lafayette, Suite 203, Englewood, CO 80113, 303-722-0613.

### **3.0 SITE HISTORY AND PROJECT DESCRIPTION**

This section provides background information for the Kingston Fossil Plant (KIF) and the Emory River.

#### **3.1 Location**

The KIF is located on the Emory River arm of Watts Bar Reservoir, which feeds into the Clinch River (Figure 3-1). The Emory River borders the KIF to the east. The Emory River rises on the Cumberland Plateau in Morgan County, Tennessee and crosses into Roane County near Harriman, Tennessee. Flow on the Emory River in the vicinity of KIF is not controlled upstream by flood control or navigation structures, but the river elevation is controlled by Watts Bar Dam located downstream of KIF.

#### **3.2 Background and Site Description**

On Monday, December 22, 2008, just before 1 a.m., a coal fly ash release occurred at TVA's Kingston Fossil Plant, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River and surrounding land.

Ash, a by-product of a coal-fired power plant, is stored in containment areas. Failure of the dredge cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the area contained about 9.4 million cubic yards of ash. The dike failure released about 5.4 million cubic yards (cy) of coal ash that now covers about 300 acres and affected about 40 area homes.

Fly ash filled the Swan Pond Embayment on the north side of the KIF property adjacent to the failed dredge cell. A dike was constructed in the eastern portion of the Swan Pond Embayment to contain that fly ash while a response action plan is developed by TVA and approved by TDEC and EPA. Fly ash to the west (formerly upstream) of the Swan Pond dike is contained from further migration toward the Emory River by the dike. Fly ash also entered the channel and overbank areas of the riverine section of the Emory River. TVA is recovering the material outside of the Swan Pond Embayment by use of dredging operations.

The U.S. Coast Guard has issued an advisory that the Emory River is not navigable from mile marker zero through mile marker 4.

#### **3.3 Site Characterization Data**

The fly ash that was released to the Emory River originates from the coal burned in boilers for power production at KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand. Trace amounts of arsenic, selenium, cadmium, boron, thallium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

#### **3.4 Comprehensive Environmental Response, Compensation, And Liability Act (CERCLA) Order**

On May 11, 2009 an order was implemented to apply the requirements of CERCLA to the response and cleanup actions associated with this program. As such, requirements related to

29 CFR 1910.120, also known as HAZWOPER, will be followed. Health and safety procedures prior to this order did not specifically incorporate the requirements of HAZWOPER but were found to be adequately protective of worker safety and health. Key changes in this document associated with this order relate primarily to terminology, site control and training requirements which include:

- Training to be conducted per the general requirements of 29 CFR 1910.120 and the specific requirements of 29 CFR 1910.120, sections (e)(3), (e)(4), (e)(5), (e)(6), (e)(8);
- Implementation of a documented supervised field experience duration for all site workers, per the requirements of 20 CFR 1910.120(e)(3)(i) and (ii) typically a 24 hour work period;
- Establishing signage around the perimeter of the site stating, "Environmental Clean-up in Progress, Do Not Enter, No Trespassing";
- Application of  $0.050 \text{ mg/m}^3$  as an 8 hour time weighted average (TWA) occupational exposure limit and  $0.025 \text{ mg/m}^3$  as the 8 hour TWA action level for crystalline silica (respirable fraction);
  - Measured levels at the action level will initiate increased site control of the associated task area, proper signage at entry points to the work area, increased worker monitoring and additional worker training on control measures;
  - Measured levels at the occupational exposure limit will implement all of the action level requirements, use of Level C personal protective equipment by all impacted individuals, personal decontamination and medical surveillance.
  - Exposure limits will be adjusted utilizing the Brief and Scala model if work shifts vary significantly from 8 hour/day, 40 hour/week shifts.
- Increased focus on personal hygiene which includes the deployment of hand washing stations, boot cleaning locations and other decontamination activities as warranted to minimize the dispersion of fly ash to personal vehicles, worker residences and support / office areas.

## **4.0 POTENTIAL HAZARDS OF THE SITE**

This section presents an assessment of the physical, chemical and biological hazards that may be encountered during the execution of this project. Additional information can be found in the Activity Hazard Analyses (AHAs) located in Appendix E. The AHAs provide the work practices, engineering controls, and/or personal protective equipment necessary to protect the workers from injury.

As work progresses, additional AHAs will be developed as needed.

It should be noted that TVA has the following items which are considered "Zero Tolerance". These items are further discussed within this document where applicable and shall be addressed as appropriate for the task on all job safety analyses:

- Working at heights greater than 4' without proper protective systems or personal fall arrest devices.
- Entering unprotected excavations.
- Not properly locking out / tagging out equipment prior to removing machine guarding or entering areas of operation.
- Entering confined spaces without proper permitting, training and equipment.

### **4.1 Physical Hazards**

Most safety hazards are discussed in the AHAs that have been developed for project tasks. Included in this section are physical hazards common to all phases.

#### **4.1.1 Slips, Trips and Falls**

The site includes significant areas of uneven ground, rip-rap, river banks and difficult walking / working surfaces. Considering slips, trips and falls are the most common cause of injury on this type of work site, considerable planning and care must be taken to minimize the likelihood of injury.

##### **4.1.1.1 Slips, Trips and Same Level Falls**

Whenever possible, walking surfaces will be designated and maintained to provide as level as possible of a walking surface. If areas are to be used repeatedly for foot traffic such as access ways to boat ramps, docks, or storage areas, it will be required to designate and maintain proper access to these locations. Special consideration must be given to walkways:

- Used by personnel carrying equipment and materials
- Used routinely for river or boat access
- Used by visitors and office personnel
- Intended to provide emergency egress from high hazard areas

- Routinely used by personnel working night shifts
- Around process equipment and stationary moving machinery

In addition to proper walkways, proper field footwear is essential to minimize risk to slips and trips. All field personnel are required to wear steel-toe work boots with adequate ankle support. Steel-toe shoes will not be worn in the field. Office personnel are encouraged to wear footwear that will provide adequate traction on the dirt walkways and wooden stairs in and around the field trailers.

#### **4.1.1.2 Falls from Elevation**

Falls from elevation can be mitigated a number of ways including; avoidance, process change, engineered fall protection systems such as standard railings or personal fall arrest systems. All of these approaches require significant advanced planning and coordination with the PHSM and SSHO. Details of how fall prevention will be implemented must be thoroughly established and all impacted personnel properly instructed prior to the activity taking place.

Both TVA and Jacobs maintain a zero tolerance policy on anyone violating fall prevention / protection requirements. This includes working outside of engineered systems, working at heights greater than 4' without personal fall arrest systems or improperly implementing established procedures.

#### **4.1.2 Heat Stress**

Heat stress is a significant potential hazard during summer months at the site. A heat stress prevention program will be implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing and for other personnel when the wet bulb globe temperature (WBGT) index exceeds TVA those established in TVA Health and Safety Procedure 806.

##### **4.1.2.1 Heat Stress Monitoring**

Monitoring will consist of either ambient, personal dosimetry or personal physiological techniques. Discussion of these various approaches are established in section 5.3 of this document.

If conditions warrant, a work rest regimen will be implemented to decrease the risk of personnel from developing heat related conditions. Work rest cycles vary based on the results of ambient or personal monitoring, the type of work being performed and the acclimatization level of workers as prescribed in TVA Health and Safety Procedure 806.

##### **4.1.2.2 Heat Stress Conditions**

Any individual exhibiting signs of heat stress conditions must be provided appropriate treatment immediately.

The following is a brief description of common heat related ailments and their treatment:

**Heat Fatigue:** Symptoms of heat fatigue include impaired performance of skilled, sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the stress and insure adequate hydration before a more serious heat-related condition develops. It may be necessary in some cases of heat fatigue to remove the worker from strenuous activity for the

entire day since symptoms may return more rapidly and with increased severity when heat exposure continues.

**Heat Exhaustion:** Symptoms include headache, nausea, vertigo, and weakness. This condition responds readily to prompt treatment such as cooling and rehydration. Workers suffering from heat exhaustion should be removed from the hot environment and provided fluids and adequate rest. Any worker suffering from signs of heat exhaustion must be removed from strenuous work activity for the day.

**Heat Stroke:** Heat stroke is a **MEDICAL EMERGENCY**. It occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. The primary signs and symptoms of heat stroke are confusion and irrational behavior, loss of consciousness, convulsions, hot, dry skin and an abnormally high temperature.

Any worker exhibiting heat stroke symptoms should be immediately removed from their protective clothing without regard to chemical decontamination. Medical emergency responders must be called and the worker cooled to the extent possible until emergency response personnel arrive. Workers having suffered this ailment must have medical clearance from a physician prior to returning to work.

#### **4.1.3 Cold Stress**

During the colder months of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The effects of low temperatures are further exacerbated by the proximity of the river. Discussion of cold stress monitoring is provided in Section 5.4 of this document.

Adequate plans and procedures must be established to minimize the impact of these potential hazards, including adequate emergency accommodations for workers on water. Protection of workers from cold stress will include additional clothing, warm up periods, etc. (see Jacobs HSEP 11.4).

#### **4.1.4 Noise**

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Suspected high noise operations will be evaluated to determine if protective measures are warranted.

Worker monitoring for noise exposure is established in section 5 of this document.

Workers with 8-hour TWA exposures exceeding 85 decibels a weight (dBA) will be included in a Hearing Conservation Program as required by 29 CFR 1910.95 and 1926.52.

#### **4.1.5 Work On or Around Water**

A significant amount of the work on this project will be conducted on or around water. Hazards associated with working around water are unique and are to be included in AHAs. In addition, prior to performing work on the water in boats outside of the immediate dredge areas, a Float Plan must be submitted, tracked and maintained by a dedicated individual on shore. The form to be used for float plans is found in Appendix D.

In preparing the AHAs, consideration will be given to the elements of Jacobs HSEP 15.3, U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, Sections 19 and 30, and any applicable TVA requirements or USCG regulations. For more extensive information on working on or around water, refer to the Marine Operations (Appendix H).

Unless otherwise posted, personal flotation devices (PFD) will be required when working within 6' of the edge of water. If exceptions to this requirement are necessary, they must be established on the task specific AHA with concurrence from the HSE group.

All groups engaged in diving operations shall as a minimum meet the requirements of 29 CFR 1910 Subpart T Commercial Diving Operations and TVA procedure 814, "Underwater Diving". This includes but is not limited to training requirements and the creation of a dive plan.

In the event that navigation changes are required in the river, they must be coordinated through the U.S Coast Guard, Nashville.

#### **4.1.6 Utility Clearance**

##### **4.1.6.1 Underground Utilities**

Whenever intrusive activities are conducted whether land or water based, the threat of contact with underground utilities exists. This would include utilities such as electrical, gas, sewage, etc. Before the execution of any intrusive activities (or any type of marine activity), the TVA process for obtaining an excavation permit and utility clearance, found in Appendix D, must be completed and an assessment of the presence of underground utilities made. The utility clearance agency will be notified and the utility companies will mark existing utilities. The clearance reference number will be recorded and kept current.

Prior to any workers entering excavations, a designated competent person must perform an excavation inspection and document the review on an Excavation Inspection form, such as the one found in Appendix D. All excavations in which workers must enter have to meet the basic requirements for sloping, shoring or shielding found in 29 CFR 1926, Subpart P; TVA procedure 804 and Jacobs HSEP 8.4.

##### **4.1.6.2 Overhead Utilities**

Adequate clearance must be established and maintained for all overhead utilities. These include utilities crossing waterways in and around the site. Prior to conducting work in areas where overhead utilities exist, it is essential that a field inspection be conducted to verify adequate distances will be maintained for all equipment intended to be used in that location. As a minimum, 10' of clearance will be maintained between equipment and overhead utilities.

Clearance distances increase as voltage increase:

- For lines rated 50,000 volts or below, minimum clearance between the lines and any equipment part shall be 10 feet;
- For lines rated over 50,000 volts, minimum clearance between the lines and any equipment part shall be 10 feet plus 0.4 inches for each 1,000 volts over 50,000 volts, or twice the length of the line insulator, but never less than 10 feet.
- A minimum of 10' of clearance must be maintained from low voltage conductors such as phone, cable and similar conductors.

#### **4.1.7 Pinch Points / Cutting Edges**

Pinch points / cutting edges are a potential hazard in many areas of the work site such as in operating hand tools, vehicle doors, and transporting debris and materials. Pinch points or cutting edges are to be identified on the task-specific Job Safety Analysis (JSA) and reviewed during tailgate meetings. Work gloves are to be worn by personnel with exposure to pinch points. Cut resistant gloves are to be worn by personnel with exposure to cutting edges.

When activities require the removal of any machine guarding over and around pinch points, it is necessary to implement the lock-out / tag-out (LOTO) procedures to prevent inadvertent start up.

#### **4.1.8 Low Illumination**

Low illumination from diminishing daylight or nightfall due to work schedules is a hazard that may affect all site operations. If general illumination levels are less than 10 foot-candles, supplemental lighting will be required. The supplemental lighting must be from pole mounted floodlights, portable temporary lighting stands or equivalent sources. Vehicle headlights, flashlights, or hard hat mounted spotlights are not to be used in lieu of adequate general illumination.

#### **4.1.9 Vehicles and Heavy Equipment Safety**

Requirements of TVA Safety Procedure 711 must be met in regard to all heavy equipment operations. The nature of the work will result in vehicle traffic around the site in the form of heavy equipment such as excavators, backhoes, bulldozers, front end loaders, dump trucks, and field vehicles. Vehicles will also be entering and exiting the site on a regular basis to/from the surface roads.

On-site controls will include wearing of high-visibility vests when working at any location on the site outside of the immediate office area. Upon initial site mobilization, vehicle and pedestrian traffic patterns on-site will be established and properly communicated to the work crews and equipment operators. Traffic control persons will be identified and used as necessary at any of the intersections of the site and public roads.

Swing radius around heavy equipment must be controlled to prevent workers inadvertently walking into the swing path of equipment. In some instances this may require barricades, cones or caution tape to be utilized. All personnel must establish eye contact and acknowledgement from equipment operators prior to entering the swing radius of operating equipment. When operators are required to interact or talk with ground personnel they must ground their equipment (buckets, etc.) and disengage the controls in order to prevent inadvertent movement.

Under no circumstances are equipment or motor vehicle operators to talk on cell phones while moving / operating equipment.

#### **4.1.10 Rail Activities**

All site employees involved in railroad operations must attend training per TVA HSE Procedure 445. This includes laborers lining railcars, equipment operators loading railcars and supervision / management associated with those activities. Requirements for working safely around rail operations are established in TVA HSE Procedure 812 and include:

- Keeping adequate body clearance to avoid injury. Adequate distance is at least arm length from any rotating or moving equipment. Special care shall be given to all pinch points where an employee could be caught between or struck by moving equipment;
- Maintaining awareness when stepping from between rail cars for equipment working on adjacent tracks;
- Reporting defects or obstructions found on tracks or bridges to your supervisor immediately. The Supervisor/Foreman shall coordinate the issuance of a work order request. If the tracks in question are utilized by the contract rail carrier, the Master Dispatcher for the Railroad Company shall be notified;
- Refraining from crawling under a railroad car unless clearance precautions have been taken for maintenance or repair.
- Clearance precautions shall be as a minimum:
  - Three way communications shall be utilized to discuss the work scope and duration of activity with the operator and the switchman
  - The rail car shall not be moved until the maintenance employee communicates face to face with the locomotive operator and switchman the release of the equipment
- Avoiding crawling over couplings unless clearance precautions have been taken for maintenance or repair;
- Not riding on the lead footboard of an engine or sitting on handrails, uncoupling rods, or draw heads of engines or rail cars;
- Avoiding walking or standing on the tracks except in the performance of assigned duties.

#### **4.1.11 Crane Activity**

All crane activities will comply with TVA Safety Procedure 802 including crane operator certification meeting TVA requirements. All rigging activities must comply with TVA Safety Procedure 721A and 721C including qualification of riggers.

All crane usage on site requires a lift plan, the basic Lift Plan and crane inspection paperwork can be found in Appendix D.

For repetitive lifts such as those occurring during debris removal in the river, a single plan can be completed which must establish the basic parameters allowed for that activity.

For those lifts meeting the definitions of a "High Hazard Lift" per TVA requirements the High Hazard Lift Paperwork found in TVA Procedure 802 must be completed.

For those lifts meeting the definition of "Critical Lift" per Jacobs requirements the Critical Lift paperwork found in Appendix D must be completed.

Only one set of lift paperwork must be completed, if the lift meets both criteria, the TVA paperwork will be completed.

The following parameters define a high hazard lift per TVA requirements:

- When the lift is 90% of net capacity (Net Capacity is the load chart capacity of a mobile crane for a given configuration minus capacity deductions i.e. everything mounted or stowed on the boom as well as everything hanging from the boom tip; examples of typical capacity deductions are weight of main hook block, weight of slings and rigging, weight of auxiliary hook, weight of wire rope from boom tip sheave to auxiliary hook, etc.) or greater for mobile cranes and 100% of capacity for overhead cranes.
- Planned engineered lifts when the capacity of an overhead crane is to be exceeded.
- When rigging, attachments, or methods are employed that are not covered in OSHA, ASME, or Rigging Handbook requirements.
- When operating on an inherently hazardous location or under severe weather or emergency conditions.
- When operating with specific operational limits due to abnormal conditions existing with equipment, load, rigging, or facilities.
- Any lift whose failure could damage a high-value, long-procurement item(s) or significantly impact plant operations, shutdown, or equipment availability as determined by site management/superintendent, plant manager, or equivalent level of management.
- Any lift, in which the crane working clearances to adjacent equipment or electrical power lines are within plus 10 percent of minimum clearances specified in the ASME standard for the respective crane, excluding approved hot-line work.
- Any lift utilizing more than one crane or more than one hook.
- Any lift of humans with platforms attached to a load line.
- Any lift of material/equipment over humans (under special/unique conditions requiring such lifts).

The following conditions define Critical Lifts per the Jacobs requirements:

- All lifts over 50 tons.
- When the load exceeds 85% of the cranes capacity, as shown on applicable crane manufacturer's load capacity charts for the configuration to be used. If the percent of capacity is greater than 95%, the lift requires written approval by the applicable Vice President or Group Vice President.
- Lifts involving more than one crane lifting a common load, except for off-loading trucks for materials storage, where the capacity does not exceed 50% for either crane. Two-crane-lifts with overhead cranes are not critical lifts unless one crane exceeds 50% of its capacity.
- Lifts involving non-rigid (flexible) objects such as tank shells.

- Lifts over active work areas, office buildings, public roadways or public transportation systems, e.g., light rail system, expressways, etc.
- Lifts made where the load or crane boom pass over or adjacent to active process facilities, pipelines, or power lines.
- Lifts in confined or tight work areas.
- Other activities that should be considered for classification by the Site Manager as a critical lift would include:
  - Lifts over water including crane set up on barges, docks, etc.
  - Lifts made on rubber.
  - Lifts for highly valuable or hazardous material.
  - When replacement time for damaged load exceeds two months.
  - Lifts using more than 200 feet of boom.

#### **4.1.12 Electrical Hazards**

Electrical generators and associated equipment used on site must be properly positioned, set up, and maintained. Since the grounding of most portable generators is accomplished through the equipment frame being in contact with the ground, all generators must be set up on the ground or a means of adequate grounding established and tested.

Outlets will require ground fault circuit interrupters which should be checked for proper operation prior to each use. All permanently installed outlets or any portable sources on site longer than a month with ground fault circuit interrupter (GFCI) protection are to be tested and documented on a monthly basis.

Properly rated extension cords with three prong plugs are required and must not display any signs of physical damage such as broken or cut insulation. Cords will not be placed where they may be run over by vehicles or create trip hazards.

Appropriate lock-out, tag-out methods must be employed when working on electrical equipment or when deficiencies in existing electrical equipment have been identified. Work on energized electrical equipment will not be performed on this site without proper review and coordination from the CM and SSHO.

All work on electrical equipment must be performed by a properly trained and licensed electrician.

#### **4.1.13 Pressurized Systems**

Various pressurized systems exist on site and include pipelines, hydraulic hoses and pneumatic control lines. Basic hazard controls must be implemented for routine use of these systems including whip checks, pins for twist lock fittings, warning signs and worker awareness.

Prior to disassembling any components of a pressurized system, residual or stored energy must be properly bled off. Once this is accomplished, LOTO controls will be implemented to prevent

inadvertent start-up of the equipment during maintenance activities. Under no circumstances are adjustments such as bolt tightening to be made on a pressurized system.

During disassembly and maintenance, control of the “line of fire” must be established to prevent any workers from entering in or standing in areas where a component failure would result in impact to personnel.

#### **4.1.14 Moving Machinery / Equipment**

Numerous pieces of machinery and equipment will be utilized on this site. Proper precautions and controls must be implemented to prevent inadvertent contact to rotating components such as belt drives, chains, sprockets, pulleys, etc.

All manufacturer guards must be clearly identified and remain in place while equipment is in routine operation. During periods of maintenance or repair, LOTO must be implemented to prevent inadvertent equipment start-up. Only authorized persons will remove machine guarding for maintenance and repair activities.

During AHA review, all rotating equipment and machinery must be identified to all impacted personnel. In addition, the types of guards in use and the location of all emergency stops must be covered with the work crew supporting the activity.

#### **4.1.15 Overhead Hazards**

The nature of site activities inherently creates the potential for overhead hazards to exist in most work areas. These hazards are frequently changing scope and location. As such, it is required that all field personnel utilize hard hats while in any work areas outside of the trailer complex. Existing and anticipated overhead hazards should be identified during the pre-task planning process and AHA review.

Overhead work activities such as crane work, work from scaffolding, work from elevated platforms and ladders must be clearly identified to those on the ground. This may require the use of danger tape in the ground area impacted by overhead activities. In areas of high foot traffic, physical barricades may be necessary.

#### **4.1.16 Fire / Explosion**

Fire and explosion prevention includes proper housekeeping, proper storage of flammable / combustible materials, use of the hot work permit system, worker training and other controls essential to risk mitigation.

It is also essential that fire extinguishers are strategically placed throughout the site as required. In general extinguishers should be available:

- In all pieces of heavy equipment
- On all boats, barges, dredges and other floating work platforms
- In all trailers
- In all site vehicles

- At all refueling areas
- In all areas where gas or diesel powered equipment is in use

Special conditions apply to refueling activities such as means for proper grounding and bonding, use of proper refueling equipment, worker training and spill control. In the event fixed refueling facilities will be utilized, it is required that pre-use inspections be conducted. These can be coordinated through the SSHO.

Hot work on this site is defined as open flame, welding, or spark generating activity. For all hot work on site, a Hot Work Permit, found in Appendix D must be issued by a site health and safety professional or their designee.

#### 4.1.17 Eye, Face, and Hand

Numerous sources of eye, face and hand injuries exist on the site. All personnel in the field will utilize ANSI Z87 approved safety glasses with side shields as a basic component of PPE. In addition, protection such as face shields or welding helmets shall be worn in addition to safety glasses when using cut-off wheels, handheld grinders, wire wheels, welding equipment and oxy-fuel torches.

Hand injuries can be prevented a number of ways including using the right tool for the job, maintaining handheld equipment in good working order, using the right type of gloves, keeping hand away from pinch points and keeping hands from between stationary objects and moving equipment.

#### 4.2 Chemical Hazards

Chemical hazards found on site include constituents of fly-ash, chemicals used in equipment such as fuel, oil, hydraulic fluids and process chemicals associated with routine plant operations such as ammonia gas.

All listed exposure limits are based on time weighted averages (TWA) for an 8 hour work shift and 40 hour work week. In instances when work shifts extend beyond these parameters, consideration will be given to adjust the exposure limit accordingly. Such adjustments must take into consideration the extended exposure time and the decreased recovery time associated with longer work shifts. Initially the Brief and Scala model will be used to implement adjustments to exposure limits for extended work shifts. This model assumes a linear adjustment and does not take into account the specific body burden and toxicology associated with specific chemicals. It is generally considered to be the most conservative model in use.

As an initial guideline, adjustments will be based on the following table:

Shift	Percentage of Original Exposure Limit to Be Used
5 days by 10 Hours (50)	70%
5 days by 12 Hours (60)	50%
6 days by 12 Hours (72)	42%

#### **4.2.1 Properties of Fly Ash Components**

Fly ash from coal combustion will be the principal material to be processed and handled during the project. Fly ash is comprised of the following:

- Crystalline Silica (3-7 percent)
- Amorphous Silica(33-57 percent)
- Aluminum Oxide (18-31 percent)
- Iron Oxide (5-25 percent)
- Calcium Oxide (1-6 percent)
- Magnesium Oxide (1-2 percent)
- Titanium Oxide (1-2 percent)
- Inorganic arsenic (16-210 ppm)

With the exception of arsenic, crystalline silica has the lowest permissible exposure limit and the highest relative concentration of all constituents listed for fly ash. As such, it will be used as the indicator contaminant in conducting worker exposure monitoring and will typically be the driver for personal protective equipment upgrades.

Crystalline silica does not pose a contact or incidental ingestion hazard. As such, routine work clothing will be worn in areas where airborne limits are below designated permissible exposure limits. Good personal hygiene, such as hand and face washing, minimizing clothing contact and boot cleaning stations will be utilized to prevent gross quantities of fly ash being transported into office areas, personal vehicles and off site.

Table 4-1 presents additional information on these chemical constituents. Worker monitoring for potential exposure to fly ash components is discussed in section 5 of this document.

#### **4.2.2 Site and Process Chemicals**

Routine chemicals such as fuels, hydraulic fluids and oils are expected to be used on site. Under normal use, these do not expect to present any unusual chemical hazards to site personnel. If work in enclosed spaces is required, further evaluation will be necessary to determine potential impact.

Any other chemicals intended to be used on site must be coordinated and cleared through operations and the SSHO prior to their use. If necessary, controls will be established and monitoring protocols implemented to evaluate worker exposure.

**TABLE 4 – 1  
 FLY ASH CONSTITUENT INFORMATION**

CONSTITUENTS	CAS #	SITE ACTION LEVEL <sup>1</sup>	SITE EXPOSURE LIMIT <sup>2</sup>	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	NIOSH METHODS
SILICA – QUARTZ <sup>3</sup> RESPIRABLE	14808-60-7	0.025 MG/M <sup>3</sup>	0.050 MG/M <sup>3</sup>	INHALATION, SKIN AND/OR EYE CONTACT, INGESTION	COUGH, DYSPNEA WHEEZING, PROGRESSIVE RESPIRATORY SYMPTOMS (SILIEOSIS), IRRITATION EYES	EYES, RESPIRATORY SYSTEM	7500 7601 7602
CRISTOBALITE	14464-46-1						
ALUMINUM OXIDE	1344-28-1	2.5 MG/M <sup>3</sup>	5 MG/M <sup>3</sup>	INHALATION, INGESTION, SKIN AND/OR EYE CONTACT	IRRITATION EYES, SKIN, RESPIRATORY SYSTEM	EYES, SKIN, RESPIRATORY SYSTEM	0500 0600
IRON OXIDE	1309-37-1	2.5 MG/M <sup>3</sup>	5 MG/M <sup>3</sup>	INHALATION, INGESTION	BENIGN, PNEUMOCONI OSIS	RESPIRATORY SYSTEMS	7300 7301 7303 9102
CALCIUM OXIDE	1305-78-8	2.5 MG/M <sup>3</sup>	5 MG/M <sup>3</sup>	INHALATION, INGESTION, SKIN AND/OR EYE CONTACT	IRRITATION EYES, SKIN, UPPER RESPIRATORY TRACT, ULCER, PERFORATION, NASAL SEPTUM	EYES, SKIN, RESPIRATORY SYSTEM	7020 7303
ARSENIC <sup>4</sup> (INORGANIC)	7440-38-2	0.005 MG/M <sup>3</sup>	0.01 MG/M <sup>3</sup>	INHALATION, SKIN ABSORPTION, SKIN AND/OR EYE INGESTION	ULCERATION OF NASAL SEPTUM, DERMATITIS, GASTROINTESTINAL DISTURBANCE, PERIPHERAL NEUROPATHY, RESPIRATORY IRRITATION	LIVER, KIDNEYS, SKIN, LUNGS, LYMPHATIC SYSTEM	7300 7301 7303 7900 9102

1. Based on 50% of the 8 hour site exposure limit

2. Based on the lower of the values recognized by OSHA or the ACGIH. Crystalline silica value is based on TOSHA levels which is typically lower than the sample-specific calculated OSHA level.

3. Suspected human carcinogen

4. Confirmed human carcinogen

### **4.3 Biological Hazards**

During the course of the project, there is a potential for workers to come into contact with biological hazards, such as animals, insects, and plants. The AHA will include specific hazards and control measures for these hazards for each task.

#### **4.3.1 Animals**

During site operations, animals such as dogs, cats, foxes, rabbits, raccoons, skunks, mice and snakes may be encountered. Workers shall use discretion and avoid all contact with animals. If erratic animal behavior is noticed, personnel will stay clear of the animal and notify the SSHO as soon as possible. If these animals present a problem, efforts will be made to remove them from the site by contacting a licensed pest control technician. If any dead birds are found, the SSHO must be notified immediately.

The focus of this plan is on venomous snakes that are present in Eastern Tennessee, Copperhead and rattlesnake (timber and western pigmy rattler). The Timber rattlesnake is yellow with black or brown cross-bands or heavy striplings of black or dark brown.

If a snake bite occurs, the victim must be immediately transported to the nearest medical facility. In addition, the snake should be identified if possible by noting color, markings, and size. Interim first aid can be provided by applying ice to the bite area and keeping the victim calm.

#### **4.3.2 Insects**

Insects, such as mosquitoes, ticks, bees, and wasps, may be present during certain times of the year. Workers are encouraged to use insect repellents and follow good work and housekeeping practices, control of food wastes, removal of standing water, use of insect repellents, and diligence should minimize the potential for problems to arise as a result of insects.

#### **4.3.3 Stinging Insects**

Yellow jackets, wasps, and similar insects may be present in our work areas. Work areas should be checked for the presence of nests/hives prior to setting up the site. Any workers known to be allergic to these insects should relay this information to their supervisor, SSHO and associated crew members. If the employee carries an epinephrine pen to counteract stings, they should instruct their counterparts on the proper use of the device in the event they become incapacitated and cannot self administer the injection.

#### **4.3.4 Spiders**

In eastern Tennessee, spiders of potential medical concern are the brown recluse and black widow. Spiders may hide in clothing and PPE. Clothing should be inspected prior to donning. If personnel sustain a spider bite, it is to be reported to the SSHO. Information on these two spiders follows.

*Brown Recluse* is a small size arachnid; it measures approximately 7-12mm (1/4" - 1/2') long. The brown recluse spider color is generally brown, its body showing a peculiar cephalothorax with a dark brown spot in a violin form; the legs are light brown and the abdomen, of an oval aspect, is dark brown, yellow, or greenish yellow. The most important characteristic is the existence of 3 pairs of eyes in the cephalothorax.

*Black Widow* is 1.5 in (38 mm) long, 0.25 in (6.4 mm) in diameter with a colored hourglass shape on their abdomens, most people who are bitten suffer no serious damage—let alone death. But bites can be fatal—usually to small children, the elderly, or the infirm. Fortunately, fatalities are fairly rare; the spiders are nonaggressive and bite only in self-defense, such as when someone accidentally sits on them.

#### 4.3.5 Ticks

All personnel and subcontractors should be aware of the potential presence of ticks in wooded areas. Rocky Mountain Spotted Fever is the most prevalent tick-borne disease in Eastern Tennessee and may be transmitted by a dog tick. The early clinical presentation of Rocky Mountain spotted fever is often nonspecific and may resemble many other infectious and non-infectious diseases. Initial symptoms of Rocky Mountain spotted fever may include:

Fever, nausea, vomiting, muscle pain, lack of appetite and severe headache.

Specific precautions include:

- Wearing hooded coveralls to cover your body as much as possible. Light color clothing makes spotting of ticks easier.
- Eliminating possible paths by which the tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape or gators may be utilized to help seal cuffs and ankles).
- If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized.
- Conducting periodic and frequent (e.g., hourly) surveys of your clothing for the presence of ticks. Remove any ticks/insects that become attached to clothing.
- Using insect/tick repellents per the directions on the label. Repellents containing the compound N,N diethyl-meta-toluamide (DEET) can be used on exposed skin except for the face, but they do not kill ticks and are not 100 percent effective in discouraging ticks from biting. Products containing permethrin kill ticks, but they cannot be used on the skin -- only on clothing. When using any of these chemicals, follow label directions carefully.

When removing ticks, use tweezers, and grab the tick as closely to the skin as possible. Do not try to remove ticks by squeezing them, coating them with petroleum jelly, or burning them with a match.

- If you remove a very small tick and want to have it tested for a tick-borne disease, place it in a clean pill vial or tight-sealed plastic storage bag.
- Report any of the above symptoms and all tick bites to the SSHO for evaluation.

#### 4.3.6 Poisonous Plants

Plants such as poison ivy and poison sumac may be prevalent at the site during certain times of the year. Poison ivy is a kind of harmful vine or shrub in the cashew family, and usually grows as a vine twining on tree trunks or straggling over the ground. However, the plant often forms upright bushes if it has no support to climb upon. The leaves of poison ivy are red in early

spring. Later in spring, they change to shiny green. They turn red or orange in autumn. Each leaf is made up of three leaflets more or less notched at the edges. Two of the leaflets form a pair on opposite sides of the leafstalk, while the third stands by itself at the tip of the leafstalk.

The key to avoiding exposure is the ability to recognize and avoid the plants. If it is necessary to work in wooded areas, the Job Safety Analysis (JSA) should include discussion on how to recognize poisonous plants.

#### **4.3.7 Bloodborne Pathogens**

Those personnel who provide first aid could be exposed to blood-borne pathogens; therefore, all personnel who are trained in First Aid/CPR must participate in Bloodborne Pathogens (BBP) Training. The primary pathogens of concern are the Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV).

## **5.0 HEALTH HAZARD MONITORING**

Jacobs will monitor workers for exposure to potential occupational health hazards including air contaminants, noise, and thermal stress. The results will be compared to associated action levels to make decisions about adequacy of PPE levels, effectiveness of work practice controls and need for medical monitoring.

When feasible, direct reading instrumentation will be used as initial exposure screening to ascertain the need for integrated monitoring such as noise dosimetry, integrated air monitoring and personal heat stress monitoring. Direct reading instrument levels will also be used, when possible, to prioritize the sequence of integrated monitoring for the different exposure groups on site.

If feasible, while integrated monitoring is performed, direct reading levels will be recorded with the expectation that a correlation can be established between direct reading instrument levels and integrated monitoring. If an adequate correlation can be established, exposure checks can be performed using direct reading instruments.

In addition to worker monitoring, the work site and property perimeter will be monitored for total dust levels and when necessary to establish PPE zones within the work areas.

### **5.1 Air Contaminants**

#### **5.1.1 Integrated Air Sampling**

The PHSM, SSHO and health and safety technician, concurrent with activities that may generate contaminants in excess of 25% of the established permissible exposure limits (PEL) shall perform assessment and evaluation of exposures to airborne contaminants through integrated personal sampling. This may include sampling for silica, respirable dust or associated heavy metals known to exist in fly ash. (Refer to Appendix B, Health Hazard Evaluation for discussion of task anticipated contaminants, and exposure probability).

When integrated monitoring is performed, a statistically significant sample of workers per the direction of the PHSM and recommended National Institute of Occupational Safety and Health (NIOSH) sample methods will be selected for exposure monitoring. Nearby areas or employees may be monitored if it is suspected a dispersed impact of the contaminants of concern however, these personnel will not count towards the statistical significance of the task workers monitored.

##### **5.1.1.1 Exposure Group Evaluation**

An evaluation of all tasks will be performed to determine recognized exposure groups within each activity. Once this has been done, a review of existing data from samples already collected will be evaluated and if possible correlated to exposure groups identified for each task. If data gaps exist, additional monitoring will be performed until all exposure groups have been adequately characterized until at least a 95 percentile confidence level has been achieved.

##### **5.1.1.2 Routine Monitoring**

Once all exposure groups are adequately characterized, routine monitoring will be performed on those groups perceived to be at highest risk based on collected data. Typically this will include the following in order of highest priority:

- Exposure groups showing results higher than established action levels (50% of the PEL), but less than the PEL
- Exposure groups showing results greater than the established permissible exposure limits
- Exposure groups routinely working in areas with highest total dust concentrations independent of chemical specific results
- Exposure groups working in direct proximity to any of the above groups

Routine monitoring will be performed until statistical significance to at least the 95<sup>th</sup> percentile has been established for all groups and all data is properly validated.

Integrated monitoring should be documented on a form similar to the one found in Appendix D.

### **5.1.1.3 Cessation of Integrated Monitoring**

Reduction or cessation of air monitoring may be approved by the PHSM when the rationale for the modification is documented in a field change notice. Rationale may include the following conditions:

- Adequate exposure group characterization has been achieved, generally to the 95% confidence level. This may be independent of whether integrated results indicate exposures above or below the associated PEL,
- A process change occurs or engineering controls implemented which effectively decreases monitoring levels to less than 25% of the associated PEL,
- Completion or cessation of the associated task or removal of the associated exposure group from the exposure environment.

### **5.1.2 Direct Read Instrument Screening**

After the start of any new task, project phase or field activity and when feasible for the contaminants of concern, exposure groups should be screened using direct reading instruments. Screening must be performed as soon as possible, with areas of highest potential exposures screened first. Direct reading measurements should be recorded on the Direct Read Air Monitoring Form found in Appendix D.

In order to keep a screening approach conservative and adequately protective of worker health, direct readings for dust will assumed to be respirable dust and the upper percentage limits given for the various metals identified on fly-ash MSDS' will be assumed to be present in all dust readings.

Information used during screening can be used to help prioritize exposure groups for integrated monitoring, but in no way shall be used to replace integrated monitoring data.

## **5.2 Data Quality Assurance**

### **5.2.1 Calibration**

Instrument calibration shall be documented and included in a dedicated safety and health log book or on separate calibration pages. An equipment calibration log for direct reading instruments can be found in appendix D. All instruments shall be calibrated before use. A calibration check must be conducted at the end of shift or sampling event. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

Air sampling pumps used to collect worker exposure samples shall be calibrated before use with a calibration check being performed at the end of sampling or shift. Calibration shall be accomplished using a primary standard calibration system, e.g., bubble tube or dry piston calibrators. Results of the calibrations shall be included on air sampling data sheets. Differences in pre and post calibration may be cause for voiding associated data collected on those instruments.

### **5.2.2 Operations**

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment, will be maintained on-site by the SSHO for reference.

Samples sent to a laboratory for analysis shall be packaged to prevent damage, spillage, or leaks. An appropriate number of blank samples must be included per the NIOSH sample method being utilized.

An air or bulk sample data sheet with chain-of-custody information must accompany any sample shipped.

### **5.2.3 Data Review**

The PHSM will interpret monitoring data with peer review by another CIH as necessary. Personnel exposure results will be tabulated and posted at the site, as soon as possible after results are received. Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PHSM.

### **5.2.4 Laboratories**

Only analytical laboratories accredited by the American Industrial Hygiene Association (AIHA) shall perform chemical analysis of samples collected for assessment of employee exposures through integrated monitoring. The laboratory analysis will include field blanks, as required by the individual method or laboratory. Duplicate samples or splits with other laboratories may be used during the project. Laboratories may be required to submit a copy of their Accreditation Certificate and most recent Quarterly PAT Performance Report.

### **5.2.5 Noise Monitoring**

Noise monitoring may be conducted in areas adjacent to heavy equipment operation or any other potential elevated noise source including the site perimeter. Work zones will then be established and posted where hearing protection must be worn. Workers with 8-hour TWA

exposures exceeding 85 dBA (82 dBA for 12 hour TWA) must be included in their company's hearing conservation program.

### **5.3 Heat Stress Monitoring**

Monitoring shall be conducted as necessary to assist in determining initial work/rest regimens and to verify that these regimens are adequate as the work progresses. Heat stress monitoring shall be performed in accordance with guidance given in the latest edition of TVA Health and Safety Procedure 806. Two primary monitoring methods are used depending on the type of protective clothing worn: (1) WBGT monitoring (when wearing permeable protective clothing); and (2) Personal physiological monitoring (when wearing impermeable protective clothing).

#### **5.3.1 Ambient Monitoring**

Personal physiologic monitoring (heart rate and body temperature, and fluid loss, if possible) of workers shall be used to assist in determining work-rest regimens whenever impermeable protective clothing is worn.

##### **5.3.1.1 Wet Bulb Globe Temperature (WBGT) Technique**

Keep in mind that disposable clothing such as Tyvek and raingear may be considered air or water vapor impermeable. The WBGT index is not normally used to determine work/rest regimens for impermeable protective clothing because the index takes into account the effects of evaporative cooling. Impermeable protective clothing impedes evaporative cooling. However, TVA Health and Safety Procedure 806 provides guidelines on work/rest regimens when wearing protective clothing.

When appropriate, a WBGT index will be measured on the site per the guidelines established by the American Conference of Governmental Industrial Hygienists (ACGIH). When the measured index exceeds established limits for the type of work being performed, work / rest cycles will be implemented accordingly. This information will be passed to each subcontractor's SSHO for coordination and implementation with their operations managers.

##### **5.3.1.2 Adjusted Temperature Technique**

The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing are the ambient temperature and radiant (solar) heat.

These factors are combined into an index called the "adjusted temperature" using the formula shown below. In this formula, ambient temperature is measured with a dry bulb thermometer shielded from the sun, and the percent sunshine is the percent time the sun is not covered by clouds that are thick enough to produce a shadow.

Adjusted Temperature °F = ambient temperature °F + (13 x percent sunshine as a decimal)

The adjusted temperature values are then used to determine the initial work/rest regimen and physiological monitoring frequency. The length of the work cycle is governed by the frequency of the required physiological monitoring. Initially, rest periods are at least 15 minutes per cycle.

### **5.3.2 Personal Monitoring**

A person competent to accurately measure pulse and/or body temperature shall perform physiologic monitoring when other forms of monitoring for heat stress conditions are deemed inaccurate for the environment or activity. Measure the worker's pulse, either at the carotid (neck) or radial (wrist) artery at the beginning of the shift and periodically thereafter based on work activities. The following formula will be used to calculate the maximum pulse rate based on the age of an acclimatized worker.

Maximum pulse rate [beats per minute (bpm)] = (180 – age); if the pulse rate has not gone below 110 bpm after one minute, allow the worker to continue to recover.

If pulse measurement is not feasible, then aural temperature measurements may be used.

Like the pulse measurement, an initial measurement is necessary for a baseline value.

When core temperature for the acclimatized worker exceeds 101.3°F or for the unacclimatized worker exceeds 100.4°F, a rest period will be used to allow the worker to recover.

Any worker exhibiting signs of heat stress will be removed from the area for rest in a cool area. Heat strain symptoms will be monitored to ensure the worker does not progress into heat stroke. If the symptoms of heat stroke occur, the worker will be taken for immediate emergency care.

Monitoring results shall be recorded on a Heat Stress Physiological Monitoring form that must be approved by Jacobs. The form must be organized so that an individual worker's measurements for a full workweek can be recorded on one form. The program should contain, at a minimum, the elements of Jacobs HSEP 11.5, Heat Stress Control.

### **5.4 Cold Stress Monitoring**

Cold stress monitoring will be conducted in accordance with Jacobs HSEP 11.4. Considerations will include ambient temperature, wind speed, type of work being performed and thermal warming effects. Warming breaks may be implemented based upon these considerations

## **6.0 PERSONAL PROTECTIVE EQUIPMENT**

### **6.1 General Requirements**

The PPE outlined in this chapter has been selected according to the site characterization and analysis, job tasks, site hazards, intended use, and duration of potential employee exposures.

Maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring of effectiveness, and PPE limitations are outlined in this chapter.

A site specific respiratory protection program has been established when use of such equipment is intended to lessen the potential for adverse health effects to any employee. The respiratory protection program for the site is detailed in Appendix C, and is to be followed should respiratory protection be required.

For those activities where fly ash is being processed dry, modified D may be required. The key for exposure control is to prevent dust accumulation on clothing, hair and skin which in turn prevents prolonged passive exposures. Protective clothing in the form of dedicated coveralls and dedicated site work boots may be required if conditions warrant.

### **6.2 Levels of Protection**

#### **6.2.1 Level D Protection**

Minimum level of PPE required in all non-office work environments:

- Coveralls and clothing as dictated by the weather
- Steel-toe work boots (ANSI Z41)
- Safety glasses with permanent side shields (ANSI Z87)
- Hard hat, Type E, (ANSI Z89.1)
- High visibility yellow reflective vests (ANSI Z107)

#### **6.2.2 Level C Protection**

- Hooded chemical coveralls suitable for particulates (Dupont ProShield, NexGen or Tyvek)
- Gloves outer – leather, nitrile, neoprene or natural rubber
- Gloves inner - cotton
- Full face or half mask respirator with P-100 filter (dependent on protection factor needed)
- Chemical protective boots or boot covers
- Safety glasses (with half mask)

### **6.2.3 Levels A and B**

Based on present site knowledge, protective levels A and B will not be required.

### **6.3 Selection of PPE**

The selection of specific types of PPE will be conducted after a thorough evaluation of the potential hazards involved for each task. Site specific addenda will evaluate the planned tasks, potential chemical hazards, nature of environmental conditions, and other factors when determining specific types of PPE to be used. The initial PPE to be worn is provided in Appendix B.

Changes to initial levels of protection may be requested by Project Management whenever site conditions warrant, but must be approved by the SSHO and PHSM. PPE change request will be submitted on the PPE downgrade rationale form found in Appendix D. Once approved changes will be made to the associated AHA as appropriate.

## **7.0 ACTIVITY HAZARD ANALYSIS**

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid; control and mitigate those hazards. The AHAs will be used to train work crews in identifying and controlling hazards prior to beginning a task.

The operations staff and site safety professionals are responsible for developing accurate AHAs for work or to obtain them from subcontractors, and review them for accuracy.

### **7.1 Task Specific AHAs**

Based on the scope of work, AHAs have been developed for the tasks expected to be performed on site and are located in Appendix E. Additional AHAs will be developed as needed.

The AHA is used as an initial hazard analysis, planning, training and auditing tool and is usually completed by a health and safety professional. The Job Safety Analysis (JSA) is a task specific planning tool and is completed by the craft lead on the actual day of activity.

### **7.2 Job Safety Analysis Development from AHAs**

The superintendent or foreman as well as the work crew participate in developing the JSA as a collective effort. A JSA is required for each work task on a daily basis.

The following steps can be used to assist in developing a JSA:

1. Check Appendix E and determine if an AHA is already developed for the task, if so print a copy.
2. If no AHA is available, consult with the HSE staff to assist in completing one for your task(s).
3. Prior to starting work on the first day of your task, review the original AHA with your work crew. Consider weather, nearby activities, changing conditions and any relevant items which may impact your plans.
4. Cross items off your AHA which do not apply. Add items by annotating directly on the document. If necessary use a blank AHA to note your additions.
5. Have the entire work crew sign the annotated document which acknowledges their understanding of the hazards and controls. This annotated and signed AHA becomes your JSA.
6. On subsequent days, use the AHA review document found in Appendix D with your work crew to address specific details impacting your task. Have the work crew sign the review document. The annotated and signed review document becomes your JSA and must remain with the original AHA
7. Once the task is complete or at the end of the week, turn all annotated AHAs and JSAs in to the safety group.

### **7.3 New Phases of Work**

Hazard analysis for activities involving short term or discrete tasks can be addressed utilizing AHAs and JSAs. For larger or longer term pieces of work it may be necessary to develop an addendum to this SWSHP.

## **8.0 WORK ZONES, SITE CONTROL AND PERSONAL HYGIENE**

Site control will be maintained in part, by identifying, delineating or communicating the locations of exclusion zones (EZ), contamination reduction zones (CRZ) and support zones (SZ). Those zones are defined as follows:

- Exclusion Zones: Work areas where fly ash is handled, stockpiled or otherwise actively being manipulated.
- Contamination Reduction Zones: Areas where personnel and equipment cleaning and / or decontamination is occurring. Also areas where fly ash exists from the original release, but is not being actively manipulated.
- Support Zones: Office areas, equipment storage areas, public roads or other areas not meeting the definition of an EZ or CRZ. It is imperative that these areas remain free of fly ash. If this cannot be accomplished they may be deemed an EZ or CRZ as appropriate.

A figure providing an overview of the established site zones is provided in Appendix I. If permanent zone changes or zone changes exceeding one week are required, notification to the EPA On Scene Coordinator must be made using the form found in Appendix D. These changes must also be explained to those personnel working in impacted areas.

With the exception of those individuals who meet the exceptions outlined in Section 11, only those authorized workers who have completed proper HAZWOPER training, medical monitoring when applicable and site orientation will be allowed to enter an EZ or CRZ. This approach will help keep untrained personnel away from higher hazard operations and reduce the number of workers in work areas. As work progresses and field conditions are monitored, work zone boundaries and site drawings may be modified. Work zones shall be clearly identified and marked using fences, signs, or tape when necessary.

Cleaning or decontamination of site vehicles prior to leaving the associated CRZ may be required if the vehicles will be entering a support zone or traveling through nearby residential areas. Dedicated areas will be identified and equipped onsite for the vehicle cleaning, dust and dirt removal. Workers who are exposed to fly ash and dust at levels above the PEL may be expected to wear coveralls and dedicated boots to avoid transferring materials offsite or to their personal vehicles.

### **8.1 Basic Work Practices**

One of the most important aspects of site control is good personal hygiene. This should minimize dispersion of materials, eliminate potential worker exposure and help ensure valid sample results by precluding cross-contamination. Some recognized protocols are:

- Do not walk through areas containing fly ash unless integral to planned activities;
- Minimize direct handling or touching of materials;
- Make sure there are no cuts or tears in work clothing and PPE;
- Take particular care to protect any skin injuries;

- Stay upwind of material handling activities whenever possible;
- With the following exceptions, do not eat or drink or smoke in any EZ or CRZ;
  - Drinking water and smoking is allowed in established support zones within the EZ
  - Drinking water is allowed in enclosed cab, HEPA filtered heavy equipment provided the equipment interior remains clean. This will likely require daily wet wiping and vacuuming of equipment interior to meet this requirement
- Do not carry food into any EZ or CRZ work areas;
- Minimize the number of personnel and amount of equipment in an EZ or CRZ to that necessary for accomplishing the work;
- Whenever possible, designate site vehicles and equipment to be used for EZ, CRZ use only;
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned;
- Keep excavated materials in dedicated areas and out of the way of workers
- Upon exiting work areas, thoroughly wash hands and face, remove any debris from work clothing. If wearing Level C PPE, perform proper dry decon and dispose of used PPE properly.

## **8.2 Personnel Hygiene Facilities and Procedures**

With the exception of personnel remaining in clean vehicles throughout their visit, personnel exiting exclusion zones shall clean or be decontaminated as appropriate. All contaminated equipment and materials will be washed, rinsed and/or removed and disposed of in the EZ area or other designated location. Used PPE will be disposed of in designated containers. A personnel decontamination area will be set up according to the type of work being conducted and the contamination level present. Table 8-1 lists the typical configurations for the decontamination stations. Figure 8-2 is a schematic of a typical decontamination area layout.

If certain tasks require decontamination procedures that differ from the standard decontamination regimes described in this plan, then it will be specified in the Task-Specific AHAs, and will be reviewed with all personnel prior to work.

At a minimum, all personnel will thoroughly wash their hands upon exiting an EZ or CRZ prior to eating, drinking, smoking, or any other actions that would increase the risk of material transfer. When necessary, the arms and face should also be washed.

Personnel performing certain tasks in some areas may be required to remove street clothes before the workday begins and shower at the end of the workday. Site-issued cotton coveralls may also be required. Showering is typically specified for those tasks where workers perform activities in dusty environments and the PEL for exposure to crystalline silica is exceeded. This increases the possibility that contamination could be on the worker's body, hair, etc.

Showering is a “best-practice” measure that is initiated to prevent the potential or perceived perception of off-site migration of contaminants, particularly to a worker’s home. The determination of the shower requirement will be made by the PHSM and SSHO, in consultation with TVA personnel, and will be specified in the Task-Specific AHA.

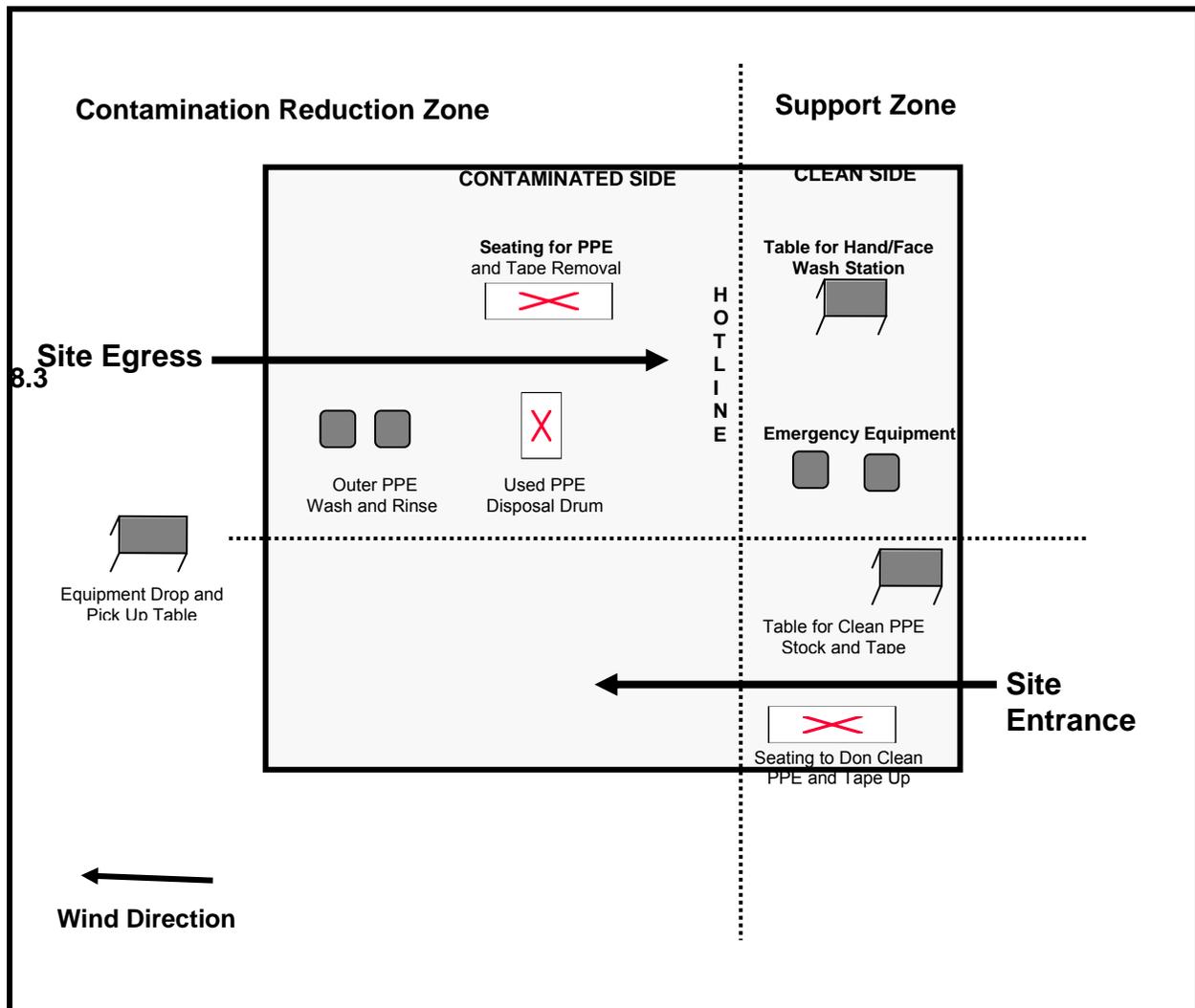
Water supply and bathroom facilities will be provided per the requirements of 29 CFR 1910.120(n). The requirements include:

- An adequate supply of potable water shall be provided on the site.
- Outlets for non-potable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.
- Toilets per the site population meeting the requirements of Table H-120.2. – Toilet Facilities. Typically one toilet seat and one urinal per 50 people.

**TABLE 8-1  
 STANDARD DECONTAMINATION STATION CONFIGURATIONS**

Level D	Level C
1. Equipment drop	1. Equipment drop
2. Hand wash (arms and face as necessary)	2. Outer boot and glove wash
	3. Outer boot and glove rinse
	4. Tape removal - boot and glove
	5. Outer boot and glove removal
	6. Coverall removal and disposal
	7. Respirator removal
	8. Inner glove removal and disposal
	9. Inner clothing removal
	10. Hand/face wash
	11. Shower when required
	12. Redress
	13. Respirator cleaning and sanitizing

**FIGURE 8-2  
TYPICAL DECONTAMINATION AREA LAYOUT**



### **8.3 Equipment Decontamination**

A centralized heavy equipment decontamination area will be established on site to accommodate large pieces of equipment and vehicles being permanently removed from the site.

The SSHO shall be consulted for specific decontamination requirements and procedures and to verify equipment permanently leaving the site is properly cleaned.

### **8.4 Decontamination during Medical Emergencies**

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving First Aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Any personnel requiring medical attention will be given priority during personnel decontamination. Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces or the individual will be suited in an additional clean coverall to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

### **8.5 Waste Collection and Disposal**

All material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly controlled, stored and disposed of.

In the case of liquids and sludges, this may include controlled discharge points or recycling back into the rim ditch or sluice trench.

With solid wastes this may include disposal with the ash.

## **9.0 MEDICAL SURVEILLANCE AND SUPPORT REQUIREMENTS**

Health exposure monitoring data may indicate the need for medical monitoring per associated OSHA requirements (29 CFR 1910.120 or 29 CFR 1910 Subpart Z). Once health exposure monitoring determinations have been completed for a given exposure group, the PHSM will review the exposure levels and with the assistance of the Jacobs medical consultant when necessary, determine what type of medical monitoring, will be required. This surveillance could include biological monitoring for specific compounds or specialized medical examinations. As a minimum, employees exposed above any PEL for 30 or more days per year will receive the medical examinations required by 29 CFR 1910.120(f).

### **9.1 Respirator Use Qualification**

Personnel required to wear respiratory protection must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134. Documentation of employee medical qualification (e.g., physician's written opinion) will be submitted to Jacobs. These records must also be maintained at the site by the Subcontractor. Documentation of a current, successful respirator fit-test conducted in accordance with OSHA requirements must be presented to Jacobs.

## **10.0 EMERGENCY RESPONSE PLAN**

Project emergencies happen unexpectedly and quickly and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures that must be addressed include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

Evaluation of emergency response drills and actual emergencies will be documented on form, "Emergency Response Best Practice" found in Appendix D. This process will help track what occurred, how the response proceeded and what changes if any are required to the Emergency Response and Contingency Plan.

The site specific Emergency Response and Contingency Plan is located in Appendix F.

## **11.0 TRAINING AND HSE MEETINGS**

All project employers shall provide their employees with the health and safety training required to comply with subcontract requirements, achieve compliance with TVA requirements, regulatory standards, and other training and qualification necessary for an employee to complete the assigned job duties safely. This training will include HAZWOPER Training per 29 CFR 1910.120, Competent Person training and/or training required by 29 CFR 1926.21, General Safety Training and Education.

Documentation of required training (e.g., training certificates or attendance rosters) will be submitted to Jacobs. These records must also be maintained at the site by any Subcontractor and made available for inspection by Jacobs, TVA, or regulatory agencies such as OSHA. Assigned site personnel (craft and labor) are required to have the 10-hour OSHA Construction training and other modules prior to working onsite. Appendix G lists TVA and Jacobs training requirements which may apply.

### **11.1 HAZWOPER Training**

Hazardous Waste Operations and Emergency Response training will be completed by site personnel as outlined in the following sections:

#### **11.1.1 General Site Personnel**

All general site personnel being provided unrestricted access to exclusion zones and contamination reduction zones shall complete 40 hours of classroom training per 29 CFR 1910.120(e)(3)(i). In addition to the classroom training, a 24 hour period of supervised field experience must be documented using the form found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

#### **11.1.2 Task Specific Personnel**

All personnel accessing exclusion zones or contamination reduction zones for limited durations and specific tasks such as surveying, shall complete 24 hours of classroom training per 29 CFR 1910.120(e)(3)(ii). In addition to the classroom training, an 8 hour period of supervised field experience must be documented using the form found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

#### **11.1.3 Supervisory Training**

On-site management and supervisors directly responsible for, or who supervise employees engaged in hazardous waste operations shall receive 40 hours initial training, and three days of supervised field and at least eight additional hours of specialized training per the requirements of 20 CFR 1910.120(e)(4).

#### **11.1.4 Support Zone Personnel**

Personnel who do not enter exclusion zones or contamination reduction zones are not required to attend HAZWOPER training, however site specific orientation must still be provided.

### **11.1.5 Exceptions to Training Requirements**

Those personnel being provided access to the site under all of the following conditions will not be required to meet the training requirements identified in sections 11.1.1 through 11.1.4:

- Will be on site not more than one day per month
- Will be escorted by an authorized individual possessing both the 40 Hour HAZWOPER and 8 Hour Supervisor Training
- Will be performing hands-off activities
- Will attend visitor orientation and sign in and out during each visit.

### **11.2 Site-Specific Training/Orientation**

Prior to commencement of field activities, all personnel assigned to the project will have completed site-specific training that will address the contents of applicable activity hazard analyses, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, locations of exclusion zones, contamination reduction zones, potential hazards, risks associated with identified hazardous substances at the site, hazard communication as necessary, PPE, incident reporting, emergency response actions, and available emergency services.

This training allows workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity. The Jacobs SSHO will conduct this training.

All escorted visitors must review the visitor HSE presentation and be provided a brief orientation relative to their specific function or tasks on the site. Once this is complete the visitor orientation form found in Appendix D must be completed and signed by the visitor, escort and HSE representative.

#### **11.2.1 Ammonia Awareness**

Ammonia awareness training will be completed by all personnel with the exception of escorted visitors. TVA provides this training and is required prior to being issued a badge.

#### **11.2.2 Railroad Safety**

All site personnel working directly with or around rail operations must complete a 2 hour railroad safety class as identified in TVA Safety Procedure 445.

### **11.3 First Aid and Cardiopulmonary Resuscitation**

Training consistent with the requirements of the American Red Cross Association will be provided for an adequate number of on-site personnel to provide support during an emergency situation. It is expected that a minimum of two personnel per active field operation will have First Aid and cardiopulmonary resuscitation (CPR) training. Jacobs and the any subcontractors are responsible for identification of necessary on-site personnel requiring First Aid and CPR training to support their work, and providing such training.

## **11.4 Bloodborne Pathogens**

Employee information and training for blood-borne pathogens shall be provided by the employer as required in 29 CFR 1910.1030 for all on-site Contractor and Subcontractor personnel who will be working in areas where pathogens may be present. This training applies to personnel expected to administer First Aid and/or CPR.

## **11.5 Other Required Training and Qualifications**

Other training and qualifications may be required depending on the task work scope and assigned duties of an individual employee. This may include training for waste handling, hazardous materials transportation, respiratory protection, noise exposure or hearing conservation, and various Qualified and/or Competent Person requirements (e.g., operation of heavy equipment, fork lifts, confined space entry, excavations, cranes, lockout/tagout).

Crane Operators must be certified by TVA in accordance with TVA Safety Procedure 802 and riggers must be trained in accordance with TVA Safety Procedure 721A.

Specific additional training and/or Qualified/Competent person requirements will be identified through the activity hazard analysis or task-specific health and safety planning process. The Subcontractor employer is responsible for ensuring that identified training and/or Qualified/Competent person requirements are met for site workers. Documentation of this certification must be provided to Jacobs. A list of Qualified and/or Competent Person will be maintained for each process or operation at the work locations.

## 12.0 HAZARD COMMUNICATION

Employee information and training on the Hazard Communication (HAZCOM) Program shall be provided as part of the site-specific training. The following are required elements of the information and training program:

- Overview of HAZCOM as described in 29 CFR 1910.1200 and TVA Procedure 216;
- Ammonia awareness training per TVA requirements;
- A review of any operations in their work areas that involve hazardous materials;
- The location and availability of the written HAZCOM materials, including the list(s) of hazardous chemicals and material safety data sheets (MSDSs);
- Methods and observations that may be used for detecting the presence or release of hazardous chemicals;
- An understanding of the physical and health hazards of hazardous chemicals in the work area;
- How to understand the information in MSDSs;
- How to read the warnings on container labels including the National Fire Protection Association (NFPA) system;
- When and how to report leaks and spills;
- How to recognize the symptoms of overexposure and how to protect against it; and
- How to implement exposure control methods including work practices, engineering controls, administrative controls, personal protective equipment, and emergency procedures.

In the event that a new chemical hazard or new task is introduced in the workplace, the SSHO or designee shall conduct additional training that includes the following:

- Objectives of the task, if applicable;
- Physical and health hazards associated with the new chemical hazard or task;
- Methods to detect the presence or release of the hazardous chemicals;
- Procedures and practices recommended to protect themselves from the hazards;
- Emergency procedures in the event of a hazardous situation or exposure; and
- Location and availability of the written program, lists of chemicals, and MSDS.

Documentation is to be maintained for each employee trained in hazard communication in accordance with Jacobs HSEP 1.3 and 3.0.

Subcontractors working for Jacobs shall be required to meet the EHS requirements outlined in their contracts.

### **13.0 SUBSTANCE ABUSE**

All site employers shall maintain and implement a Drug Free Workplace program for site work activities. Use, or working under the influence of controlled substances (other than prescribed or over-the-counter medication) or alcohol on the job is strictly prohibited.

Site workers are subject to substance abuse testing at any time “for cause” or following a safety or property damage incident. Subcontractors are responsible for ensuring that pre-work and post-incident drug and alcohol testing is performed. Positive substance abuse tests resulting from “for cause” or post-incident substance abuse testing shall be reported to the Jacobs PHSM or SSHO immediately.

## **14.0 MEETINGS**

### **14.1 Daily Safety Meetings**

All project field personnel, including Subcontractors, shall participate in daily 15-20 minute “tailgate” safety meetings prior to the start of each work shift. The Tailgate Safety Meeting form can be found in Appendix D.

The meeting shall include a discussion of the planned work activities and periodic special safety topics of interest to site personnel. Project personnel may be requested by Jacobs to present a safety briefing based upon their scope of work. In addition, the following items shall also be discussed as appropriate:

- Necessary training requirements and site work rules.
- Changes in work practices or environmental conditions.
- Precautions or safe work practices related to the day’s site activities.
- New or modified site-wide procedures or requirements.
- Bulletins or Safety Reports provided by Jacobs.

### **14.2 Weekly HSE Staff Meetings**

All designated subcontractor HSE representatives must attend a weekly meeting chaired by the Jacobs PSHM or designee. The meeting will review program status, air monitoring results, upcoming activities, lessons learned and other topics deemed relevant by the group.

### **14.3 Progress Meetings**

The PSHM or designee will attend progress meetings and other meetings as requested by project team or client.

## **15.0 LOGS, REPORTS AND RECORDKEEPING**

The following is a summary of required health and safety logs, reports and recordkeeping.

### **15.1 Medical and Training Records**

Copies or verification of training and medical clearance for use of respiratory protection will be maintained on-site by the SSHO. This includes records for all subcontractor employees.

Proof of initial HAZWOPER, annual refresher and supervisor training as appropriate must be provided during the initial pre-entry briefing. Workers will not be granted site access to exclusion zones or contamination reduction zones without training documentation.

### **15.2 Weekly Safety Reports**

All Subcontractors on the Project shall submit a Weekly Safety Report to the Jacobs Program Health and Safety Manager, the coversheet is provided in Appendix D. The Weekly Safety Report is due by close of business on Monday for the previous week. The report may include a brief summary of significant safety activities, and the following items as necessary:

- Copies of daily safety meeting documentation and attendee sign-in sheets;
- Copies of any integrated personal sampling results, including data sheets, laboratory analytical results, and exposure calculation sheets;
- Copies of any permits or safety related checklists used for the day including intrusive soils activity permits, hot work permits, lockout/tagout documentation, confined space entry permits/checklists;
- Copies of the site First Aid log if there are new entries;
- Copies of completed "Safety Observations Reports".

### **15.3 Exposure Records**

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the Program Health and Safety Manager during site work. At the end of the project they will be maintained according the 29 CFR 1910.120 and TVA Procedures.

### **15.4 Incident Reporting, Investigation, and Case Management**

#### **15.4.1 Incident Definition**

For all site activities, an incident is defined as follows:

- A work-related injury or illness.
- An exposure to a hazardous substance above the allowable exposure limit.
- Property/vehicle/equipment damage.
- An uncontrolled fire or explosion.

- An unplanned spill or release (including air releases) to the environment.
- A permit or permit equivalent exceedance.
- Any unexpected contact or damage to aboveground or below ground utilities.
- A “near miss” or an unplanned event that has a reasonable probability of resulting in one of the outcomes described above had the circumstances been different, and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome.

**15.4.2 Verbal Notifications**

All Project personnel have the responsibility to immediately report any incident to their supervisor. Supervisors shall take appropriate corrective action and immediately verbally report the incident to the individuals identified in table 15-1.

**TABLE 15-1**

<b>Project Notification<sup>1</sup> – All Personnel Should be Contacted</b>		
Name	Organization	Number
Mike Scott	TVA – PM	423-240-5025
John Moebes	Jacobs – PM	865-765-5407
Mike Gahagan	TVA – HSE Manager	865-755-4058
Sean Healey	Jacobs – HSE Manager	865-414-9823
Kirk Morris	Jacobs – HSE Officer	508-726-4426
Tom Bock	Jacobs – HSE Officer	865-599-7116
<b>Medical Support Contacts</b>		
Plant Nurse <i>(Mon – Thu; 0600 – 1600)</i>	TVA	865-717-2589
Advatech Paramedics <i>(7 days week; 24 hours per day)</i>	Advatech	Days: 865-717-1510 865-567-6740
		Nights: 865-717-6503 865-567-6740
TVA Police	TVA	800-824-3861
<b>Fire Response Contacts</b>		
Roane County Fire <sup>2,3</sup>	Roane County	911

1. Provide initial medical care and initiate emergency control activities prior to making project notifications.
2. If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
3. TVA has a dedicated fire brigade for in-plant response. For activities occurring out on site, Roane County Fire will provide primary response.

**15.4.3 Incident Reports**

A written incident report will be prepared for all incidents during the work shift when the incident occurred. The report is to be prepared by the supervisor responsible for the activity/area where the incident occurred and must be distributed per Table 15-2 based on the incident type. In

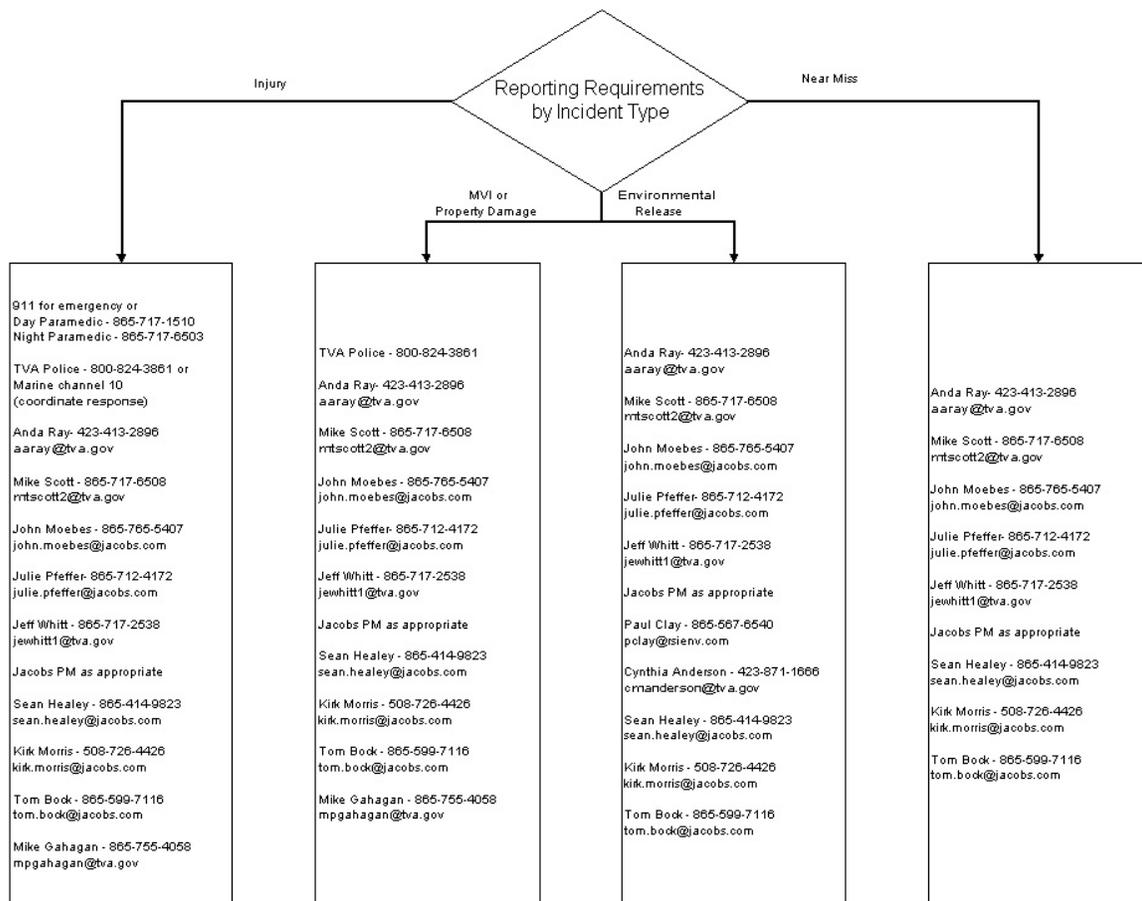
In addition to the standard distribution, the associated Jacobs Project Manager must be included in the distribution as well. The supervisor may be assisted by the SSHO if necessary.

The Jacobs incident report form found in Appendix D shall be used and is due to the SSHO as soon as reasonably possible and prior to leaving the site for the day on the date that the incident occurred. In the event the incident results in a recordable injury or is likely to evolve into a recordable injury, the TVA form found in Appendix D must be completed and sent within 24 hours via the e-mail distribution identified at the bottom of the form.

An incident investigation shall be performed for all incidents for which a report is required. The supervisor and the designated SSHO shall perform the investigation and shall include participation by others as necessary. The investigation is to be initiated as soon as possible after the incident.

The incident investigation report form shall be used and is due to the SSHO within 48 hours of incident occurrence. Follow-up reports shall be provided as necessary if additional information regarding the incident is learned.

**TABLE 15-2**



**15.4.4 Investigation Follow-Up**

All subcontractors on the Project shall establish a follow-up system for all investigation findings under their control. The system shall identify the corrective action(s) to be taken, the individual

responsible for each corrective action, and the date the corrective action was implemented or verified.

#### **15.4.5 Management of Potential Injuries Or Illnesses**

All subcontractors on the Project are responsible for implementing and maintaining an effective case management program for their employees and Subcontractor employees that addresses potential injuries or illnesses related to work at the site. The goal of the case management program is to ensure that workers receive the appropriate level of care, that injured or ill workers return to normal work duties as soon as possible, that injury or illness records are consistently and accurately maintained, that unnecessary or fraudulent injury or illness cases are avoided, and that the Subcontractor actively seeks to minimize the impact of any incident with respect to recordability, restricted duty, and lost time aspects.

The case management program shall include the following elements:

- Employee Information. Each site worker shall be informed of the project incident reporting and investigation requirements and their responsibilities in the event that an incident occurs, including the location and hours of operation for the designated local medical provider.
- Employee Points of Contact. Each site worker shall be made aware of the primary person to report all incidents to, and what to do if that individual is unavailable. This includes whom to notify if a work-related condition develops or intensifies outside normal working hours.
- Subcontractor Representation at Clinic Visits. A knowledgeable Contractor representative shall accompany any worker seeking medical attention for any incident related to work at the project. The Contractor representative shall be knowledgeable in the worker's normal job duties; potential safety and health hazards present at the worksite, and be able to discuss any limitation or modification of normal duties with the local medical provider staff. The representative shall also be knowledgeable (or have access to someone who is knowledgeable) of treatment options that provide equivalent medical attention while avoiding any impact to recordability, restricted duty, and lost time recordkeeping. Items that may affect the recording status of an injury or illness (such as prescription medications, limitations to normal job duties, and further treatment) shall be reviewed with the medical provider at the time of the visit to ensure that appropriate medical attention is provided with a minimum of impact to recordkeeping.
- Status Reporting to Jacobs. All Subcontractors shall keep the Jacobs HSE staff informed of case management status, progress, and issues for the duration of any evaluation or treatment provided. The Subcontractor shall provide updated information to the Jacobs HSE staff regarding injury or illness status within 24 hours of each visit or change in status regarding recordability, restricted duty, or lost time.

#### **15.4.6 OSHA Form 300**

OSHA Forms 300, 301 and 301A will be kept at the project site by the Jacobs HSE staff. All OSHA Recordable injuries or illnesses will be recorded on this form. Subcontractor employers must also meet the requirements of maintaining the OSHA Injury and Illness forms. The criteria for determining OSHA Recordability will also follow the guidelines of the new regulation.

## 15.5 Health and Safety Logbooks

All Contractors and Subcontractors shall complete and maintain logbooks in the field to document health and safety-related events as they occur during the day. Logbooks should document any significant safety-related information such as site monitoring and calibration, sampling, weather conditions, conversations, changes to PPE requirements, unusual conditions, and other items related to site health and safety.

The following logbook guidelines should be used:

- Use blue or black ink.
- Write clearly, print if necessary.
- Use an underline (rather than highlighter) to emphasize important information.
- Do not use correction fluid - draw one line through errors, write the correction above, then initial and date next to the correction.
- Start a new day at the top of a page with identifying information such as the project name, location, and date.
- Add entries in chronological order and note the time periodically throughout the day.
- If there is blank space at the end of the day, mark through it with a slash or N/A and initial at the bottom of the last page for the day.

## 15.6 Hazard Communication Program/MSDS

MSDS will be obtained for applicable substances and included in the site Hazard Communication file. The hazard communication program will be maintained on-site in accordance with 29 CFR 1910.1200 and Jacobs HSEP 1.3.

## 15.7 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, excavation and trenching, etc., will be maintained in the project files.

Issuance of permits should be coordinated through the response site HSE group.

## 15.8 Inspections

Regular inspections of active fieldwork areas shall be conducted to identify and correct potential worksite hazards as outlined below. The Jacobs equipment inspection forms may be used and may be modified as desired to reflect task- or site-specific health and safety issues.

Administrative operations such as offices and storage areas have less frequent inspection requirements as the working conditions, and work practices in these areas are not expected to change as rapidly as active field work areas. The trailer and storage areas will be inspected on a monthly basis (fire extinguishers and First Aid kits) and on a quarterly basis in accordance with Jacobs HSEP 6.9 and 6.10.

### **15.8.1 Daily Inspections (Health and Safety Supervisor or Designee)**

Daily informal inspections of active field work area(s) will be conducted. The inspection shall cover workplace conditions, physical facility safety, and employee work practices. The inspection, conducted by the SSHO, shall include a walk-around of the site and a review of workplace conditions and work practices. The SSHO shall document any deficiencies and corrective actions in a logbook.

### **15.8.2 Weekly Inspections (Site Supervision)**

Informal weekly inspections of the active field work area(s) will be conducted. The inspection shall be performed by the first line supervisor, superintendent, or equivalent supervisory position and the Jacobs SSHO. The inspection shall include a review of work activities and an evaluation of compliance with required procedures and plans, a walk-around of the site, physical facility safety, and employee work practices.

Noted discrepancies and areas of achievement can be documented on the Jacobs Safety Observation Report form found in Appendix D.

### **15.8.3 Monthly Inspections (Site and Project Management)**

Monthly inspections of active field work area(s) will be conducted. The Jacobs Project Manager or their designee; shall perform the inspection using the TVA Safety Coaching Visit checklist found in Appendix D. Subcontractors shall schedule the time of the monthly inspection in advance with the Jacobs Project Manager.

### **15.8.4 Client Inspections**

The Client may conduct worksite inspections at any time. Additionally, the client may, at their discretion, participate in any of the inspections required by this document. The impacted Subcontractors shall participate in all client Inspections.

### **15.8.5 Equipment Inspections**

Any equipment, including construction equipment, as well as watercraft, must be maintained in a safe operating condition. To assist in achieving this, formal documented inspections of specific equipment must be performed on a routine basis. Some equipment must be inspected on a daily basis using forms developed for the specific piece of equipment. The Jacobs SSHO will provide forms or assist in the development of forms if one is not available. Additionally, an initial inspection of all construction equipment and floating plant will be performed by the subcontractor and the Jacobs SSHO. Selected inspection forms are included in Appendix D.

### **15.8.6 Corrective Action**

Corrective actions shall be implemented in a timely manner and tracked through completion. Findings for weekly, monthly, or quarterly site inspections not completed or verified by the next scheduled inspection shall be reentered on the subsequent inspection form (with the date of the original inspection added at the end of the corrective action). Corrective actions should be carried forward on each subsequent inspection until the corrective action is completed or verified. The notation 'F' (for carried forward) shall be made in the Date corrected column of the site inspection form whenever a finding is carried forward to a subsequent inspection.

Subcontractors shall implement corrective actions to inspection findings at the time of the inspection, where feasible. Interim corrective actions shall be implemented as necessary for areas that present an immediate hazard to site workers. Interim corrective actions may include suspension of work, barricading unsafe areas, posting of warning signs or other similar measures to effectively mitigate the immediate hazard.

#### **15.8.7 Annual Closeout Safety Report**

Annual Closeout Safety Report is required at the completion of each calendar year. Information provided in the Daily Safety Report does not have to be duplicated in the Closeout Report. The Closeout Report shall be submitted to the Jacobs Fed-Ops HSE Manager by the PHSM no later than March 1 each year. The report will cover the following items:

- A description of significant events, exposures, incidents, First Aid cases and actions taken to prevent their recurrence;
- A copy of the OSHA 300 log for site work.

## 16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc. 2007. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*. Cincinnati, OH. ACGIH.

National Institute of Occupational Safety and Health. *NIOSH Pocket Guide to Chemical Hazards*. <http://www.cdc.gov/NIOSH/npg>. (27 February 2009).

U.S. Army Corps of Engineers. 2003. *Safety and Health Requirements Manual*. EM385-1-1. Washington, D.C.

U.S. Department of Labor. Occupational Health Administration Regulations (Standards – 29CFR). <http://www.osha.gov/pls/osha.web>. 27 February 2009.

TVA Safety Manual, Rev. 13, January 26, 2009.

## **APPENDIX**

## **APPENDIX A**

### **APPLICABLE PROGRAMS, PROCEDURES AND GUIDELINES**

### Key TVA HSE Procedures

<b>General Safety</b>	
207	General Safety Rules and Employee Conduct
215	Hazard Assessment
216	Hazard Communication
217	Safety Coaching Visits
220	Safety Meetings
226	Safety Stand-down
303	Emergency Shower and Eye Wash
304	Eye and Face Protection
305	Fall Protection Systems
306	Flotation Devices
307	Foot Protection
308	Hand Protection
309	Head Protection
310	Hearing Conservation
312	Respiratory Protection
<b>Training</b>	
401	Health and Safety Training
406	Boating Safety Training
414	Defensive Driver Training
418	Ergonomics Training
419	Excavation – Affected Person Training
420	Excavation – Competent Person Training
421	Fall Protection Training
422	Vehicle Flagging Training
423	Forklift Operations Training
425	Hand and Portable Power Tools Training
426	Handling and Storage of Compressed Gas Training
427	Hazard Recognition Training
430	Hearing Conservation Course
431	Heat Stress Course
435	Safety Coaching Visits Training
436	Job Safety Analysis Training
437	Ladder Safety Course
438	Lock-out / Tag-out Training
441	Personal Protective Equipment Training
445	Railroad Safety Course
447	Respiratory Protection Course
448	Rigging Course
449	River and Deck Skills Course
451	Supervisory Safety Orientation
455	OSHA 10-Hour Construction Course
<b>General Safety</b>	
602	Barricades and Barriers
603	Boating Safety

606	Hand Tools
607	Housekeeping
609	Lifting and Handling Materials
610	Motor Vehicle Operations
611	Office Safety
612	Warning Signs
615	Lock-out / Tag-out
616	Manual Material Handling
<b>Mechanical</b>	
705	Compressed Air
706	Compressed Gas Cylinders
707	Conveyor Systems
710	Grinding and Cutting
711	Heavy Equipment Operations
713	Portable Ladders
714	Machine Guarding
718	Pneumatic Tools
719	Portable Heating Equipment
721A	Rigging (non-nuclear)
<b>Special Work Requirements</b>	
802	Safe Operations of Cranes
804	Excavations and Trenching
805	Forklift Operations
806	Heat Stress
809	Hot Work
810	Marine Operations
812	Railroad Operations
814	Underwater Diving
815	Welding and Cutting
<b>Chemical / Hazardous Material</b>	
901	Ammonia
906	Combustible and Flammable Liquids
913	Silica
<b>Electrical - General</b>	
1007	Ground Fault Circuit Interrupters
1011	Portable and Vehicle Mounted Generators
1012	Portable Electrical Tools and Attachments

## **APPENDIX B**

# **HEALTH HAZARD EVALUATION**

<b>Appendix B</b>						
<b>Health Hazard Evaluation</b>						
<b>Process or Task</b>	<b>Chemical</b>	<b>Hazard</b>	<b>Hazard Level</b>	<b>Exposure Route</b>	<b>Identify Initial PPE</b>	<b>Comments, Unusual Issues</b>
Equipment Staging and Dredge Support	Crystalline Silica	Carcinogen	Low	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposure may occur from vehicle dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Pipeline Management	Crystalline Silica	Carcinogen	Low	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Should not directly involve fly ash or proximity to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Debris Removal	Crystalline Silica	Carcinogen	Low	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Wet process, dust not expected under normal conditions.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Dredging	Crystalline Silica	Carcinogen	Low	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Wet process, dust not expected under normal conditions.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Rim Ditch Management	Crystalline Silica	Carcinogen	Mod.	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Wet process, however area is in proximity to windrow locations and could be downwind.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Staging and Stockpiling Activities ("Ballfield")	Crystalline Silica	Carcinogen	High	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots respiratory protection likely needed	Likely one of the highest potential areas for exposures to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Mod	Inhalation		

Appendix B						
Health Hazard Evaluation						
Process or Task	Chemical	Hazard	Hazard Level	Exposure Route	Identify Initial PPE	Comments, Unusual Issues
Rail Car Prep and Load-out	Crystalline Silica	Carcinogen	High	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots respiratory protection likely needed	Likely one of the highest potential areas for exposures to dust.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Mod	Inhalation		
Rail Car Control	Crystalline Silica	Carcinogen	Mod.	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Area is in proximity to windrow activities.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Equipment Maintenance and Repair	Crystalline Silica	Carcinogen	Mod.	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposure to dust on equipment.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		
Process Management and Oversight	Crystalline Silica	Carcinogen	Mod	Inhalation	Coveralls, hard hat, safety glasses, steel-toe boots	Incidental exposures possible.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatotoxin	Low	Inhalation		

**Hazard:** Flammable (F), Combustible (C), Explosive (E), Reactive (R), Oxidizer (O), Corrosive (Corro), Radioactive (Radio), Primary or Secondary Irritant (I), Simple or Chemical Asphyxiants (Asphy), Anesthetic (Anes), Narcotic (Narco), Hepatotoxic or Nephrotoxic or Neurotoxin Systemic Poison (P), Sensitizer (Sens), Carcinogen (Carc), Mutagen (Muta), Teratogen (Terato)

**Hazard Level:** Low(L) ≤10% PEL, TLV, STEL, Ceiling, Peak, LEL, Moderate(Mod)>10% and < 100% PEL, TLV, STEL, Ceiling, Peak, LEL, High(H) ≥100% PEL, TLV, STEL, Ceiling, Peak, LEL. **Note:** preplanning, management approval and monitoring required for all IDLH tasks.

**Exposure Route:** Inhalation (Inh), Ingestion (Ing), Skin Absorption (Abs), Skin or Eye Contact (Con)

**Personal Protective Equipment (PPE):** Identify the specific PPE to be donned based on chemicals and chemical concentrations expected.

## **APPENDIX C**

### **SITE SPECIFIC RESPIRATORY PROTECTION PLAN**



## **Site-Specific Respiratory Protection Program**

Company Name: TVA / Jacobs

Facility Name: TVA Kingston Fly Ash Response

Location: Kingston, TN

Program Administrator: Sean Healey, CIH, CSP

Site HSE Supervisor: Kirk Morris

Date: May 12, 2009

Revision Number: 1

## **Site-specific Respiratory Protection Program**

This Site-specific Respiratory Protection Program has been developed to define site-specific procedures for respirator use at this site.

This Program establishes acceptable HSE standards and procedures to be used when respiratory protection is required.

This United States Respiratory Protection Program has been developed in accordance with the provisions of 29 CFR 1910.134 and 29 CFR 1926.103.

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## 1.0 PROGRAM ADMINISTRATION

The Program Administrator is responsible for the overall administration of this Program and for required evaluations of the Program's effectiveness.

The Program Administrator has designated the Site HSE Supervisor to assist with administration of the Program and evaluation of the Program's effectiveness.

Program components include:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Fit testing procedures for tight-fitting respirators,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators, and
- Procedures for regularly evaluating the effectiveness of the program.

Regular program effectiveness observations should be documented through the use of Appendix C, Respiratory Protection Program Checklist. Safety Observation Reports (SORs) and Safety Evaluation Reports (SERs) can also be used to document Program effectiveness.

The Site Supervisor, in conjunction with the site HSE Supervisor, shall ensure that noted deficiencies are corrected as soon as possible.

## **2.0 MEDICAL EVALUATION**

A medical evaluation will be completed to determine the worker's ability to use a respirator, before the respirator wearer is fit tested or required to use the respirator in the workplace.

Based on the findings of the medical evaluation, a medical examination may also be required.

### **2.1. Medical Evaluation Procedures**

- 2.1.1. A physician or other licensed health care professional (PLHCP) performs all respirator user medical evaluations. Each respirator wearer shall complete the Medical Questionnaire for Respirator Users ([Appendix A](#)), which is forwarded to a Jacobs-designated physician for a written determination of the worker's ability to use the selected respirator, under the defined working conditions.
- 2.1.2. All respirator users will complete the Medical Questionnaire for Respirator Users, [Appendix A](#).
- 2.1.3. If a pre-employment or annual physical is required and conducted, it may be used to meet the requirements of this section, if it includes the same information as the Medical Questionnaire for Respirator Users, [Appendix A](#).
- 2.1.4. The medical questionnaire and examinations are administered confidentially during the respirator wearer's normal work hours or at a time and place convenient to the worker. The medical questionnaire is also administered in a manner that ensures the respirator wearer understands its content.
- 2.1.5. The respirator wearer is also provided an opportunity to discuss the questionnaire and examination results with the PLHCP.
- 2.1.6. Any worker who refuses to be medically evaluated for respirator use will not be allowed to use a respirator.

### **2.2. Medical Examinations**

- 2.2.1. A medical examination is provided for any worker who gives a positive response to any of Questions 1 through 8 in Section 2 of the Medical Questionnaire for Respirator Users, [Appendix A](#), or whose initial medical examination demonstrates the need for a follow-up medical examination.

The medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make final determination on the respirator wearer's ability to use a respirator.

### **2.3. Supplemental Information for the PLHCP**

- 2.3.1. Supplemental information concerning the specific type(s) of respirator to be used and the anticipated working conditions is provided to the PLHCP, with each Medical Questionnaire for Respirator Users, [Appendix A](#), before the PLHCP makes a recommendation concerning a worker's ability to use a respirator.

### **2.4. Medical Recommendation**

- 2.4.1. Following the evaluation and/or examination, a written recommendation regarding the worker's ability to use the respirator must be provided by the PLHCP. The recommendation shall provide the following information:

- Any limitations on respirator use related to the medical condition of the worker or to the workplace conditions in which the respirator will be used, including whether or not the worker is medically able to use the respirator;
  - The need, if any, for follow-up medical evaluations; and
  - A statement that the PLHCP has provided the worker with a copy of the PLHCP's written recommendation.
- 2.4.2. For negative pressure respirator work, if the PLHCP finds a medical condition that may place the worker's health at increased risk, a powered air-purifying respirator (PAPR) can be provided if the PLHCP determines that the worker can use the PAPR.
- 2.4.3. If a worker is wearing a PAPR because of medical restrictions and if a subsequent medical evaluation finds that the worker is medically able to use a negative pressure respirator, then there is no longer a requirement to provide a PAPR.

### **3.0 ADDITIONAL MEDICAL EVALUATIONS AND/OR EXAMINATIONS**

- 3.1.1. An additional medical evaluation and/or examination shall be conducted if:
- A worker reports medical signs or symptoms that are related to ability to use a respirator;
  - A PLHCP, supervisor, Site HSE Supervisor, or the Respirator Program Administrator determines that a worker needs to be reevaluated;
  - Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for worker reevaluation; or
  - A change occurs in workplace conditions, e.g., physical work effort, protective clothing, temperature, that may result in a substantial increase in the physiological burden placed on a worker.

## 4.0 RESPIRATOR SELECTION

This section presents the types of respirators available on-site and the criteria and procedure to be used to determine respiratory protection needed for specific tasks.

### 4.1.1. Criteria for Respirator Selection

4.1.2. The respirator type that is selected for each work scenario shall be appropriate for the chemical state and physical form of the contaminant. The respirator type is to be chosen using the selection logic presented in Appendix D. The parameters used making the selection are to be documented on Form 3-1, Respirator Selection Worksheet, or equivalent.

4.1.3. For each type of task for which respiratory protection is required, the selection sequence in Appendix D shall be addressed. Task examples include permit-required confined space entry, first line breaks, process valve maintenance activities, painting, cleaning, or degreasing with solvents, etc.

For routine tasks, where conditions or hazards do not change, a single respiratory hazard selection evaluation is generally sufficient. If hazards, work sequences, or conditions change, the respirator selection criteria must be re-evaluated.

## 4.2. Particulate Exposure Respirator Selection

4.2.1. For particulate exposures, the particulate cartridge Types N, R, and P refer to standard performance designations established by NIOSH.

- N refers to no oil exposure and 95%, 99%, or 100% (99.97%) filter efficiency.
- R refers to some oil up to eight hours and 95%, 99%, or 100% (99.97%) filter efficiency.
- P cartridge types can be used with oil exposure with no time restriction and 95%, 99%, or 100% (99.97%) filter efficiency. Individual manufactures may have different designations. To aid in decision-making on the appropriate type of respirator, individual manufacturer literature will also be used.

## 4.3. Assigned Protection Factors (APFs)

4.3.1. Assigned Protection Factors (APFs) as specified by OSHA and NIOSH are presented in Tables 1-3 in Appendix D.

4.3.2. The lower of the two factors for each respirator and contaminant type shall be used in conjunction with exposure limits and workplace concentrations to assess the appropriateness of the respirator.

4.3.3. Fit factors determined for an individual by quantitative fit testing or other methods are not to be substituted for the APF provided in tables. The fit factor determined through fit testing must be greater than the APF; otherwise the respirator is not to be used.

## 4.4. 3.4 Filtering Facepiece Respirator

4.4.1. Filtering facepiece respirators (dust mask) are a class of air-purifying half-mask respirator. The APF of the filtering facepiece respirators are equal to that for the

air-purifying half-mask respirator. Filtering facepiece respirators are not to be used for contaminants with substance-specific standards (as listed in 29 CFR 1910.1001-1450, Subpart Z) or to protect against class A-1 carcinogens (as listed in American Conference of Governmental Hygienists TLVs and BEIs, 2006). This respirator provides protection against low levels of certain dusts and/or fumes, but does not supply oxygen, and shall not be used in an oxygen deficient atmosphere. It is not to be used in any atmosphere that is immediately dangerous to life or health.

- 4.4.2. All requirements that apply to air-purifying respirators apply to filtering facepiece respirators when used for protection against contaminants with workplace concentrations greater than the respective action levels.

#### **4.5. Cartridge Change Schedule**

At this time it is not expected that cartridges will be used on this site. The most likely item will be the P-100 filter. These filters can be used until the breathing resistance increases.

If task are identified which requires cartridges, change-out schedules will be established accordingly.

### **5.0 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH ATMOSPHERES**

- 5.1.1. Worker exposure to any of the following Immediately Dangerous To Life Or Health (IDLH) task conditions shall be avoided.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are potentially Immediately Dangerous to Life or Health (IDLH), or
- Unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- Unprotected exposure to known chemical sensitizers.

- 5.1.2. When work in these environments seems to be absolutely necessary, the Project Manager shall appeal to the appropriate Senior Operations Manager and Program HSE Manager for written approval to proceed and specific safe work procedures.

- 5.1.3. For tasks for which there is the *potential* for IDLH atmospheres, the respirator must be a full facepiece supplied-air respirator in positive pressure mode and 5-minute (minimum) escape cylinder.

Examples of jobs that have the *potential* to become IDLH:

- Breaking into flare lines,
- Initial opening of all H<sub>2</sub>S or CO equipment vessels and lines,
- Confined space entry work where inert gas, e.g., nitrogen purge, may be present, or
- Working in certain process or sanitary sewers.

In *potential* IDLH atmospheres, ongoing air monitoring shall be conducted to verify contaminant concentrations and to detect changes.

- 5.1.4. For work in atmosphere with the *potential* for IDLH conditions, trained rescue standby person(s) located outside the *potential* IDLH area are posted and equipped with an SCBA or supplied-air respirator on separate supply. This includes work in confined spaces that require supplied-air respiratory protection.
- 5.1.5. Standby persons will be equipped with:
- Continuous-flow or pressure-demand SCBAs or a continuous flow or pressure-demand, supplied-air respirator with a 5-minute (minimum) escape air cylinder and
  - Appropriate retrieval equipment (harnesses, wristlets, anklets) for removing an employee, who enters the hazardous atmosphere.
- 5.1.6. Retrieval equipment must be used unless it would increase the overall risk of rescue. Situations may exist in which retrieval lines would pose an entanglement problem, especially if airlines and/or electrical cords are present.

Verify that visual or signal line communication is maintained between personnel in the *potential* IDLH atmosphere and personnel located outside the *potential* IDLH atmosphere.



## 6.0 FIT TESTING REQUIREMENTS

Respirator fit testing is performed in accordance with the fit test protocols and procedures described below.

### 6.1. General Fit Test Protocols

The Program Administrator will designate qualified persons to conduct qualitative and/or quantitative fit tests.

6.1.1. The following fit testing requirements will be met.

- Each respirator wearer will be fit-tested on each, specific (model, size) respirator worn prior to initial use and annually thereafter.
- Spectacles (glasses), goggles, face-shields, or welding helmets will be worn in a manner that does not interfere with the facepiece seal of the respirator.
- Contact lenses (soft and gas permeable only) may be worn with a full-facepiece respirator. However, some clients have policies, which prohibit their use on their sites.
- Respirator wearers shall be clean-shaven. Facial hair shall not interfere with the sealing surface of the facepiece and the face or interfere with valve function.
- User seal checks are performed each time the respirator is donned.

Fit tests shall be documented and retained until the next fit test is administered.

Fit test Form 4-1, Qualitative Respirator Fit-Test Record, and Form 4-2, Quantitative Respirator Fit-Test Record, may be used to document the fit test.

6.1.2. The respirator wearer shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

6.1.3. Prior to the selection process, the respirator wearer shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit.

A mirror will be available to assist the respirator wearer in evaluating the fit and positioning of the respirator. This instruction does not constitute the respirator wearer's formal training on respirator use, because it is only a review.

6.1.4. Respirator wearers shall be informed that they are being asked to select the respirator that provides the most acceptable fit.

6.1.5. The respirator wearer shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit. The more acceptable face-pieces are noted in case the one selected proves unacceptable.

6.1.6. The most comfortable facepiece is donned and worn at least five minutes to assess comfort. If the respirator wearer is not familiar with using a particular respirator, then he/she shall be directed to don the facepiece several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6.1.7. Assessment of comfort shall include a review of the following points with the respirator wearer.

- Position of the respirator on the nose
- Room for eye protection
- Room to talk
- Position of respirator on face and cheeks

6.1.8. The following criteria shall be used to help determine the respirator fit.

- Chin properly placed
- Adequate strap tension, not overly tightened
- Fit across nose bridge
- Respirator of proper size to span distance from nose to chin
- Tendency of respirator to slip
- Self-observation in mirror to evaluate fit and respirator position

6.1.9. The respirator wearer shall conduct negative and positive pressure user seal checks each time the respirator is donned.

Before conducting the negative and positive pressure user seal checks, the respirator wearer shall be told to seat the respirator on the face by moving the head from side-to-side and up and down slowly, while taking in a few slow deep breaths.

Another facepiece shall be selected and retested if the respirator wearer fails the user seal check.

The test shall not be conducted if there is any hair growth between the skin and the facepiece-sealing surface, such as stubble beard growth, beard, mustache, or sideburns, which cross the respirator-sealing surface.

Any type of apparel or obstruction, which interferes with a satisfactory fit, shall be altered or removed.

6.1.10. If the respirator wearer exhibits difficulty in breathing during the tests, he or she shall be referred to a physician or other PLHCP for a medical re-evaluation to determine whether they can wear a respirator while performing their duties.

6.1.11. If the respirator wearer finds the fit of the respirator unacceptable, the respirator wearer shall be given the opportunity to select a different respirator and to be retested.

6.1.12. A tight fitting powered air purifying respirator (PAPR) can be fit tested by not turning the fan motor on.

6.1.13. Exercise Regimen

Prior to the commencement of the fit test, the respirator wearer shall be given a description of the fit test and the respirator wearer's responsibilities during the test procedure.

The description of the process shall include a description of the test exercises that the respirator wearer will be performing.

The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

The fit test shall be performed while the respirator wearer is wearing any applicable safety equipment that may be worn during actual respirator use, which could interfere with respirator fit.

#### 6.1.14. Test Exercises

The following test exercises are performed for all fit testing methods prescribed in this procedure, except for the Control Negative Pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol. The respirator wearer shall perform exercises, in the test environment, in the following manner.

- Normal Breathing  
In a normal standing position, without talking, the respirator wearer shall breathe normally.
- Deep Breathing  
In a normal standing position, the respirator wearer shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- Turning Head Side To Side  
Standing in place, respirator wearer shall slowly turn his or her head from side to side between the extreme positions on each side.  
The head shall be held at each extreme momentarily so the respirator wearer can inhale at each side.
- Moving Head Up And Down  
Standing in place, the respirator wearer shall slowly move his or her head up and down.  
The respirator wearer shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- Talking  
The respirator wearer shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The respirator wearer can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.
- 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.”
- Grimace  
The respirator wearer shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- Bending Over

The respirator wearers shall bend at the waist as if they were to touch their toes. Jogging in place shall be substituted for this exercise in those test environments, such as shroud type QLFT units, which do not permit bending over at the waist.

- Normal Breathing

In a normal standing position, without talking, the respirator wearer shall breathe normally.

Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.

The respirator wearer shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

## 6.2. Qualitative Fit Test Requirements

- 6.2.1. Negative-pressure air purifying respirators that will be worn in concentrations that are equal to or less than 10 times the PEL may be fit tested using qualitative fit test requirements (QLFT). (QLFT may only be used to fit negative pressure air purifying respirators that allow for a fit factor of 100 or less.)

QLFT is not to be used to test for respirator fit if the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens

- 6.2.2. The person administering the QLFT will be able to prepare test solutions, calibrate equipment, and perform tests properly; recognize invalid tests; and ensure that test equipment is in proper working order.
- 6.2.3. The QLFT equipment is to be kept clean and well maintained so as to operate within the parameters for which it was designed.

## 6.3. Quantitative Fit Test Requirements

- 6.3.1. The following quantitative fit test (QNFT) methods are acceptable.

Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; The QNFT is to be used for fit factors greater than or equal to 100 for tight fitting half-facepiece or greater or equal to 500 for tight fitting full facepiece respirators.

If the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens, it is required that the QNFT be used to test for respirator fit

Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit;

Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

### 6.3.2. QNFT Procedure

- The person administering the QNFT will be able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- The QNFT equipment must be kept clean, maintained, and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
- Once a respirator has been modified or altered with a fit test probe, the facepiece will only be used for fit testing. When the facepiece is returned to the original NIOSH tested-and-certified configuration, the facepiece may be returned to service.

**Form 4-1, Qualitative Respirator Fit-Test Record**

Name: \_\_\_\_\_ Respirator User  
(print) \_\_\_\_\_ Identification Number: \_\_\_\_\_

Date: \_\_\_\_\_ Project: \_\_\_\_\_ Location: \_\_\_\_\_

**Personal Use Conditions/Limitations:** The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by HSEP 13.9, Respiratory Protection Program.

Check all that apply:

\_\_\_\_\_ None      \_\_\_\_\_ Beard/Facial Hair      \_\_\_\_\_ Dentures  
                         \_\_\_\_\_ Prescription Eyeglasses      \_\_\_\_\_ Contact Lenses

Scars/Other: Explain: \_\_\_\_\_

**Fit-Test Record**

Respirator (Make, Model and Size): \_\_\_\_\_

Qualitative Fit-Testing Agent:

- \_\_\_\_\_ Bitrex™ (Denatonium Benzoate)
- \_\_\_\_\_ Isoamyl Acetate (Banana Oil)
- \_\_\_\_\_ Irritant Smoke (Stannic Chloride)
- \_\_\_\_\_ Saccharin Solution

**Fit-Test Results**

\_\_\_\_\_ **PASS:** Fit-Test Agent Not Detected Inside the Facepiece by Respirator Wearer  
(Worker's signature is required.)

I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

\_\_\_\_\_ **FAIL:** Fit-Test Agent Detected Inside the Facepiece by Fit-Tested Worker.

Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: \_\_\_\_\_

Respirator Wearer's Signature: \_\_\_\_\_

**Form 4-2, Quantitative Respirator Fit-Test Record**

Name: \_\_\_\_\_ Respirator User  
(print) \_\_\_\_\_ Identification Number: \_\_\_\_\_

Date: \_\_\_\_\_ Project: \_\_\_\_\_ Location: \_\_\_\_\_

**Personal Use Conditions/Limitations:** The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by HSEP 13.9, Respiratory Protection Program.

Check all that apply:

\_\_\_\_\_ None      \_\_\_\_\_ Beard/Facial Hair      \_\_\_\_\_ Dentures  
                                 \_\_\_\_\_ Prescription Eyeglasses      \_\_\_\_\_ Contact Lenses

Scars/Other: Explain: \_\_\_\_\_

**Fit-Test Record**

Respirator (Make, Model and Size): \_\_\_\_\_

**Quantitative Fit-Testing**

Ambient Aerosol Condensation Nuclei Counter (Portacount):  Yes  No

Controlled Negative Pressure:  Yes  No

**Fit-Test Results**

\_\_\_\_\_ **PASS:** I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

\_\_\_\_\_ **FAIL:** Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: \_\_\_\_\_

Respirator Wearer's Signature: \_\_\_\_\_

## 7.0 PROPER RESPIRATOR USE

### 7.1. General Requirements

- 7.1.1. All respirators, filters, cartridges, and components used at this site shall be certified by NIOSH and shall be worn in accordance with all manufacturers' instructions.
- 7.1.2. Respirators shall be used only for the purpose intended and shall not be modified in any way.
- 7.1.3. Tight-fitting facepiece respirators are not to be worn by workers, who have any condition that interferes with the face-to-facepiece seal or valve function (such as facial hair).
- 7.1.4. If a worker wears corrective glasses or goggles or other personal protective equipment, the Site HSE Supervisor shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.
- 7.1.5. For all tight-fitting respirators, a user seal check is conducted each time the respirator is donned. Tight-fitting respirators that cannot be seal-checked are not acceptable for use.
- 7.1.6. Site management shall ensure appropriate surveillance of work area conditions and degree of worker exposure or stress. When there is a change in work area conditions or degree of worker exposure or stress that may affect respirator effectiveness, the Site HSE Supervisor shall reevaluate the continued effectiveness of the respirator.

The worker's Supervisor will ensure that workers can leave the area:

- To wash their faces and respirator face-pieces as necessary to prevent eye or skin irritation associated with respirator use;
  - If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece; or
  - To replace the respirator or the filter, cartridge, or canister elements, when vapor or gas breakthrough is detected, changes in breathing resistance occurs, or when there is leakage of the facepiece. The respirator will be replaced or repaired before allowing the worker to return to the work area.
- 7.1.7. Prior to use, the following items are visually inspected, as appropriate:
    - Tightness of connections
    - Condition of facepiece
    - Head straps
    - Valves and connecting tube
    - Cartridge/Canisters
    - Elastic parts (for pliability)
    - Respirator function

## **7.2. Procedures for Using the Respirator**

Inspect the respirator before use to verify that all parts are present and in good working order.

Follow the manufacturer's instructions when donning and adjusting the respirator straps. Some disposable single-use respirators utilize elastic straps and adjustable buckles.

If detection of vapor inside the facepiece (by smell or otherwise) or difficult breathing is experienced, workers are trained to leave the area immediately, report the condition to their supervisor, and provide the respirator to the Site HSE Supervisor for inspection.

## **7.3. Particulate Filter Respirator**

Particulate Filter Respirators provide protection against low levels of certain dusts and/or fumes (Appendix D [Table 1](#)). This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health.

## **7.4. Chemical Cartridge Respirator/Air Purifying Respirator (Non-IDLH)**

### **7.4.1. Limitations**

This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health. Workers are trained to leave the area immediately if an odor is detected inside the respirator.

7.4.2. These respirators provide protection against low levels of certain gases and vapors. Respirator canisters or cartridges shall be specifically selected for concentrations of gases and/or vapors that may be encountered (Appendix D [Table 2](#))

7.4.3. Air purifying respirators (APRs) shall not be used for rescue or emergency work.

7.4.4. Cartridges are replaced in accordance with cartridge change schedule stated in the Respirator Selection Worksheet, [Form 3-1](#), or if workers can smell or otherwise detect vapors inside the facepiece, or if difficulty breathing is experienced, the cartridges will be changed.

## **7.5. 5.5 Airline Respirator**

### **7.5.1. Limitations**

An airline respirator shall not be used in any atmosphere that is immediately dangerous to life or health, including an oxygen deficient atmosphere, unless equipped with a self-contained escape (5, 15, or 30 minute) air cylinder.

### **7.5.2. Procedures for Using Airline Respirators**

- Workers shall inspect all equipment before each use to assure all parts are present and in good working order.
- If using an escape air cylinder, user will ensure that air supply is of sufficient capacity (5, 15, or 30 minute) to permit safe escape from work area.
- The worker will then follow the manufacturer's instruction to select correct length of airline hose.

- Connect hose to regulator and air supply. (The maximum air pressure at the point of attachment of hose to air supply is determined by manufacturer's instructions.)
- The worker will then don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- Next the worker shall connect the respirator to the regulator and adjust the airflow in the facepiece.
- In case of respirator malfunction, workers are trained to leave the area immediately, report the condition to their supervisor.

#### 7.5.3. Procedures for Using Airline Respirators with Compressors

- If using a compressor, the worker and their supervisor, or the Site HSE Supervisor, will verify that the compressor's air intake is in an uncontaminated area. Air-purifying filters and/or sorbents shall be used if necessary to assure Grade D quality air. (Refer to the section below related to Breathing Air Quality.)
- Record on a tag, which will be maintained at the compressor, the most recent filter change date and the signature of the person authorized to perform the filter change.
- If the compressor is oil-lubricated, it shall be equipped with high temperature and carbon monoxide alarms that are both audible and visual.
- For compressors that are not oil-lubricated, ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm.
- In-line air purifying sorbent filters with water and oil traps shall be installed between the compressor and user(s).

### 7.6. Self-Contained Breathing Apparatus (SCBA)

7.6.1. SCBAs are provided primarily for use in emergency response when spills, leaks, or other circumstances present respiratory hazards.

7.6.2. Grade D breathing air quality cylinders shall be stored and maintained in a fully charged state and shall be recharged if the pressure falls to 90% of the manufacturer's recommended pressure level.

#### 7.6.3. Limitations

Air supply is generally rated for 30 minutes.

Heavy exertion and excitement will increase the breathing rate and deplete the air supply sooner. Workers are trained to leave the area when the alarm indicates low air supply.

#### 7.6.4. Procedures for Using the Equipment

Workers shall inspect the unit before each use and ensure a sufficient air supply (at or above 90%) and that the regulator and low pressure warning devices function properly.

The user will then open the cylinder air supply valve.

Next, don unit so cylinder is on the user's back with the valve pointing down and engage and tighten the harness.

Then the worker will don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.

The worker will then connect the facepiece hose to the regulator.

Workers are trained to use the bypass only in the event of regulator failure and to leave area immediately, whenever the low-pressure alarm sounds.

- 7.6.5. Care and maintenance of SCBAs is performed by a qualified person.
- 7.6.6. Bottles are refilled only with breathing air that meets the specifications for Grade D Breathing Air in Compressed Gas Association Commodity Specification G-7.1-1989. Grade D has an oxygen content of 19.5-23.5%, condensed hydrocarbon of 5 mg/m<sup>3</sup> or less, carbon monoxide of 10 ppm or less, carbon dioxide of 1,000 ppm or less, and lack of noticeable odor.
- 7.6.7. SCBA emergency use respirators are kept accessible to the work area and stored in compartments or in covers that are clearly marked as containing emergency respirators.
- 7.6.8. All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.
- 7.6.9. Emergency escape-only respirators shall be inspected before being carried into the workplace for use.
- 7.6.10. For respirators maintained for emergency use, the Site HSE Supervisor or Supervisor will assure the presence of a tag or label containing the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator.

This information is provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent inspection.

## **7.7. Breathing Air Quality**

- 7.7.1. Air supply shall be free of harmful quantities of contaminants, and shall meet specification for Grade D Breathing Air as described in the Compressed Gas Association publication G-7 1988, Compressed Air for Human Respiration.
- 7.7.2. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus.
- 7.7.3. Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders must have a dated label or sticker affixed to them indicating "Certified Breathing Air" or equivalent.
- 7.7.4. Workers are instructed to stop work immediately if they experience difficulty in breathing, smell any unusual odors, or experience an ill feeling such as a headache or upset stomach, etc. and report the situation to their Supervisor.

## **7.8. User Seal Checks**

Workers shall test the seal of their respirator to their face prior to using by performing both negative-pressure and positive-pressure user seal checks according to the following guidelines.

#### 7.8.1. Negative-Pressure Seal Check Procedure

Close inlet openings of the respirator, canister(s), cartridge(s), or filter(s) by covering with palm of hands, by replacing the inlet seal on the canister(s), or by squeezing a breathing tube or blocking its inlet so as not to allow the passage of air.

Inhale gently and hold breath for ten seconds.

Verify that a satisfactory fit has been achieved by assuring that the facepiece collapses slightly and no inward leakage of air into facepiece is detected.

If inward leakage is detected the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory fit check is obtained.

#### 7.8.2. Positive-Pressure Seal Check Procedure

Close exhalation valve or breathing tube or both.

Exhale gently.

Verify that a satisfactory fit has been achieved by assuring that a slight buildup of positive pressure is generated inside the facepiece without detection of outward leakage between the sealing surface and the face.

If outward leakage is detected, the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory seal check is obtained.

## **8.0 TRAINING**

Training is provided to all workers who are required to use respirators, prior to them using the respirator in the workplace.

### **8.1. Training Content**

The training is comprehensive and is to be conducted on an annual basis or more often, if necessary. At a minimum, the training includes the following topics:

- The nature of the hazard(s), including physical properties, odor characteristics, physiological effects on the body, and known concentration levels of toxic material or airborne radioactive level;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The physical characteristics, functional capabilities, and limitations of various types of respirators;
- How to use the respirator in emergency situations;
- How to inspect, don, doff, use, and check the seal of the respirator;
- Procedures for maintenance and storage of the respirator; and
- How to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators.

### **8.2. Training Documentation**

Training documentation is maintained for all workers who are assigned work that requires the use of a respirator. (Form 6-1 may be used to document training.)

Re-training is administered annually and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the respirator wearer's knowledge or use of the respirator indicate that the worker has not retained the requisite understanding or skill; or
- Situations arise in which retraining appears necessary to ensure safe respirator use.

**Form 6-1, Air-Supplied Respirator Training**

Name: \_\_\_\_\_ Respirator User  
 (print) \_\_\_\_\_ Identification Number: \_\_\_\_\_

Date: \_\_\_\_\_ Project: \_\_\_\_\_ Location: \_\_\_\_\_

<b>I Have Been Trained and Understand</b>	<b>APR</b>	<b>SAR</b>
	(√ as applicable)	
The workplace hazards		
Respirator capabilities and limitations		
How improper fit, usage, and maintenance can compromise respirator		
How to use the respirator		
How to use the respirator in an emergency		
How to don, doff, and seal check the respirator		
Cartridge change schedule (APR only)		
How to maintain and store the respirator		
The medical signs & symptoms that may limit effective use of respirator		

APR=Air Purifying Respirator  
 SAR=Supplied Air Respirator

<b>Respirator Description</b>	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	

Person Performing Training: \_\_\_\_\_

Respirator Wearer's Signature: \_\_\_\_\_

## **9.0 RESPIRATOR MAINTENANCE**

### **9.1. Cleaning and Sanitization**

The following provides guidelines for cleaning and sanitizing respirators. Recommendations provided by the equipment manufacturer may be used provided the procedures are as effective as those listed here.

9.1.1. Respirators will be cleaned and sanitized before being issued. Commercial wipes may also be used by the wearer to clean his/her respirator between uses during the work shift.

9.1.2. Cleaning, disinfecting, and storage of respirators shall be performed as follows:

- Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand- and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (43° C [110° 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.
- Rinse components thoroughly in clean, warm (43° C [110° F] maximum), preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components will be immersed for two minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43° C (110° F);
  - 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° C (110° F); or
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, as recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm (43° C [110° F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face-pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- Components are hand-dried with a clean lint-free cloth or air-dried.
- Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- Test the respirator to verify that all components work properly.

9.1.3. Chemical cartridges and mechanical filters shall be discarded and replaced as defined in Section 3.0 of this Program.

### **9.2. Inspecting and Storing**

Respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

Inspection and replacement of respirator parts shall be performed according to the following:

- 9.2.1. All respirators must be inspected by the wearer prior to each use.
- 9.2.2. Storage shall be in a convenient, clean, and sanitary location. At a minimum, respirators shall be stored in a protective bag.
- 9.2.3. SCBAs shall be inspected monthly and after each use by a qualified person. The wearer shall self-inspect the SCBA prior to each use. SCBA inspections shall include checking cylinder pressure and units shall be brought to the rated pressure. Units shall be recharged after each use.
- 9.2.4. Airline respirators shall receive a functional check before and after each use.
- 9.2.5. Replacement of parts shall be made only with those specifically designed for the respiratory device used. All maintenance and repair shall be performed only by appropriately trained persons and shall be documented.

For some respiratory equipment's maintenance and repairs, e.g., SCBAs, escape units, the manufacturer will provide training certification for the person doing the maintenance or repairs.

### **9.3. Repairing, Discarding, and Maintaining Respirators**

- 9.3.1. Defective equipment shall be immediately removed from service and repaired prior to use. Repairs shall be made only by an appropriately trained, designated qualified person, and only with the manufacturer's approved replacement parts.
- 9.3.2. Defective equipment not repaired immediately shall be tagged:

Danger — Do Not Use – Defective
- 9.3.3. Specific defect(s) will be listed on the tag.
- 9.3.4. Users may self-perform repairs only if they have been appropriately trained and approved parts are available. Reducing and admission valves, regulators, and alarms for air-supplied respirators shall only be repaired by the manufacturer or a certified technician trained by the manufacturer.

## **10.0 VOLUNTARY RESPIRATOR USE REQUIREMENTS**

Workers may voluntarily use a respirator with the approval of their Supervisor. The Site HSE Supervisor and Supervisor will evaluate requests for voluntary respirator use to determine if the worker can perform the activities safely and respirator use will not in itself create a hazard.

If it is determined that voluntary use will be permitted, a copy of Appendix B of this program shall be provided to the worker.

A medical evaluation and PLHCP's written determination will also be provided for all workers who are permitted to use respirators voluntarily, prior to their use of a respirator. (See Section 2.0 of this program).

Additionally, all requirements for cleaning, maintaining and storage of respirators contained in this Program shall also apply to workers permitted to use respirators voluntarily. (See Section 7.0 of this program).

Respirators worn on a voluntary basis do not require fit testing.

## **11.0 Respirator Program Evaluation**

The effectiveness of this site-specific Respiratory Protection Program will be evaluated with routine observations and formal Program evaluations.

### **11.1. Routine Observations**

The Site HSE Supervisor shall be responsible for conducting routine observations related to the effective selection, use, maintenance, storage and other aspects of this Program. Observations shall be noted through the use of SORs or equivalent documented routine safety inspections. Noted deficiencies shall be corrected as soon as possible.

### **11.2. Program Evaluations**

Formal Program evaluations shall be conducted on an annual basis and documented on Respiratory Protection Program Checklist, Appendix C. SORs and SERs can also be used to document Program effectiveness.

Noted deficiencies are corrected as soon as possible.

### **11.3. Content of Program Evaluations**

Program evaluations shall conform to the following:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Initial and annual fit testing for tight-fitting respirators,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators,
- Procedures for regularly evaluating the effectiveness of the program,
- Voluntary use procedures, and
- Other applicable observations.

## APPENDIX A – OSHA Respirator Medical Evaluation Questionnaire

**TO THE EMPLOYER:** Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

**TO THE EMPLOYEE:** Can you read:  Yes  No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

---

**PART A. SECTION 1.** (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator. (Please Print):

Today's Date: \_\_\_\_\_ Location/Job #: \_\_\_\_\_

Your Name: \_\_\_\_\_ DEN/SSN: \_\_\_\_\_

Your Age (to nearest year): \_\_\_\_\_ Sex:  Male  Female

Your height: \_\_\_\_\_ ft. \_\_\_\_\_ in. Your weight: \_\_\_\_\_ lbs.

Your job title: \_\_\_\_\_

A phone number where you can be reached by the health care professional who reviews this questionnaire. (Include the area code): \_\_\_\_\_

The best time to reach you at this number: \_\_\_\_\_

Has your employer told you how to contact the health care professional who will review this questionnaire?  Yes  No

Check the type of respirator you will use (you can check more than one category):

- A.  N, R, or P disposable respirator (filter mask, non-cartridge type only).
- B.  Other type (for example, half- or full-face piece type, powered-air purifying, supplied air, self-contained breathing apparatus).

Have you ever worn a respirator?  Yes  No

If yes, what types? \_\_\_\_\_

Have you ever failed a respirator examination or pulmonary function test?  Yes  No

If yes, why?

Have you ever been denied or turned down for the use of a respirator?  Yes  No

If yes, why?

**PART A. SECTION 2.**

Name: \_\_\_\_\_

**(Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator.**

1.	<p>Do you <b>currently</b> smoke tobacco, or have you smoked tobacco in the last month?                  If yes, how long have you smoked? _____                  What do you smoke? (please circle) <input type="checkbox"/> Cigarettes <input type="checkbox"/> Cigars <input type="checkbox"/> Pipe tobacco                  How much do you smoke per day? _____                  If <b>NO</b>, are you a former smoker? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <ul style="list-style-type: none"> <li>• How long since you quit? _____</li> <li>• How many years did you smoke? _____</li> <li>• How much did you smoke per day? _____</li> </ul>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>
2.	<p>Have you <b>ever</b> had any of the following conditions?  <b><u>Explain all yes answers in the space provided below.</u></b></p> <p>A. Seizures (fits) _____                  B. Diabetes (sugar disease) _____                  C. Allergic reactions that interfere with your breathing _____                  D. Claustrophobia (fear of closed-in places): _____                  E. Trouble smelling odors _____</p> <p><b><u>Explain all yes answers here</u></b> (include dates and treatment): _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>
3.	<p>Have you <b>ever</b> had any of the following pulmonary or lung problems?  <b><u>Explain all yes answers in the space provided below.</u></b></p> <p>A. Asbestosis _____                  B. Asthma _____                  C. Chronic bronchitis _____                  D. Emphysema _____                  E. Pneumonia _____                  F. Tuberculosis _____                  G. Silicosis _____                  H. Pneumothorax _____                  I. Lung cancer _____                  J. Broken ribs _____                  K. Any chest injuries or surgeries _____                  L. Any other lung problem that you have been told about _____</p> <p><b><u>Explain all yes answers here</u></b> (include dates and treatment): _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>

<p>4.</p>	<p>Do you <b>currently</b> have any of the following symptoms of pulmonary or lung diseases?</p> <p><b><u>Explain all yes answers in the space provided below.</u></b></p> <p>A. Shortness of breath</p> <p>B. Shortness of breath when walking fast on level ground or walking up a slight hill or incline</p> <p>C. Shortness of breath when walking with other people at an ordinary pace on level ground</p> <p>D. Have to stop for a breath when walking at your own pace on level ground</p> <p>E. Shortness of breath when washing or dressing yourself</p> <p>F. Shortness of breath that interferes with your job</p> <p>G. Coughing that produces phlegm (thick sputum)</p> <p>H. Coughing that wakes you early in the morning</p> <p>I. Coughing that occurs mostly when you are lying down</p> <p>J. Coughing up blood in the last month</p> <p>K. Wheezing</p> <p>L. Wheezing that interferes with your job</p> <p>M. Chest pain when you breathe deeply</p> <p>N. Any other symptoms that you think may be related to lung problems</p> <p><b><u>Explain all yes answers here</u></b> (include dates and treatment): _____</p> <p>_____</p> <p>_____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>
<p>5.</p>	<p>Have you <b>ever</b> had any of the following cardiovascular or heart problems?</p> <p><b><u>Explain all yes answers in the space provided below.</u></b></p> <p>A. Heart attack</p> <p>B. Stroke</p> <p>C. Angina</p> <p>D. Heart failure</p> <p>E. Swelling in your legs or feet (not caused by walking)</p> <p>F. Heart arrhythmia (heart beating irregularly)</p> <p>G. High blood pressure</p> <p>H. Any other heart problem that you have been told about</p> <p><b><u>Explain all yes answers here</u></b> (include dates and treatment): _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>
<p>6.</p>	<p>Have you <b>ever</b> had any of the following cardiovascular or heart symptoms?</p> <p><b><u>Explain all yes answers in the space provided below.</u></b></p> <p>A. Frequent pain or tightness in your chest</p> <p>B. Pain or tightness in your chest during physical activity</p> <p>C. Pain or tightness in your chest that interferes with your job</p> <p>D. In the past two years, have you noticed your heart skipping or missing a beat</p> <p>E. Heartburn or indigestion that is not related to eating</p> <p>F. Any other symptoms that you think may be related to heart or</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>

	<p>circulation problems  <u><b>Explain all yes answers here</b></u> (include dates and treatment): _____                  _____                  _____                  _____                  _____</p>	
7.	<p>Do you <b>currently</b> take medication for any of the following problems?  <u><b>Explain all yes answers in the space provided below.</b></u>                  A. Breathing or lung problems                  B. Heart trouble                  C. Blood pressure                  D. Seizures (fits)  <u><b>List medications and dosages:</b></u> _____                  _____                  _____                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>
8.	<p>If you have used a respirator, have you <b>ever</b> had any of the following problems? (If you have never used a respirator, check the following space and go to question 9) <input type="checkbox"/>  <u><b>Explain all yes answers in the space provided below.</b></u>                  A. Eye irritation                  B. Skin allergies or rashes                  C. Anxiety                  D. General weakness or fatigue                  E. Any other problem that interferes with you use of a respirator  <u><b>Explain all yes answers here</b></u> (include dates and treatment): _____                  _____                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>
9.	<p>Would you like to talk to the health care professional that will review this questionnaire about your answers on this questionnaire?</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10	Have you <b>ever</b> lost vision in either eye (temporarily or permanently)? · <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO
11	Do you <b>currently</b> have any of the following vision problems? · A. Wear contact lenses B. Wear glasses C. Color blind D. Any other eye or vision problem <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO
12	Have you <b>ever</b> had an injury to your ears, including a broken eardrum? · <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO
13	Do you <b>currently</b> have any of the following hearing problems? · A. Difficulty hearing B. Wear a hearing aid C. Any other hearing or ear problem <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO
14	Have you <b>ever</b> had a back injury? · <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO
15	Do you <b>currently</b> have any of the following musculo-skeletal problems? · <b>Explain all yes answers in the space provided below.</b> A. Weakness in any part of your arms, hands, legs or feet B. Back pain	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO

	C. Difficulty fully moving your arms and legs D. Pain or stiffness when you lean forward or backward at the waist E. Difficulty fully moving your head up or down F. Difficulty fully moving your head side to side G. Difficulty bending at your knees H. Difficulty squatting to the ground I. Climbing a flight of stairs or a ladder carrying more than 25 pounds J. Any other muscle or skeletal problem that interferes with using a respirator <b>Explain all yes answers here</b> (include dates and treatment): _____ _____ _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO
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<b>12.0 PART B: DISCRETIONARY QUESTIONS</b> Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.		
1.	In your <b>present</b> job, are you working at high altitudes (over 5,000 feet) or in a place that that has lower than normal amounts of oxygen?  <b>If yes</b> , do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions? Explain below: _____ _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO
2.	At work or at home, have you <b>ever</b> been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals?  <b>If yes</b> , name the chemicals if you know them: _____ _____ _____	<input type="checkbox"/> YES <input type="checkbox"/> NO
3.	Have you <b>ever</b> worked with any of the materials, or under any of the conditions, listed below: A. Asbestos B. Silica (e.g., in sandblasting) C. Tungsten / cobalt (e.g., grinding or welding this material) D. Beryllium E. Aluminum F. Coal (for example, mining)	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO

	<p>G. Iron                  H. Tin                  I. Dusty environments                  J. Any other hazardous exposures  <b>If yes</b>, describe these exposures: _____                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>
4.	<p>List any previous occupations: _____                  _____</p>	
5.	<p>List your current and previous hobbies:                  _____                  _____</p>	
6.	<p>List any second jobs or side businesses you have: _____                  _____</p>	
7.	<p>Have you been in the military services?  <b>If yes</b>, were you exposed to biological or chemical agents (either in training or combat):  <b>If yes</b>, please list them in the space provided:                  _____                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>
8.	<p>Have you ever worked on a HAZMAT team?  <b>If yes</b>, please list them in the space provided:                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>
9.	<p>Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications)?  <b>If yes</b>, please list them in the space provided:                  _____                  _____                  _____                  _____</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>
10.	<p>Will you be using any of the following items with your respirator(s)?                  A. HEPA Filters                  B. Canisters (For example, gas masks)                  C. Cartridges</p>	<p><input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO  <input type="checkbox"/> YES <input type="checkbox"/> NO</p>



16. Describe the work you will be doing while you are using your respirator: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

17. Describe any special or hazardous conditions you might encounter when you are using your respirator(s):  
(For example, confined spaces, life-threatening gases): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

18. Provide the following information, if you know it, for each toxic substance that you will be exposed to when you are using your respirator(s):  
Name of the first toxic substance: \_\_\_\_\_  
Estimated maximum exposure level per shift: \_\_\_\_\_  
Duration of exposure per shift: \_\_\_\_\_  
Name of the second toxic substance: \_\_\_\_\_  
Estimated maximum exposure level per shift: \_\_\_\_\_  
Duration of exposure per shift: \_\_\_\_\_  
Name of the third toxic substance: \_\_\_\_\_  
Estimated maximum exposure level per shift: \_\_\_\_\_  
Duration of exposure per shift: \_\_\_\_\_  
The name of any other toxic substances that you will be exposed to while using your respirator:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

19. Describe any special responsibilities you will have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DATE: \_\_\_\_\_ SIGNED: \_\_\_\_\_

## **Appendix B – Employees Using Respirators When Not Required Under the Standard**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker.

Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA or other applicable regulations or standards.

If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following.

1. Read and follow all instructions provided by the manufacturer on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. In the U.S., National Institute for Occupational Safety and Health (NIOSH) respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is tested and certified for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

## Appendix C – Respiratory Protection Program Checklist

Site Name: \_\_\_\_\_ Location: \_\_\_\_\_  
Site Manager: \_\_\_\_\_ Site HSE  
Supervisor: \_\_\_\_\_  
Reviewer: \_\_\_\_\_ Date Reviewed: \_\_\_\_\_

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### PROGRAM ADMINISTRATION

Yes No

- Are the Program Administrator and Site HSE Supervisor identified?
- Are the nine program elements followed?
- If program include emergency respirator use, are procedures in place?
- Is the Site HSE Supervisor effectively administering the program?
- Is the written program updated as necessary to account for changes in the workplace affecting respirator use?
- Equipment, training, and medical evaluations provided at no cost to employees?

Comments: \_\_\_\_\_  
\_\_\_\_\_

### MEDICAL EVALUATION

Yes No

- All employees in respirator jobs have been evaluated to determine their ability to wear a respirator prior to respirator use.
- A physician or other licensed health care professional (PLHCP) has been identified to perform the medical evaluations.
- Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in the medical questionnaire for respiratory use in Appendix A, or if their initial medical evaluation reveals that a follow-up exam is needed.
- Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.
- Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.
- Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and the PLHCP has given the employee a copy of these recommendations.
- Employees who are medically unable to wear a negative pressure respirator are provided with a powered air-purifying respirator (PAPR) if they are found by the PLHCP to be medically able to use a PAPR.
- Employees are given additional medical evaluation when:
  - The employee reports symptoms related to his or her ability to use a respirator.

Yes No

- The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary.
- Information from the respiratory protection program suggests a need for reevaluation.
- Workplace conditions have changed in a way that could potentially cause increased risk to the employee's health.

Comments: \_\_\_\_\_

## RESPIRATOR SELECTION

Yes No

- The specific hazards for each respiratory protection task have been identified.
- Respirators are NIOSH certified, and used under the conditions of the certification.
- Respiratory job exposures characterized as routine or incident-related.
- Respirator job exposures are evaluated for IDLH exposure potential.
- Estimated exposure concentration is included for tasks with routine exposures.
- Respirator manufacturer and model information are specified for each respirator job.
- A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.
- For IDLH jobs, full facepiece pressure demand SARs with escape cylinder or full face piece pressure demand SCBAs, with a minimum service life of 30 minutes, are provided.
- Respirators used for escape only are NIOSH certified for the atmosphere in which they will be used.
- Oxygen deficient atmospheres are considered IDLH.
- Respirators selected are appropriate for the chemical state and physical form of the contaminant.
- Air-purifying respirators used for protection against gases and vapors are equipped with ESLIs or a change schedule has been specified and implemented.
- Air-purifying respirators used for protection against particulate are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulate.
- Air-purifying respirators used for routine gas and vapor exposure protection have service life documentation using manufacturer software, attached to program.

Comments: \_\_\_\_\_

## FIT TESTING

Yes No

- All employees who are using tight fitting respirator facepieces have passed an

**Yes No**

appropriate fit test prior to being required to use a respirator.

- Fit testing is conducted with the same make, model, and size of respirator that the employee will be expected to use at the worksite.
- Fit tests are conducted annually and when different respirator facepieces are to be used.
- Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.
- Employees are given the opportunity to select a different respirator facepiece, and be retested, if their respirator fit is unacceptable to them.
- Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.
- QNFT is used in all situations where a negative pressure respirator is intended to protect workers from contaminant concentrations greater than 10 times the PEL.
- For tight-fitting respirators and powered air-purifying respirators:
  - All tests are conducted in the negative pressure mode.
  - QLFT is achieved by temporarily converting the facepiece-into a negative pressure respirator with appropriate filters, or by using an identical negative pressure APR.
- QNFT is achieved by modifying the facepiece with an adaptor to allow for sampling inside the mask midway between the nose and mouth. The facepiece is restored to its approved configuration before being used in the workplace.

Comments: \_\_\_\_\_

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## PROPER RESPIRATOR USE

**Yes No**

- Workers using tight-fitting respirators have no conditions, such as facial hair, that would interfere with a face-to-facepiece seal or valve function.
- Workers wear corrective glasses, goggles, or other protective equipment in a manner that does not interfere with the face-to-facepiece seal or valve function.
- Workers perform user seal checks prior to each use of a tight-fitting respirator.
- Procedures are in place for conducting ongoing surveillance of the work area for conditions that affect respirator effectiveness, and when such conditions exist, are taken to address those situations.
- Employees are permitted to leave their work area to conduct respirator maintenance, such as washing the facepiece, or to replace respirator parts.
- Employees do not return to their work area until their respirator has been repaired or replaced in the event of breakthrough, a leak in the facepiece, or a change in breathing resistance.
- There are procedures for respirator use in IDLH atmospheres to ensure that the appropriate number of standby personnel are deployed; standby personnel and employees in the IDLH environment maintain communication; standby personnel

**Yes No**

are properly trained, equipped, and prepared; the Site HSE Supervisor is notified when standby personnel enter an IDLH atmosphere; and the Site HSE Supervisor will respond to the notification.

- Standby personnel are equipped with a pressure demand or other positive pressure, SCBA, or a positive pressure supplied air respirator with an escape bottle, and appropriate retrieval equipment or other means for rescue.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## **TRAINING AND INFORMATION**

**Yes No**

- Employees can demonstrate knowledge of the following:
- Why the respirator is necessary and the consequences of improper fit, use, or maintenance.
  - Limitations and capabilities of the respirator.
  - How to effectively use the respirator in emergency situations.
  - How to inspect, don, doff, use, and check the seals of the respirator.
  - Maintenance and storage procedures.
- Training is provided prior to employee use of a respirator
- Retraining is provided:
- Annually.
  - Upon changes in workplace conditions that affect respirator use.
  - Whenever retraining appears necessary to verify safe respirator use.
  - Respirator voluntary use requirements are provided to voluntary users.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## RESPIRATOR MAINTENANCE AND CARE

### Cleaning and Disinfecting

Yes No

- Respirators are provided that are clean, sanitary, and in good working order.
- Respirators are cleaned and disinfected as often as necessary when issued for the exclusive use of one employee; before being worn by different individuals; after each use for emergency use respirators; and after each use for respirators used for fit testing. Commercially available mild detergents or cleaner/sanitizer recommended by the manufacturer are used.

### Storage

Yes No

- Respirators are stored to protect them from damage from the elements, and from becoming deformed.
- Emergency respirators are stored, to be accessible to the work area, in compartments marked as such, and in accordance with manufacturer's recommendations.

### Inspections

Yes No

- Routine-use respirators are inspected before each use and after cleaning.
- SCBAs and emergency respirators are inspected monthly and checked for proper function before and after each use.
- Emergency escape only respirators are inspected before being carried into the workplace for use.
- Inspections include: check of respirator function; tightness of connections; condition of the facepiece, head straps, valves, cartridges, and condition of elastomeric parts.
- For SCBAs, inspection includes checking that cylinders are fully charged, and that regulators and warning devices function properly.
- Emergency use respirators are inspected. The inspection documentation is attached to the respirator or its compartment, or stored with inspection reports.
- Respirators that have failed inspection are taken out of service.

### Repairs

Yes No

- Repairs are made only by trained personnel.
- Only NIOSH-approved parts are used.
- Reducing and admission valves, regulators and alarms are adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## BREATHING AIR QUALITY AND USE

### General

**Yes No**

- Compressed breathing air meets the requirements for Grade D breathing air.
- Compressed oxygen is not used in respirators that have previously used compressed air.
- Oxygen concentrations greater than 23.5 percent are used only in equipment designed for oxygen service or distribution.
- Breathing air couplings are incompatible with outlets for other gas systems.
- Breathing gas containers are marked with appropriate NIOSH certification.

### Breathing Air Cylinders

**Yes No**

- Breathing air cylinders are tested and maintained according to DOT 49 CFR Part 173 and 178.
- A certificate of analysis for breathing air has been obtained from the supplier.
- Moisture content in the cylinder breathing air does not exceed a dew point of -500° F at 1 atmosphere pressure.

### Air Compressors

**Yes No**

- Are constructed and situated to prevent contaminated air from getting into the system and are set up to minimize the moisture content.
- Are equipped with in-line air-purifying sorbent beds and/or filters that are maintained or replaced following manufacturer's instructions and are tagged with information on the most recent change date of the filter and an authorizing signature.
- Carbon monoxide does not exceed 10 ppm in the breathing air from compressors that are oil-lubricated, and high-temperature and carbon monoxide alarms are used on oil-lubricated compressors, or the air is monitored often enough to verify that carbon monoxide does not exceed 10 ppm if only a high-temperature alarm is used.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## PROGRAM EVALUATION

Yes No

- Workplace evaluations are being conducted to verify that the written respiratory protection program is being effectively implemented.
- Employees required to wear respirators are being regularly consulted to assess the employees' views and to identify problems with respirator fit, selection, use and maintenance.
- Any problems identified during evaluations are corrected.

## RECORDKEEPING

Yes No

- Records of medical evaluations are being retained for the term of employment plus 30 years.
- Fit testing records are being retained for 1 year.
- A copy of the current respiratory protection program has been retained onsite.
- Access to these records is provided to workers.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## CORRECTIVE ACTIONS REQUIRED

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## Appendix D – NIOSH Respirator Selection Logic Sequence - 2004

To use this selection logic, first assemble the necessary toxicologic, safety, and other relevant information for each respiratory hazard, as follows:

- General use conditions
- Physical, chemical, and toxicological properties of the contaminants
- Occupational Exposure Limit (STEL,REL, PEL, TLV)
- Expected concentration of each respiratory hazard
- IDLH concentration
- Oxygen concentration or expected oxygen concentration
- Eye irritation potential
- Environmental factors such as presence of oil aerosols

General use conditions should include a description of the job task, including the duration and frequency, location, physical demands, industrial processes, and issues affecting the comfort of the respirators.

After all criteria have been identified and evaluated and after the requirements and restrictions of the respiratory protection program have been met, follow this sequence of questions to identify the class of respirators that should provide adequate respiratory protection. If there exist site contaminants with a substance-specific standard, respirator selection must meet or exceed the respirators required in that standard.

**Step 1** Is the respirator intended for use during fire fighting?

- a. If yes, only a full-facepiece, pressure-demand, self-contained breathing apparatus (SCBA) meeting the requirement of the NFPA 1981, Standard on Open-circuit Self-contained Breathing Apparatus for Fire and Emergency Services (2002 edition) is required.
- b. If no, proceed to Step 2.

**Step 2** Is the respirator intended for use in an oxygen-deficient atmosphere, i.e., less than 19.5% oxygen?

- a. If yes, any type of SCBA other than escape only, or supplied-air respirator (SAR) with an auxiliary SCBA is required. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.  
If yes, and contaminants are also present, proceed to Step 3 to determine if the hazard requires the SCBA or SAR/SCBA to meet a specific APF level.
- b. If no, proceed to Step 3.

**Step 3** Is the respirator intended for entry into unknown or IDLH atmospheres (e.g., an emergency situation)?

- a. If yes, one of two types of respirators is required: a pressure-demand SCBA with a full facepiece or a pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.

b. If no, proceed to Step 4.

**Step 4** Is the exposure concentration of each of the contaminants, as determined by acceptable industrial hygiene methods, less than its respective exposure limit?

a. If yes, a respirator is not required for routine work. For escape respirators, determine the potential for generation of a hazardous condition caused by an accident, spill, or equipment failure. Proceed to Step 6.

b. If no, proceed to Step 5.

**Step 5** Are conditions such that a worker who is required to wear a respirator can escape from the work area and not suffer loss of life or immediate or delayed irreversible health effects if the respirator fails, i.e., are the conditions not immediately dangerous to life or health (IDLH)?

a. If yes, conditions are not considered to be IDLH. Proceed to Step 6.

b. If no, conditions are considered to be IDLH. See Section 3.2 for further guidance.

**Step 6** Is the contaminant an eye irritant, or can the contaminant cause eye damage at the workplace concentration?

a. If yes, a respirator equipped with a full facepiece, helmet, or hood is required. Proceed to Step 7.

b. If no, a half-mask or quarter-mask respirator may still be an option, depending on the exposure concentration. Proceed to Step 7.

**Step 7** Determine the maximum hazard ratio (HR) by the following:

- Divide the time-weighted average (TWA) exposure concentration for the contaminant determined in Step 4 by the applicable exposure limit. If the exposure limit is an 8-hour limit, the TWA used must be an 8-hour average. If the exposure limit is based on 10 hours, use a 10-hour TWA.
- If the contaminant has a ceiling limit, divide the maximum exposure concentration for the contaminant determined in Step 4 by the ceiling limit.
- If the contaminant has a short term exposure limit (STEL), divide the maximum 15-min TWA exposure concentration for the contaminant determined in Step 4 by the STEL.
- For escape respirators, determine the potential for generation of a hazardous condition caused by an accident or equipment failure.

If the calculated maximum HR is greater than 1, proceed to Step 8.

**Step 8** If the physical state of the contaminant is:

- a particulate (solid or liquid aerosol) during periods of respirator use, proceed to Step 9;
- a gas or vapor, proceed to Step 10;
- a combination of gas or vapor and particulate, proceed to Step 11.

**Step 9** Particulate Respirators

Is the particulate respirator intended only for escape purposes?

The maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

For multi-component mixtures the MUC can be calculated by:

$$C1/MUC1 + C2/MUC2 + \dots Cn/MUCn = 1$$

The MUC for the selected respirator class must exceed the expected contaminant concentration.

**Step 10** Gas/Vapor Respirators

**10.1** Is the gas/vapor respirator intended only for escape?

- a. If yes, refer to escape respirators.
- b. If no, the gas/vapor respirator is intended for use during normal work activities. Proceed to Step 10.2.

**10.2** An air-purifying chemical cartridge/canister respirator that has a sorbent suitable for the chemical properties of the anticipated gas/vapor contaminant(s) and for the anticipated exposure levels is required. Information on cartridges or canisters approved for use for classes of chemicals or for specific gases or vapors can be found in the NIOSH Certified Equipment List <http://www.cdc.gov/NIOSH/npptl/topics/respirators/cel/>. Proceed to Step 10.3.

**10.3** Respirators that have not been eliminated from Table 2 by the previous steps and that have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7 are required. Note, however, that the maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:

$$C_1/MUC_1 + C_2/MUC_2 + \dots C_n/MUC_n = 1$$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

### Step 11. Combination Particulate and Gas/Vapor Respirators

**11.1** Is the combination respirator intended for "escape only" purposes?

- a. If yes, refer to the section on escape respirators, for a discussion and selection of "escape only" respirators.
- b. If no, the combination respirator is intended for use during normal work activities. Proceed to Step 11.2.

**11.2** From Table 3, select a respirator type, not eliminated by the previous steps, and have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7. Note, however, that the maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)
- The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:

$$C_1/MUC_1 + C_2/MUC_2 + \dots C_n/MUC_n = 1$$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

**Table 1 - Respirator Assigned Protection Factors - Particulate**

Respirator Type	APF-NIOSH	APF-OSHA
Quarter Mask	5	5
Air-Purifying Half-mask with appropriate type of particulate filter <sup>1</sup>	10	10
Air-Purifying Full facepiece with appropriate type of particulate filter	10	50
Air-purifying full facepiece with N-100, R-100, or P-100 filter.	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with Hood or helmet and HEPA filter	25	25/1000 <sup>2</sup>
Powered air purifying with loose fitting facepiece		25
Powered air-purifying with tight-fitting facepiece (half-mask)and high efficiency filter	50	50
Powered air-purifying with tight-fitting full facepiece and high efficiency filter	50	1000 ??
Continuous flow supplied-air with hood or helmet	25	25/1000 <sup>2</sup>
Continuous flow supplied-air with tight fitting half-mask facepiece	50	50
Continuous flow supplied-air with tight fitting full facepiece	50	1000
Continuous flow supplied-air with loose fitting facepiece		25
Pressure-demand supplied air with half-mask	1000	50
Pressure-demand supplied air with full facepiece	2000	1000
Pressure-demand self-contained with full facepiece <sup>3</sup>	10,000	10,000
Pressure-demand self-contained with helmet/hood		10,000

<sup>1</sup> Includes elastomeric facepiece and filtering facepiece.

<sup>2</sup> Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

<sup>3</sup> May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

**Table 2 - Respirator Assigned Protection Factors – Gas/Vapor**

<b>Respirator Type</b>	<b>APF-NIOSH</b>	<b>APF-OSHA</b>
Air-Purifying Half-mask with appropriate type of gas/vapor cartridge <sup>1</sup>	10	10
Air-Purifying Full facepiece with appropriate type of gas/vapor cartridge	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with Hood or helmet with appropriate type of gas/vapor cartridge	25	25/1000 <sup>2</sup>
Powered air purifying with loose fitting facepiece		25
Continuous flow supplied-air with hood or helmet	25	25/1000 <sup>2</sup>
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1000 <sup>2</sup>
Powered air-purifying with tight-fitting facepiece (half-mask) and appropriate gas/vapor cartridge	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) and appropriate gas/vapor cartridge	50	1000
Negative pressure (demand) self-contained with half mask.		10
Negative pressure (demand) self-contained with full facepiece	50	50
Pressure demand supplied air with half-mask	1000	50
Pressure demand supplied air with full facepiece	2000	1000
Pressure demand self-contained with full facepiece <sup>3</sup>	10000	10000
Pressure demand self-contained with helmet/hood		10,000

<sup>1</sup> Includes elastomeric facepiece

<sup>2</sup> Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

<sup>3</sup> May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

**Table 3 - Respirator Protection Factors - Gas/Vapor and Particulate Combination**

<b>Respirator Type</b>	<b>APF-NIOSH</b>	<b>APF-OSHA</b>
Air-Purifying Half-mask equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter <sup>1</sup>	10	10
Air-Purifying Full facepiece equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter <sup>1</sup>	10	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet	25	25/1,000 <sup>2</sup>
Continuous flow supplied-air with hood or helmet	25	25/1,000 <sup>2</sup>
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000 <sup>2</sup>
Powered air-purifying with tight-fitting facepiece (half-mask) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	1,000
Powered air purifying with loose fitting facepiece		25
Negative pressure (demand) self-contained with full facepiece	50	50
Negative pressure (demand) self-contained with half-mask		10
Negative pressure (demand) self-contained with helmet/hood		50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece <sup>3</sup>	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

<sup>1</sup> Includes elastomeric facepiece

<sup>2</sup> Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

<sup>3</sup> May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

## Appendix E – Definitions

Administrative Controls	Methods of controlling employee exposures to contaminants by job rotation, work assignment, or time periods away from the contaminant.
Air-purifying respirator	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
Atmosphere-supplying respirator	A respirator that supplies the users with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.
Canister or cartridge	A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Dust	Dry particulate aerosols generated by handling, crushing, or grinding organic or inorganic material. Particle size ranges from 1 µm to 1 mm diameter.
Emergency situation	Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.
End-of-service-life indicator (ESLI)	A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.
Engineering Controls	Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment.
Escape-only respirator	A respirator intended to be used only for emergency exit.
Filter or air purifying element	A component used in respirators to remove solid or liquid aerosols from the inspired air.
Filter facepiece (dust mask)	A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
Fume	Aerosol particles generated from heating a solid material. These particles range in diameter from .001 to 1 µm.
Gas	A state of matter in which the material has very low density and viscosity, can expand and contract in response to changes in temperature and pressure, easily diffuses into other gases, and that uniformly distributes throughout any container.
High efficiency particulate air (HEPA) filter	A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 micrometers or greater in diameter. The equivalent NIOSH particulate filters are the N100, R100 and P100 filters.
Hood	A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
Immediately dangerous to life or health (IDLH)	An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Mist	Suspended droplet aerosols produced from bulk liquids by mechanical processes such as splashing, bubbling, or spraying. Particle sizes range from .01 to 10 µm in diameter. .
Negative pressure respirator (tight fitting)	A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
Oxygen deficient atmosphere	An atmosphere with an oxygen content below 19.5%.
PLHCP	A physician or other licensed health care professional.
Positive pressure respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
Pressure-demand respirator	A supplied-air respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
Powered air purifying respirator (PAPR)	An air purifying respirator that uses a blower to force the ambient air through air purifying elements to the inlet covering.
Pressure demand respirator	A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
Qualitative fit test (QLFT)	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
Quantitative fit test (QNFT)	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
Radionuclides	An atom capable of spontaneously emitting radiation.
Respiratory inlet covering	That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air purifying device or breathing air source, or both. It may be a facepiece, helmet, hood suit, or mouthpiece respirator with nose clamp.
Self contained breathing apparatus (SCBA)	A supplied-air respirator for which the breathing air source is designed to be carried by the user.
Supplied air respirator (SAR) or air line respirator	A supplied-air respirator for which the source of breathing air is not designed to be carried by the user.
Tight fitting facepiece	A respiratory inlet covering that forms a complete seal with the face.
User seal check	An action conducted by the respirator user to determine if the respirator is properly seated to the face.
Vapor	The gaseous form of a substance, which is at equilibrium with its liquid or solid state.

## **APPENDIX D**

### **FORMS**

**TVA FLY ASH RESPONSE, JOB SAFETY ANALYSIS**

**Use for your daily team review and sign-off.  
 Review existing AHA, modify as necessary after considering the critical items listed below.  
 If no AHA exists for your task, contact HSE or create one using a blank Job Safety Analysis form**

Date: \_\_\_\_\_ Site Name: \_\_\_\_\_ Task: \_\_\_\_\_

DAILY SITE CONDITION OR ACTIVITY (circle all that apply)	IMPACT ON ACTIVITIES	SAFE PLAN
Weather Conditions Temp range: Precipitation: Wind:		
Change in Classification of Work Zone (circle one new designation) EZ CRZ SZ		
Permits Needed: Utility clearance, hot work, critical lift, confined space		
Energized Electrical Work		
Work at Heights		
Non-routine Chemical Usage		
Other:		
Other:		
Other:		
Team Lead: _____	Team Members: _____, _____, _____, _____ _____, _____, _____, _____ _____, _____, _____, _____	



## Confined Space Entry Assessment And Permit

Date	Confined Space Name/Location			
Confined Space Entry Supervisor	Describe Tasks Involved			
<b>SECTION I — Assessment</b>				
<b>Hazards Identified</b>	<b>Y</b>	<b>N</b>	<b>NA</b>	<b>Detail of Hazard and Appropriate Control</b>
<b>Isolation Hazards</b>				
Access points to space labeled "Danger, Permit-Required Confined Space, Do Not Enter"				
Access points to space protected with barrier tape, barricades, or fencing				
Lines and tanks flushed, purged, and clean				
Blanks installed				
Electrical lock-out/tag-out installed and tested				
Mechanical lock-out/tag-out installed and tested				
Radioactive source removed or shielded				
<b>Physical Hazards</b>				
Ladders, scaffolds, work platforms safeguarded				
Fall protection required				List fall protection equipment under PPE section
Walking and working areas dry and clean				
Minimum illumination of 5 foot-candles				
Continuous audio or visual communication				Identify communication method used
<b>Atmospheric/Chemical Hazards</b>				
Identify and measure all chemical hazards in the confined space				
High pressure				
High temperature or heat stress				
Chemicals generated due to work processes				
Burning, cutting, welding controlled				Specify method: Mechanical ventilation or respiratory protection
Hazardous materials in surface coating (lead, etc)				Identify the hazardous material
Possibility of toxic/ inert gases leaking/sinking in				
Continuous Atmospheric Monitoring required				Complete Continuous Atmospheric Testing Section
Mechanical ventilation required				Calculate air changes per hour required
Respiratory Protection required				List Respiratory Protection in PPE Section
Supplied air or self contained air required				
Asbestos disturbed				
Potential IDLH				SCBA or airline respirator, and retrieval harness required
<b>Electrical Hazards</b>				
All equipment bonded, grounded and tested				
GFCIs for all electrical equipment				
All equipment explosion proof/ intrinsically safe				
<b>Work Activities</b>				
Permits required: Hot Work, Excavation, etc				Identify permits
Hazardous work activities in surrounding areas				
Other hazards not listed above				
<b>PPE (Describe all required PPE including retrieval equipment and harnesses.)</b>				
Eye Protection				
Protective Clothing				
Hand and Foot Protection				
Respiratory Protection				
Fall Protection				

<b>SECTION II — Permit</b>			
This confined space permit is valid only for the work, location, and time listed. If changes occur, the confined space must be re-evaluated and the permit re-issued. All hazards listed in the Assessment and Permit Section must be addressed in the SPA.			
Oxygen 20.8% (19.5 - 23.5%)	Yes	No	If oxygen is < or > 20.8%, determine why
Combustible gas concentration < 1 % LEL	Yes	No	
Carbon monoxide < 25 ppm	Yes	No	
Carbon dioxide < 1,000 ppm	Yes	No	
Hydrogen sulfide < 10 ppm	Yes	No	
List other Chemicals	Monitoring Levels and Action Levels		Exposure Limits (PEL, TLV, etc.)
For non-continuous atmospheric testing, state type of testing, calibration dates, and monitoring frequency.			
For continuous atmospheric testing, list monitoring instruments and calibration dates.			
Has rescue plan been assembled and practiced	Yes	No	
List name of emergency rescue service and identify the equipment that will be used to summon rescue service.			
<b>Printed Names of Trained Entrants</b>		<b>Printed Names of Trained Attendants</b>	
Printed Name of Entry Supervisor			
Entry Supervisor's Signature		Date	Time
HSE Supervisor's (or Project/Site Manager) Signature		Date	Time
<b>SECTION III — Closure</b>			
After confined space entry is complete, the supervisor shall record in this space any incidents and actions taken and any lessons learned.			
Supervisor Closure Signature		Date and Time of Permit Closure	

**Confined Space Authorized Entrants Sign-In and Sign-Out Log**

Client:	Project:	Location:	Date:
Name/Description of Confined Space:		Entry Supervisor:	
Standby Attendant 1 Name (printed):		Standby Attendant 2 Name (printed):	

<u>Entrant's Name Printed</u>	<u>Entrant's Signature</u>	<u>Enter Time In and Out</u>											
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

## Critical Lift Permit

<b>A. Lift Identification</b>	
Job Number:	Location:
Lift Supervisor Name:	
Date of Lift:	Time:
Lift Description:	
<b>B. Approvals (Signatures Required)</b>	
Site Manager:	Date:
Project Manager (if over 50 tons):	Date:
Lift Supervisor:	Date:
Rigging Superintendent:	Date:
Qualified Person:	Date:
Operator(s):	Date:
Engineering:	Date:
If Engineering Designs Are Used	
Other:	Date:
<b>C. Attachments (Insert Page Numbers)</b>	
	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

## Figure 2 Critical Lift Load and Capacity Calculations

Critical Lift Load and Capacity Calculations (Page 1 of 4)			
<b>Lift Description:</b>			
<b>A. Weight of Load (Equipment) – Live Load</b>			
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>B. Total Lifted Weight (load and/or equipment + rigging + main crane deductions)</b>			
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.			
<b>TOTAL LIFTED WEIGHT (Sum B2 thru B11)</b>			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)			

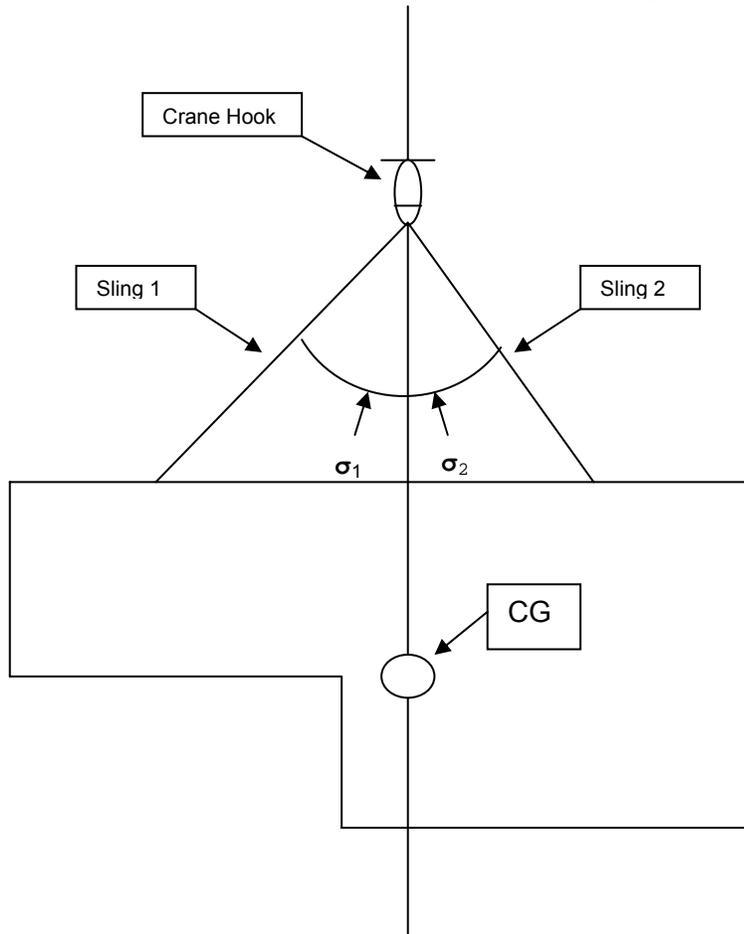
<b>Load and Capacity Calculations (Page 2 of 4)</b>			
<b>C. Capacities of the (Main) Crane</b>			
Make & Model of Crane			
2. Counter Weight Size:		Type of Boom:	
3. Lifting Arrangement			
a. Max. Radius During Lift		Ft.	
b. Length of Boom		Ft.	
c. Angle of Boom at Pick		Deg.	
d. Angle of Boom at Set		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.
<b>D. Percent of Cranes Capacity</b>			
		$\frac{\text{Total Lifted Weight X 100}}{\text{Rated Capacity}} =$	%
<b>E. Size of Slings</b>			
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 ( )

<b>Load and Capacity Calculations (Page 3 of 4)</b>			
<b>F. Total Lifted Weight to be lifted by Tailing Crane</b>			
1. Percent of Total Equipment/Material 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			
12. Total Weight of Load/Equipment lifted by tailing crane (F2 through F11)			<b>Lbs.</b>
Source of Load Weight: (Name Plate, Drawings, Calculated, Weighed)			
Weights Verified By (Name Print and Sign):			
<b>G. Capacities for Tailing Crane Based on Configuration</b>			
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	<b>YES</b>	<b>NO</b>	
b. Length of Jib			Ft.
c. Jib Angle			Ft.
d. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over, front, side, or...)			Lbs.
5. Cable			
a. Number of Parts			
b. Size of Cable			Inch.
c. Maximum Capacity			Lbs.

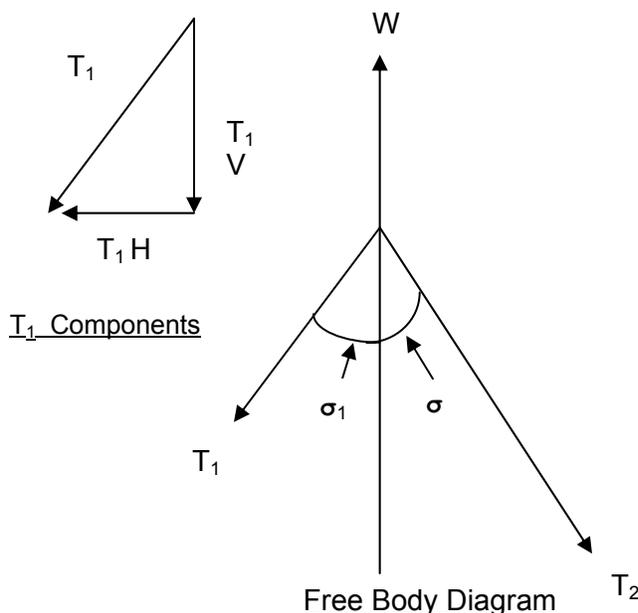


**Figure 3**

**Example of a Lift Geometry Diagram and a Free Body Diagram**



Lift Geometry Diagram



Free Body Diagram

CG= center of gravity of load  
 W = weight of load, lb.  
 $\sigma_1$  = angle from verticle of sling 1, in degrees  
 $\sigma_2$  = angle from verticle of sling 2, in degrees  
 $T_1$  = tension in sling 1, lb., kg., tons, etc.  
 $T_2$  = tension in sling 2, lb., kg., tons, etc.

**Problem:** Find  $T_1$  and  $T_2$  when  $\sigma_1$ ,  $\sigma_2$ , CG, and W are known.

**Solution:** For equilibrium to exist, the summation of forces in both the vertical and horizontal directions must equal to zero.

**Therefore:**

- a) Vertical direction:  
 $\text{Cos } \sigma_1 (T_1) + \text{Cos } \sigma_2 (T_2) = W$
- b) Horizontal direction:  
 $\text{Sin } \sigma_1 (T_1) = \text{Sin } \sigma_2 (T_2)$

**Let**

- $W = 100,000 \text{ lb.}$
- $\sigma_1 = 40^\circ$        $\text{Sin } 40^\circ = 0.643$
- $\sigma_2 = 20^\circ$        $\text{Cos } 40^\circ = 0.766$
- $\text{Sin } 20^\circ = 0.342$
- $\text{Cos } 20^\circ = 0.940$

**Then**

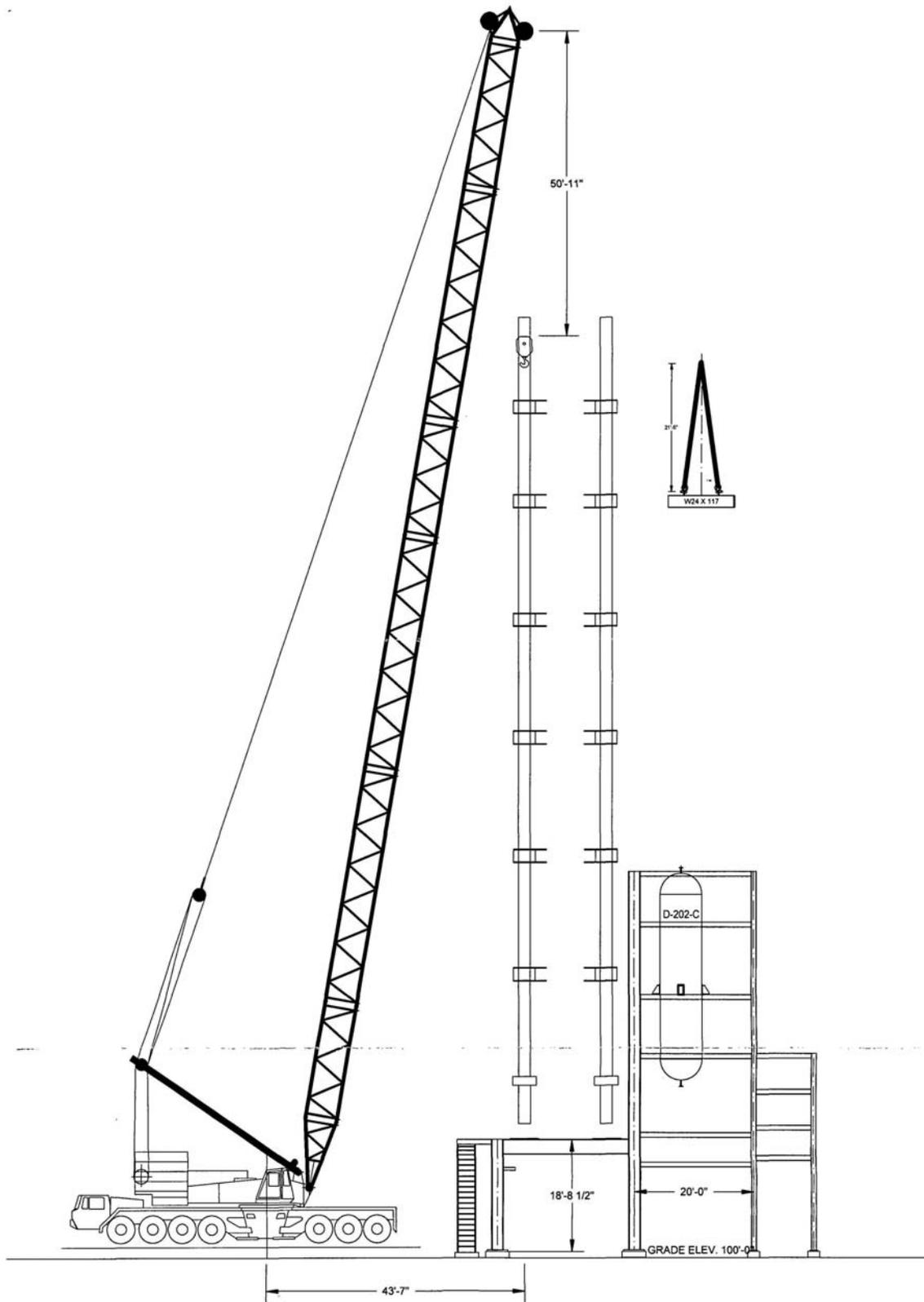
- a)  $0.766 (T_1) + 0.940 (T_2) = 100,000$
- b)  $0.643 (T_1) = 0.342 (T_2)$

Solving equation b:  
 $T_2 = (0.643/0.342)T_1 = 1.880 (T_1)$   
 Solving equation a for  $T_1$ :  
 $0.766 (T_1) + 0.940 (1.880)(T_1) = 100,000$

$2.533 (T_1) = 100,000$   
 $T_1 = 39,474 \text{ lb.}$   
 and from equation b:  
 $T_2 = 1.880 (T_1) = 1.880 \times 39,474$   
 $T_2 = 74,211 \text{ lb.}$

As can be seen sling 2 carries 1.9 times the load of sling 1 ( $74,211/39,474 = 1.9$ )

**Figure 4**  
**Example of Crane Set-up and Rigging Diagrams**



**Figure 5**

<b>Pre-Lift Checklist</b>		Yes	No
1.	Crane operator meets company qualification requirements?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Lift calculations and rigging plan completed?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Are lift equipment swing & travel requirements & clearances known?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Are all required approvals/permits signed?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Crane inspections up to date (Annual/Monthly/Daily)?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Weather conditions and wind speed acceptable?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Has the stability of the ground been assured by soil bearing analysis?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Location and size of underground facilities are known?	<input type="checkbox"/>	<input type="checkbox"/>
9.	Matting and/or outrigger pads inspected and approved?	<input type="checkbox"/>	<input type="checkbox"/>
10.	Electrical equipment and power lines at required distance?	<input type="checkbox"/>	<input type="checkbox"/>
11.	Rigging Inspected for defects?	<input type="checkbox"/>	<input type="checkbox"/>
12.	Engineered lifting lugs fabricated and installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
13.	Connecting/disconnecting means been developed?	<input type="checkbox"/>	<input type="checkbox"/>
14.	Have the safety precautions been reviewed?	<input type="checkbox"/>	<input type="checkbox"/>
15.	Is survey equipment required?	<input type="checkbox"/>	<input type="checkbox"/>
16.	The total lifted weight is below 95% of capacity?	<input type="checkbox"/>	<input type="checkbox"/>
17.	Signal person(s) assigned?	<input type="checkbox"/>	<input type="checkbox"/>
18.	Safe Plan of Action (SPA) Completed?	<input type="checkbox"/>	<input type="checkbox"/>
19.	Pre-Lift Meeting/Task Safety Awareness Meeting (TSA) held?	<input type="checkbox"/>	<input type="checkbox"/>
20.	Hoist area & load path cleared of non-essential personnel?	<input type="checkbox"/>	<input type="checkbox"/>
21.	Crane set up per the lift plan (radius, configuration, etc)?	<input type="checkbox"/>	<input type="checkbox"/>
22.	Rigging equipment and tag line(s) installed per plan?	<input type="checkbox"/>	<input type="checkbox"/>
Completed By Signature:		Name Printed:	Date:



## Daily Trench/Excavation Inspection

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Site Name: \_\_\_\_\_

Excavation Location \_\_\_\_\_

### Site Evaluation

- |  |  |
|--|--|
| <input type="checkbox"/> Surface encumbrances          | <input type="checkbox"/> Warning system for mobile equipment   |
| <input type="checkbox"/> Underground installations     | <input type="checkbox"/> Protection from water accumulation    |
| <input type="checkbox"/> Access and egress             | <input type="checkbox"/> Stability of adjacent structures      |
| <input type="checkbox"/> Exposure to vehicular traffic | <input type="checkbox"/> Employee protection - loose rock/soil |
| <input type="checkbox"/> Exposure to falling loads     | <input type="checkbox"/> Inspections                           |
| <input type="checkbox"/> Hazardous atmospheres         | <input type="checkbox"/> Fall protection                       |
| <input type="checkbox"/> % Oxygen (O <sub>2</sub> )    | <input type="checkbox"/> % of Lower Explosive Limit            |

Note: Atmospheres in excavations greater than four feet shall be tested for oxygen content and flammable gas concentrations prior to entry of personnel. Emergency rescue equipment shall be readily available.

### Soil Classification

Soil classification shall be made based on the results of at least one visual, and one manual test.

Stable rock       Type A       Type B       Type C

#### Visual Tests

Inspect worksite for:

- Fissured ground
- Layered soil
- Previously disturbed earth
- Seepage
- Vibration
- Poor drainage

#### Manual Tests

Analyze soil for:

- Plasticity
- Dry strength
- Thumb penetration
- Pocket penetrometer
- Sherevane
- Drying test

### Protective Support Systems

#### Sloping & Benching

- Stable rock: 90 degrees
- Type A: 53 degrees
- Type B: 45 degrees
- Type C: 34 degrees

#### Shoring & Shielding

- Timber or hydraulic
- Trench boxes, trench shields
- Design using tabulated data
- RPE design

**Additional Comments or Information:** \_\_\_\_\_

Inspection performed by: \_\_\_\_\_

**Authorized Competent Person**

# FLOAT PLAN

## JACOBS

TVA Fly Ash Response Site Complete this plan before you go boating. Ask the person holding the plan to notify the TVA Police if you do not return by the "If Not Returned By" time and you cannot be immediately located.

THIS PLAN DOES NOT HAVE TO BE FILED WITH THE COAST GUARD  
Upon return, take the plan back from the person holding it and submit it to the Site Safety & Health Officer.

**Pilot's Name :** \_\_\_\_\_ **Phone # :** \_\_\_\_\_

**Address :** \_\_\_\_\_  
\_\_\_\_\_

### DESCRIPTION OF VESSEL

**Name of Vessel :** \_\_\_\_\_ **Registration # :** \_\_\_\_\_

**Type :** \_\_\_\_\_ **Hull Color :** \_\_\_\_\_ **Trim Color :** \_\_\_\_\_

**Make :** \_\_\_\_\_ **Hull Material :** \_\_\_\_\_ **Length :** \_\_\_\_\_

**Distinguishing Features :** \_\_\_\_\_  
**Engine(s) Number/Type/Horsepower :** \_\_\_\_\_

**Fuel Type/Capacity :** \_\_\_\_\_ Watercraft Checked-in proper working order

### TRAILER INFO

**Tow Vehicle Registration # :** \_\_\_\_\_ **State :** \_\_\_\_\_ **Make/Model/Color :** \_\_\_\_\_

**Trailer Registration # :** \_\_\_\_\_ **State :** \_\_\_\_\_

**Ramp Location :** \_\_\_\_\_  
\_\_\_\_\_

### PASSENGERS ON-BOARD

<u>Name</u>	<u>Address &amp; Phone #</u>
_____	_____
_____	_____
_____	_____
_____	_____

### TRIP DETAILS

**Departure Date :** \_\_\_\_ / \_\_\_\_ / \_\_\_\_ **Departure Time :** \_\_\_\_\_  
AM/PM

**Point of Departure :** \_\_\_\_\_  
\_\_\_\_\_

**Destination(s)/Purpose of Trip:** \_\_\_\_\_  
\_\_\_\_\_

**Point of Return :** \_\_\_\_\_  
\_\_\_\_\_

**Planned Return Date :** \_\_\_\_ / \_\_\_\_ / \_\_\_\_ **Planned Return Time :** \_\_\_\_\_  
AM/PM

**SAFETY EQUIPMENT ON-BOARD**

- PFDs     Flares     Flag and Flashlight     Dock & Anchor Lines      
Anchor     Paddle     VHF Radio (Monitor Channel 13 and Weather Alert Channel)

**NOTIFICATION**

**The point of contact holding the plan is to notify TVA Police (800-824-3861) if the vessel has not returned by the planned time and cannot be located.**

**CUTTING, WELDING, OPEN FLAME, AND SPARK PRODUCTION PERMIT**

NO.: \_\_\_\_\_

Location: \_\_\_\_\_ Date: \_\_\_\_\_  
 \_\_\_\_\_ Time: \_\_\_\_\_

Work to be performed:

Permit from \_\_\_\_\_ to \_\_\_\_\_  
 Date Time Date Time

Hazardous Gas/Liquid Area: \_\_\_\_\_ Dust: \_\_\_\_\_ Controlled Area: \_\_\_\_\_

REQUIRED	NOT REQUIRED	N/A	PROTECTION
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1. Fire suppression in service.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2. Floors clean of combustibles. 35 feet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. Combustible floors protected. 35 feet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4. Flammable liquids removed. 35 feet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5. Combustible materials protected. 35 feet
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6. All wall or floor openings covered. 35 feet
			<b>MISCELLANEOUS</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7. Inspect for possible conduction of heat to remote combustibles.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8. Flammable liquids and vapors removed from all enclosed equipment.
			<b>FIRE ATTENDANT</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. Provide a fire watch during and up to 30 minutes (2 hours for coal handling facility) after work. NAME: _____
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10. Provide additional fire suppression equipment (e.g., extinguishers, hose, etc.).
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11. Explosive atmosphere test required.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12. Wet down or wash down required.

Special restrictions, precautions or comments:

The above location has been inspected and the permit issued subject to the precautions noted above.

By: \_\_\_\_\_  
 Issuing Authority

Where the work permit shall extend beyond the shift issue, the supervisor assuming responsibility shall sign and date below.

1<sup>st</sup> shift following issue X \_\_\_\_\_ 4<sup>th</sup> shift following issue X \_\_\_\_\_  
 2<sup>nd</sup> shift following issue X \_\_\_\_\_ 5<sup>th</sup> shift following issue X \_\_\_\_\_  
 3<sup>rd</sup> shift following issue X \_\_\_\_\_

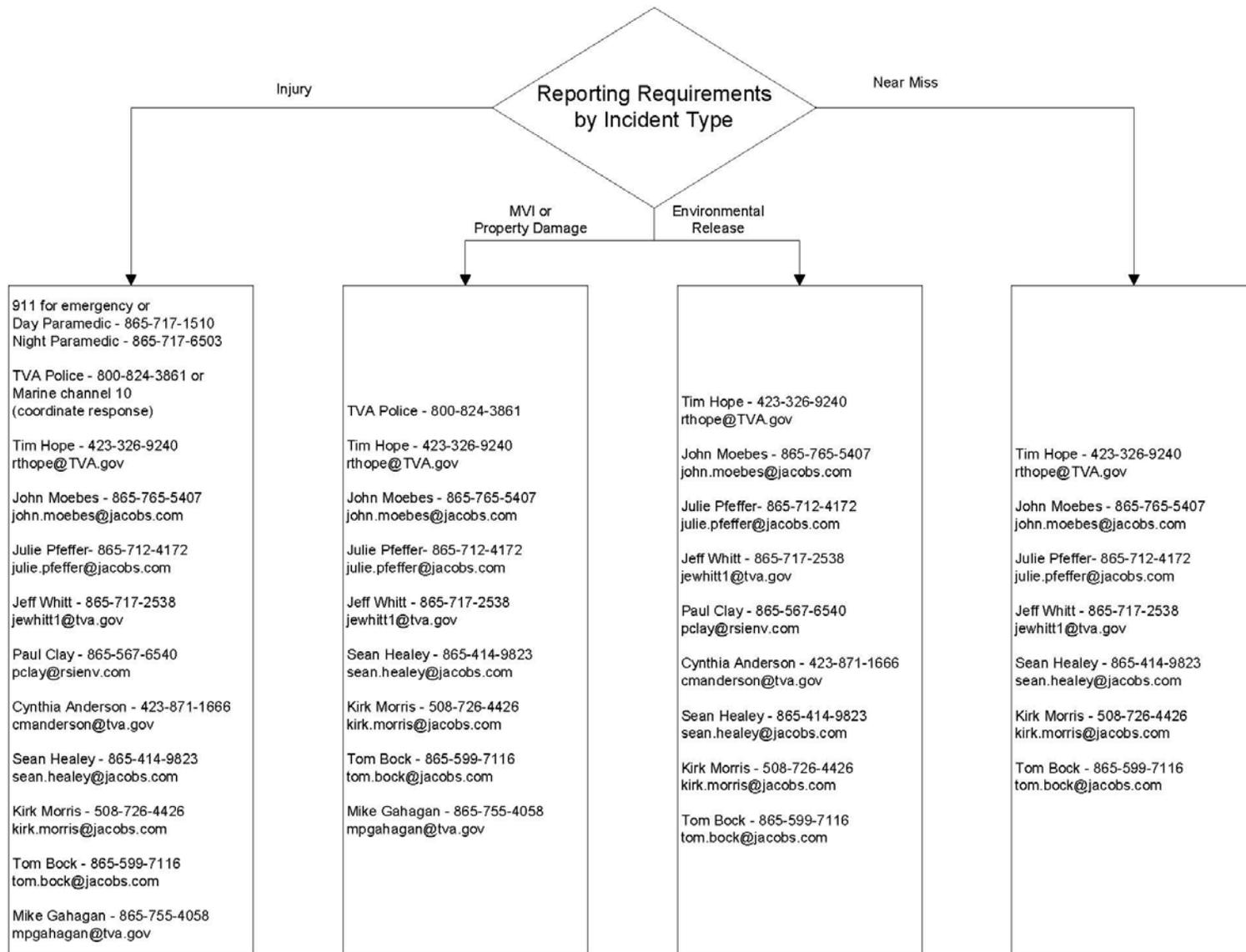
Work Started \_\_\_\_\_ Work Completed \_\_\_\_\_ Final Check \_\_\_\_\_

The work area and all adjacent areas to which sparks and heat might have spread (such as the floor above and below and the opposite side of the walls) have been inspected and found fire safe.

By: \_\_\_\_\_

Permit to be posted in work area. After completion of work, return completed form to the plant safety designee.

TVA 6561a [1-2003]



## INTEGRATED AIR MONITORING RECORD

Employee Name: \_\_\_\_\_ Social Security Number: \_\_\_\_\_ Title: \_\_\_\_\_  
 Project Name: \_\_\_\_\_ Project Number: \_\_\_\_\_  
 Date Sampled: \_\_\_\_\_ Sampled By: \_\_\_\_\_

Sampling Method and Analyte: \_\_\_\_\_

Sample Type: \_\_\_\_\_ Justification for Sampling: \_\_\_\_\_  
 \_\_\_\_\_ Personal-TWA \_\_\_\_\_ Blank \_\_\_\_\_  
 \_\_\_\_\_ Personal Peak \_\_\_\_\_ Bulk Does Sampling Represent Typical Exposure? \_\_\_\_\_  
 \_\_\_\_\_ Area \_\_\_\_\_ Other \_\_\_\_\_ Temperature: \_\_\_\_\_ Baro. Pressure: \_\_\_\_\_  
 \_\_\_\_\_ Source \_\_\_\_\_ Humidity: \_\_\_\_\_ Wind: \_\_\_\_\_

Collection Media:  
 \_\_\_\_\_ Charcoal Tube \_\_\_\_\_ Filter(Total) \_\_\_\_\_ Passive Dosimeter \_\_\_\_\_ Collector Mfg: \_\_\_\_\_  
 \_\_\_\_\_ Silica Gel \_\_\_\_\_ Filter(Resp.) \_\_\_\_\_ Other: \_\_\_\_\_ Size/Type: \_\_\_\_\_  
 \_\_\_\_\_ Chromosorb \_\_\_\_\_ Impinger \_\_\_\_\_ Lot #: \_\_\_\_\_

Sample Pump: Mfg&Model#: \_\_\_\_\_ Serial #: \_\_\_\_\_  
 Calibrator: Type: \_\_\_\_\_ Mfg & Model #: \_\_\_\_\_ Serial #: \_\_\_\_\_  
 Calibration Date: \_\_\_\_\_ Calibrated By: \_\_\_\_\_

Sample #	Time On	Time Off	Total Time	Pre Cal Flow Rate	Post Cal Flow Rate	Average Flow Rate	Sample Volume	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences etc.)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date: \_\_\_\_\_ Signature: \_\_\_\_\_



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

## Monthly Mobile Crane Inspection Report

Date:		Location:			
Crane Make/Model:			Project Number:		
Hour Meter #:	Capacity as configured: Main Hoist	Tons	Auxiliary Hoist		
√ (Check Mark) Indicates good condition    "R" Indicates Repair Required    "N" Indicates not applicable					
No	Item Inspected	Condition	No	Item Inspected	Condition
1.	<b>General:</b> Operators Manual in Cab		27.	<b>Carrier:</b> Tire/Track Condition & Slack	
2.	Load Charts and Fire Ext. in Cab		28.	Tire Pressure/Drive Chain, etc.	
3.	Signal Chart and Power Line Signs		29.	Brakes	
4.	Controls Clearly Marked/Function Correctly		30.	Steering Controls/Linkage	
5.	Windows clear and free of cracks, etc.		31.	Axle Lockouts for on Rubber Lifts	
6.	Windshield wipers		32.	Outriggers-Beam, Pad/Pad Swivel	
7.	Cab/Platforms/Ladders Safe and Clean		33.	<b>Upper Works:</b> Counter Weight Secure	
8.	All Guards in Place		34.	Load Hoist(s)/Boom Hoist Drums	
9.	Bolts and Rivets Per Spec. and Tight		35.	Main/Aux. Hoist Brakes/Pawls	
10.	Boom Angle Indicator Functioning Correctly		36.	Boom Hoist Brakes/Pawls	
11.	<b>Elect:</b> Lights-Front, rear, brake, turn signals		37.	Swing Gear Assembly and Brakes	
12.	Horn and Back Up Alarm		38.	Pins/Gears/Shafts/Clutches	
13.	Control Panel Gauges and Hour Meter		39.	Locking Devices	
14.	Anti-Two Block(s) Functioning Correctly		40.	<b>Boom Assembly:</b> Boom Stops/Pins	
15.	LMI Functioning Within Calibration Limits		41.	Structure-Tubing, Chords and Lacing	
16.	<b>Power Plant:</b> Water and Oil Levels (No Leaks)		42.	Telescope Sections Droop/Alignment	
17.	Filters clean and in place		43.	Telescope Wear Pads/Lubrication	
18.	Hoses, Belts, and Wiring		44.	Jib or Boom Extension	
19.	Engine Performance With and W/O Load		45.	<b>Blocks:</b> B. Point Sheave(s) Condition/Lube	
20.	Transmission Performance and Oil Level		46.	Load Block/Sheave(s) Condition/Lube	
21.	Air System		47.	Boom Fall Sheave(s) Condition/Lube	
22.	<b>Hydraulic System:</b> Lines/Hoses		48.	Hook(s) and Safety Latch(s)	
23.	Motors, Pumps, and Cooler		49.	Sheave Guards	
24.	Cylinders no Drift/Seal Leaks/Scoring (Boom-crowd and lift, outriggers, etc.)		50.	<b>Wire Rope:</b> Load/ Aux./Whip Line	
			51.	All Lines Reeved Correctly	
25.	Filters/Strainers/Fluid Level		52.	Boom Lines	
26.	Counter Balance/Load Hold Valves		53.	Pendant Lines	
Note Hydraulic Pressure Relief Valves should be checked for calibration every six months.					
Notes/Comments/Other items by Manufacturer:					
Inspector(s) (Print Name):			Signature(s):		
Distribution: 1 copy to site equipment coordinator & 1 copy to be kept in crane. Retain indefinitely.					

## Daily Mobile Crane Inspection Report

Date:			Location:		
Crane Make/Model:				Project Number:	
Hour Meter #:		Capacity as configured: Main Hoist	Tons	Auxiliary Hoist	
√ (Check Mark) Indicates good condition    "R" Indicates Repair Required    "N" Indicates not applicable					
No	Item Inspected	Condition	No	Item Inspected	Condition
1.	<b>General:</b> Operators Manual in Cab		20.	<b>Carrier cont'd:</b> Brakes	
2.	Load Charts displayed/attached in Cab		21.	Steering Controls/Linkage	
3.	Controls Clearly Marked/Function Correctly		22.	Axle Lockouts for on Rubber Lifts	
4.	Windows clear and free of cracks, etc.		23.	Outriggers-Beam, Pad/Pad Swivel	
5.	Cab/Platforms/Ladders Safe and Clean		24.	<b>Upper Works:</b>	
6.	Fire Extinguisher in Cab		25.	Main/Aux. Hoist Brakes/Pawls	
7.	All Guards in Place		26.	Boom Hoist Brakes/Pawls	
8.	<b>Elect:</b> Lights-Front, rear, brake, turn		27.	Swing Gear Assembly and Brakes	
9.	Horn and Back Up Alarm		28.	<b>Boom Assembly:</b> Boom Stops/Pins	
10.	Control Panel Gauges and Hour Meter		29.	Structure-Tubing, Chords and Lacing	
11.	Anti-Two Block(s) Functioning Correctly		30.	Jib or Boom Extension	
12.	LMI Functioning Within Cal. Limits		31.	Boom Angle Indicator	
13.	<b>Power Plant:</b> Water and Oil Levels		32.	Load Block/Sheave(s) Condition/Lube	
14.	Transmission Performance and Oil Level		33.	Hook(s) and Safety Latch(s)	
15.	<b>Hydraulic System:</b> Lines/Hoses		34.	<b>Wire Rope:</b> Load/ Aux./Whip Line	
16.	Cylinders no Drift/Seal Leaks/Scoring (Boom-crowd and lift, outriggers, etc.)		35.	All Lines Reeved Correctly	
			26.	Boom Lines	
17.	Filters/Strainers/Fluid Level		37.	Other items noted or per Manufacturer:	
18.	<b>Carrier:</b> Tire/Track Condition & Slack				
19.	Tires Properly Pressurized, Drive Chain Tensioned Properly, etc.		38.	Other:	
Note Hydraulic Pressure Relief Valves should be checked for calibration every six months.					
Notes/Comments:					
Inspector (Print Name):			Signature:		
Distribution: 1 copy to site equipment coordinator & 1 copy to be kept in crane. Retain indefinitely.					

## Pre-Lift Checklist

	Yes	No
1. Crane Operator meets company qualification requirements?	<input type="checkbox"/>	<input type="checkbox"/>
2. Lift calculations and rigging plan completed?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are all required approvals/permits signed?	<input type="checkbox"/>	<input type="checkbox"/>
4. Crane inspections up to date (Annual/Monthly/Daily)?	<input type="checkbox"/>	<input type="checkbox"/>
5. Weather conditions and wind speed acceptable?	<input type="checkbox"/>	<input type="checkbox"/>
6. Has the stability of the ground been assured?	<input type="checkbox"/>	<input type="checkbox"/>
7. Matting and/or outrigger pads inspected and approved?	<input type="checkbox"/>	<input type="checkbox"/>
8. Electrical equipment and power lines at required distance?	<input type="checkbox"/>	<input type="checkbox"/>
9. Rigging Inspected for defects?	<input type="checkbox"/>	<input type="checkbox"/>
10. Engineered lifting lugs fabricated and installed correctly?	<input type="checkbox"/>	<input type="checkbox"/>
11. Connecting/disconnecting means been developed?	<input type="checkbox"/>	<input type="checkbox"/>
12. Have the safety precautions been reviewed?	<input type="checkbox"/>	<input type="checkbox"/>
13. Is survey equipment required?	<input type="checkbox"/>	<input type="checkbox"/>
14. The total lifted weight is below 95% of capacity?	<input type="checkbox"/>	<input type="checkbox"/>
15. Signal person(s) assigned?	<input type="checkbox"/>	<input type="checkbox"/>
16. Safe Plan of Action (SPA) Completed?	<input type="checkbox"/>	<input type="checkbox"/>
17. Pre-Lift Meeting/Task Safety Awareness Meeting (TSA) held?	<input type="checkbox"/>	<input type="checkbox"/>
18. Hoist area & load path cleared of non-essential personnel?	<input type="checkbox"/>	<input type="checkbox"/>
19. Crane set up per the lift plan (radius, configuration, etc)?	<input type="checkbox"/>	<input type="checkbox"/>
20. Rigging equipment and tag line(s) installed per plan?	<input type="checkbox"/>	<input type="checkbox"/>
Person Completing Check List: _____		
Signature: _____		Date: _____

## Load and Capacity Calculations

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.       |
| 4. Total Weight of Load/Equipment<br>(Sum A2 through A3f) |         |          | _____ Lbs. |

### B. Total Lifted Weight (Weight of Load/Equipment + Rigging+ Crane Deductions)

- |                                   |          |                             |          |
|-----------------------------------|----------|-----------------------------|----------|
| 1. Percent of Load/Equip. Weight* | _____ %  | 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 (Continued)

#### C. Capacities of the Crane

Make & Model of Crane \_\_\_\_\_

1. Counter Weight Size: \_\_\_\_\_ Type of Boom: \_\_\_\_\_

2. 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.

e. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or....) \_\_\_\_\_ Lbs.

3. 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.

4. 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 Crane's Capacity

$$\frac{\text{Total Lifted Weight X 100}}{\text{Rated Capacity}} = \text{_____ \%}$$

#### E. Size of Slings

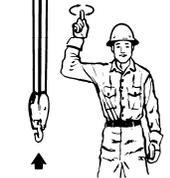
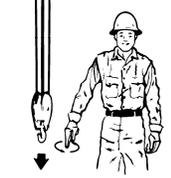
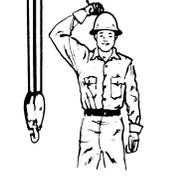
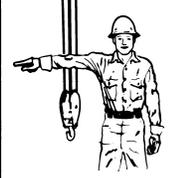
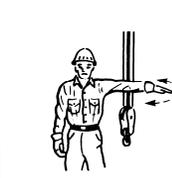
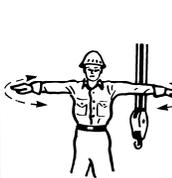
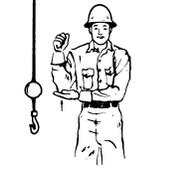
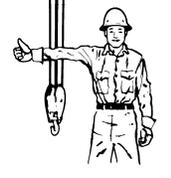
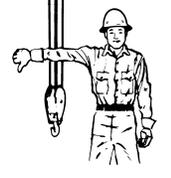
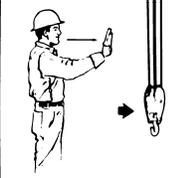
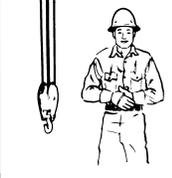
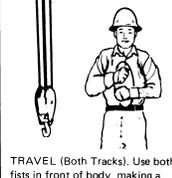
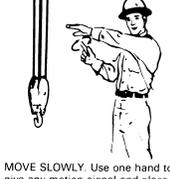
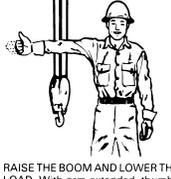
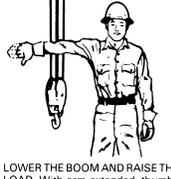
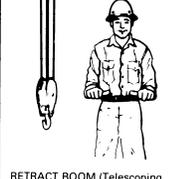
1. Sling Selection

- 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 ( )

## Standard Hand Signal Chart for Controlling Crane Operations

 <p><b>HOIST</b> With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p><b>LOWER</b> With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p>	 <p><b>USE MAIN HOIST.</b> Tap fist on head; then use regular signals.</p>	 <p><b>SWING</b> Arm extended, point with finger in direction of swing of boom.</p>	 <p><b>STOP</b> Arm extended, palm down, move arm back and forth horizontally.</p>	 <p><b>EMERGENCY STOP</b> Both arms extended, palms down, move arms back and forth horizontally.</p>
 <p><b>USE WHIPLINE (Auxiliary Hoist).</b> Tap elbow with one hand; then use regular signals.</p>	 <p><b>RAISE BOOM.</b> Arm extended, fingers closed, thumb pointing upward.</p>	 <p><b>LOWER BOOM.</b> Arm extended, fingers closed, thumb pointing downward.</p>	 <p><b>TRAVEL</b> Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>	 <p><b>DOG EVERYTHING.</b> Clasp hands in front of body.</p>	 <p><b>TRAVEL (Both Tracks).</b> Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)</p>
 <p><b>MOVE SLOWLY.</b> Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p>	 <p><b>RAISE THE BOOM AND LOWER THE LOAD.</b> With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.</p>	 <p><b>LOWER THE BOOM AND RAISE THE LOAD.</b> With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.</p>	 <p><b>TRAVEL (One Track)</b> Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)</p>	 <p><b>EXTEND BOOM (Telescoping Booms).</b> Both fists in front of body with thumbs pointing outward.</p>	 <p><b>RETRACT BOOM (Telescoping Booms).</b> Both fists in front of body with thumbs pointing toward each other.</p>

## TVA Fly Ash Response Site

### CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

CONTRACTOR'S NAME: \_\_\_\_\_

EMPLOYEE'S NAME: \_\_\_\_\_

The contract for the above project requires the following: that you be provided with and complete formal and site specific training; that you be supplied with proper personal protective equipment including respirators (as needed); that you be trained in its use; and that when necessary, you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE BEEN BRIEFED ON, UNDERSTAND AND AGREE TO FOLLOW THE  
SITE SAFETY AND HEALTH PLAN

Name:

Date:

\_\_\_\_\_

SITE SPECIFIC TRAINING: I have been provided and have completed the site specific training required by this Contract. The Site Safety and Health Officer conducted the training.

RESPIRATORY PROTECTION:  I have  Have not at this time, been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I wear. I have been trained in and will abide by the facial hair policy.

RESPIRATOR FIT TEST TRAINING:  I have  Have not at this time, been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will wear. I have been fit tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit check upon donning negative pressure respirators each time.



**SAFETY COACHING VISIT CHECKLIST**

Location:	Date and time of observation:
Type of work being observed:	Number of people observed:
Equipment being worked on:	Name of SCV Coach:
Pre- Job Briefing held            yes    no	
2-minute rule used to identify work place hazards: yes    no	"Eyes On The Path" used during transient to work site: yes    no

CATEGORY A			CATEGORY C			CATEGORY E		
Adequacy of personal protective equipment			Are reactions of people appropriate			Procedures		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Eyes & Face	<input type="checkbox"/>	<input type="checkbox"/>	Adjusting PPE	<input type="checkbox"/>	<input type="checkbox"/>	Is standard practice adequate for job	<input type="checkbox"/>	<input type="checkbox"/>
Ears	<input type="checkbox"/>	<input type="checkbox"/>	Changing positions	<input type="checkbox"/>	<input type="checkbox"/>	Is standard practice established	<input type="checkbox"/>	<input type="checkbox"/>
Head	<input type="checkbox"/>	<input type="checkbox"/>	Rearranging jobs	<input type="checkbox"/>	<input type="checkbox"/>	Is standard practice being maintained	<input type="checkbox"/>	<input type="checkbox"/>
Hands & Arms	<input type="checkbox"/>	<input type="checkbox"/>	Stopping Job	<input type="checkbox"/>	<input type="checkbox"/>	Is electrical clearance proper	<input type="checkbox"/>	<input type="checkbox"/>
Feet & Legs	<input type="checkbox"/>	<input type="checkbox"/>	Attaching Grounds	<input type="checkbox"/>	<input type="checkbox"/>	Is fire watch adequate	<input type="checkbox"/>	<input type="checkbox"/>
Respiratory System	<input type="checkbox"/>	<input type="checkbox"/>	Exposure to moving equipment	<input type="checkbox"/>	<input type="checkbox"/>	Properly briefed at job/shift briefing	<input type="checkbox"/>	<input type="checkbox"/>
Trunk	<input type="checkbox"/>	<input type="checkbox"/>	Changing tools	<input type="checkbox"/>	<input type="checkbox"/>	Clearance Boundaries Evaluated	<input type="checkbox"/>	<input type="checkbox"/>
Arc Flash PPE	<input type="checkbox"/>	<input type="checkbox"/>	Hurrying	<input type="checkbox"/>	<input type="checkbox"/>			

CATEGORY B			CATEGORY D			CATEGORY F		
Positions of People			Tools & Equipment			Orderliness		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Striking Against (Struck by)	<input type="checkbox"/>	<input type="checkbox"/>	Right for Job	<input type="checkbox"/>	<input type="checkbox"/>	Standards established (including JSA)	<input type="checkbox"/>	<input type="checkbox"/>
Being off balance	<input type="checkbox"/>	<input type="checkbox"/>	Used correctly	<input type="checkbox"/>	<input type="checkbox"/>	Standards understood	<input type="checkbox"/>	<input type="checkbox"/>
Being caught between (pinch points)	<input type="checkbox"/>	<input type="checkbox"/>	Carried or stored properly	<input type="checkbox"/>	<input type="checkbox"/>	Passageways unobstructed	<input type="checkbox"/>	<input type="checkbox"/>
Falling	<input type="checkbox"/>	<input type="checkbox"/>	In safe condition	<input type="checkbox"/>	<input type="checkbox"/>	Tools & materials organized	<input type="checkbox"/>	<input type="checkbox"/>
Riding on mobile equipment	<input type="checkbox"/>	<input type="checkbox"/>	Seat belt in use	<input type="checkbox"/>	<input type="checkbox"/>	Stair platform unobstructed	<input type="checkbox"/>	<input type="checkbox"/>
Electrical current contact	<input type="checkbox"/>	<input type="checkbox"/>	Barricades or warning lights	<input type="checkbox"/>	<input type="checkbox"/>	Housekeeping / appearance adequate	<input type="checkbox"/>	<input type="checkbox"/>
Inhaling / absorbing material	<input type="checkbox"/>	<input type="checkbox"/>	Chocks /restraints properly used	<input type="checkbox"/>	<input type="checkbox"/>	FME Standards maintained	<input type="checkbox"/>	<input type="checkbox"/>
Overexertion	<input type="checkbox"/>	<input type="checkbox"/>	Inspection color code present and correct	<input type="checkbox"/>	<input type="checkbox"/>	Absence of any oil or slip hazard	<input type="checkbox"/>	<input type="checkbox"/>
Repetitive body motions	<input type="checkbox"/>	<input type="checkbox"/>	Mobile Equipment Ops. Requirements	<input type="checkbox"/>	<input type="checkbox"/>			

<b>OBSERVATIONS DISCUSSED WITH EMPLOYEES</b>	

<b>REFERRED TO MANAGEMENT TEAM</b>	<b>EMPLOYEE FEEDBACK AND SUGGESTIONS</b>
Yes <input type="checkbox"/> Other:	
Yes <input type="checkbox"/> Other:	
Yes <input type="checkbox"/> Other:	

(Failure to coach "at-risk" behavior implies acceptance)

## TVA Fly Ash Response Site

### SITE TAILGATE MEETING and EXCLUSION ZONE ENTRY LOG

Facility: TVA Fly Ash Response Site Conducted by: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Client: TVA \_\_\_\_\_  
Specific Location: \_\_\_\_\_  
Type of Work: \_\_\_\_\_  
Chemicals Brought to Site: \_\_\_\_\_  
MSDSs available:      Yes      No

### HEALTH AND SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: \_\_\_\_\_

Chemical Hazards: \_\_\_\_\_

Physical  
Hazard:

\_\_\_\_\_

Emergency Procedures: \_\_\_\_\_

Emergency Response \_\_\_\_\_

Hospital/Clinic: \_\_\_\_\_

Address: \_\_\_\_\_

Special Equipment: \_\_\_\_\_

Evacuation Route: \_\_\_\_\_

General Discussion Information: \_\_\_\_\_



SOR Number: \_\_\_\_\_

# Safety Observation Report

Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Observation:**

**Describe Immediate Corrective Action:**

**Describe Action to Prevent Recurrence:**

**Observer**

Name Printed: \_\_\_\_\_

Signature: \_\_\_\_\_

---

**Description of Corrective Action:**

**Supervisor/Manager**

Name Printed: \_\_\_\_\_

Signature: \_\_\_\_\_

Date Completed: \_\_\_\_\_

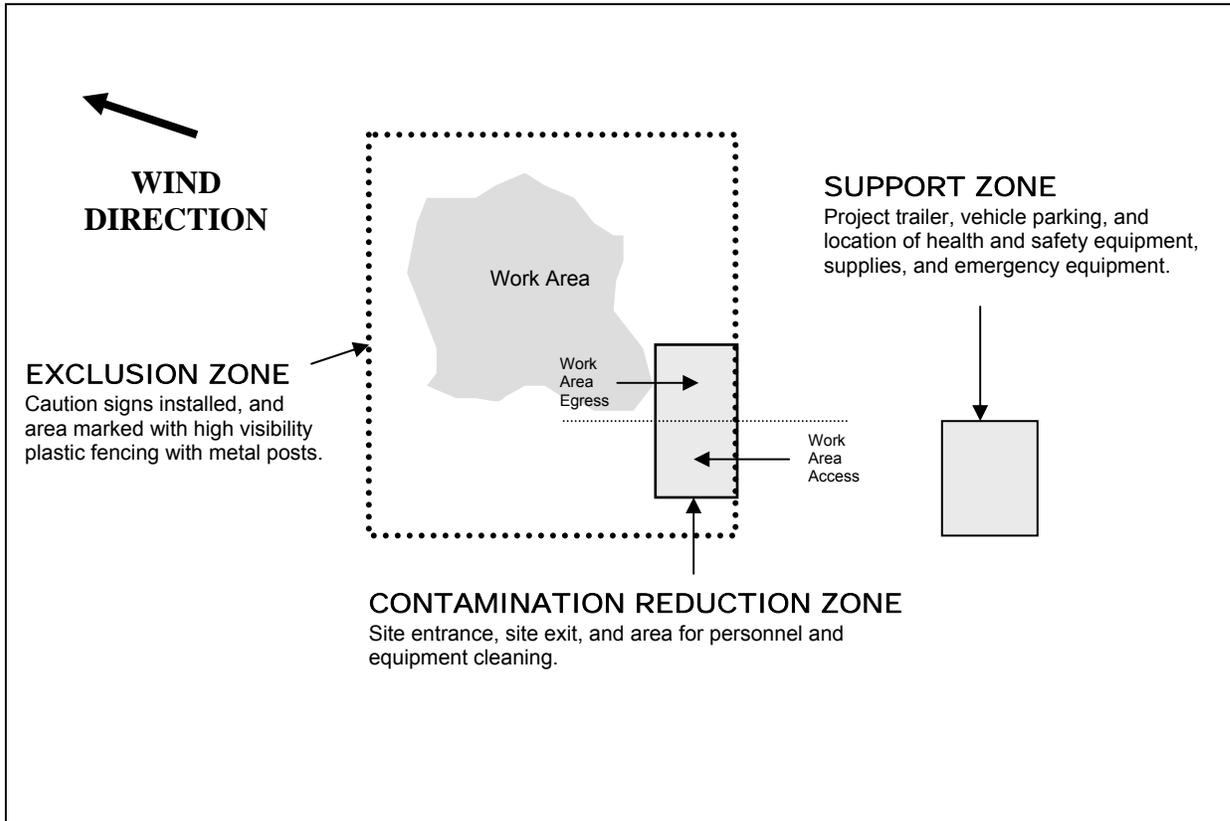
- |                                     |  |   |  |
|-------------------------------------|--|---|--|
| <input type="checkbox"/> Biological | <input type="checkbox"/> Fall From Elevation | <input type="checkbox"/> Slips, Trips and Falls | <input type="checkbox"/> Weather       |
| <input type="checkbox"/> Electrical | <input type="checkbox"/> Good Work Practices | <input type="checkbox"/> Spills/Releases        | <input type="checkbox"/> Work Practice |
| <input type="checkbox"/> Ergonomics | <input type="checkbox"/> Housekeeping        | <input type="checkbox"/> Tools and Equipment    | <input type="checkbox"/> Other         |
| <input type="checkbox"/> Facilities | <input type="checkbox"/> PPE                 | <input type="checkbox"/> Vehicles               |  |

CC: Jacobs Project Manager: \_\_\_\_\_

Subcontractor SSHO: \_\_\_\_\_

Other: \_\_\_\_\_

### Typical Work Area Layout



### Utility Clearance Permit

Project: \_\_\_\_\_ Completed by: \_\_\_\_\_

Site Location: \_\_\_\_\_ Date: \_\_\_\_\_

Reason for Clearance: \_\_\_\_\_

DESCRIPTION OF ACTIVITY	YES	NO	N/A	DATE	INITIALS
1. Review of Existing Maps					
2. Interviewed Personnel Familiar With Area?					
3. Above Ground Utilities					
a) marked on site maps					
b) necessary to lockout					
c) document procedures used to lockout or re-route					
4. Underground Utilities					
a) State Agency called: (specify)					
Ticket Number:					
b) State name of additional utility called:					
Ticket Number:					
c) Specify geophysical clearance method used:					
Done By:					
d) Utility locations marked with appropriate color code?					
Done By:					
e) Utilities marked on site map (please attach)					
Done By:					
5. Hand augering to _____ feet done by :					
6. Trench/Excavation probed by:					
a) Hand Clearance required:					
7. Clearance Approval Site Manager: Client Representative:					
8. Procedure Deviations Approval: Project Manager: HSE Manager:					

Describe Deviations: \_\_\_\_\_

Justification: \_\_\_\_\_



# TVA KINGSTON FOSSIL PLANT

## ASH RELEASE RESPONSE

### VISITOR ORIENTATION

Date: \_\_\_\_\_

Visitor Name: \_\_\_\_\_

Visitor Company: \_\_\_\_\_

Escort Name: \_\_\_\_\_

Escort Company: \_\_\_\_\_

Purpose of Visit: \_\_\_\_\_

**Topics Discussed:**

1. Escort required at all times.
2. Emergency response numbers.
3. Ammonia awareness.
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

Signatures:

\_\_\_\_\_

Visitor

\_\_\_\_\_

Escort

\_\_\_\_\_

HSE Representative



### Emergency Response Best Practice

Date of Event:

Location:

Subcontractor(s) / Crew(s) Involved:

Planned Drill:  Yes  No

Changes Required to ERCP:  Yes  No

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Type of Response (check all that apply)

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Weather Emergency | <input type="checkbox"/> Fire                  | <input type="checkbox"/> Man Overboard    |
| <input type="checkbox"/> Medical on Water  | <input type="checkbox"/> Medical on Land       | <input type="checkbox"/> Chemical Release |
| <input type="checkbox"/> Motor Vehicle     | <input type="checkbox"/> Underground Utilities | <input type="checkbox"/> Other _____      |

Describe Event:

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Summarize Response Actions:

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Summarize Best Practices Identified:

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Completed By:

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### Task Managed Contractor Preliminary Incident / Injury Report

Instructions: This report must be completed by the contractor manager for all OSHA recordable incidents that occur. This applies to all task managed **Contractors and Subcontractors**. The completed form must be e-mailed within 24 hours of occurrence to the **Technical Contract Manager (TCM)** and the TVA distribution list below:

**Job Title of Person(s) Injured:**

**Company Name:**

**Site Management Contact:**

**Description of Possible Injuries:**

**Date and Time of Injury(s):**

**Work Location:**

**Did the injured employee return to work?**       Yes       No

**Description of Event(s) That Caused Injuries**  
*(What happened and why based on initial factual information?)*

**Immediate Corrective Actions Taken/Steps Take to Mitigate Future Exposure:**

**Distribution of this report via e-mail within 24 hours of occurrence:**

Ashok S. Bhatnagar	Ralph E. Dudley	Rob E. Manning	Anda Ray
Tabitha A. Billingsley	Janet C. Herrin	William R. McCollum	Phillip L. Reynolds
Tiffany T. Bridges	Tom Kilgore	John McCormick	Preston D. Swafford
Terrell Burkhart	John E. Long, Jr.	Jeffrey T. Parsley	Dana J. White
TVTLC Hourly LaGonda Wittenmyer (lmatoy@aol.com)	TVTLC Annual Jan Jennings (jan@branstetterlaw.com)		



## WORK ZONE CLASSIFICATION CHANGE NOTICE

Change Date: \_\_\_\_\_  
Change Duration: \_\_\_\_\_  
Area(s) Impacted: \_\_\_\_\_  
Description of Change: \_\_\_\_\_  
(attach drawing) \_\_\_\_\_  
Justification: \_\_\_\_\_  
Submitted By: \_\_\_\_\_

### Change Type

- 1. Exclusion Zone to Contamination Reduction Zone
- 2. Exclusion Zone to Support Zone
- 3. Contamination Reduction Zone to Exclusion Zone
- 4. Contamination Reduction Zone to Support Zone
- 5. Support Zone to Exclusion Zone
- 6. Support Zone to Contamination Reduction Zone
- Other: \_\_\_\_\_

### Adjustments to Decon Areas or Entry Control Points

- Are Not Needed
- Are Needed (if changes are needed, describe below)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Indicate how impacted personnel will be notified:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Approvals:  
Construction Manager: \_\_\_\_\_  
Program Health and Safety Manager: \_\_\_\_\_  
Program Manager (for change types 5&6 only): \_\_\_\_\_

## **APPENDIX E**

### **ACTIVITY HAZARD ANALYSIS**

### ACTIVITY HAZARD ANALYSIS

**SITE: TVA Kingston**  
**Activity: Debris Removal**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 1 of 4

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Placement of Excavator or Crane on Barge, Securing onto barge	Falling overboard	All persons remain seated except when working All personnel to wear USCG PFDs Non slip surfaces on all working surfaces Adequate number of throw rings on each watercraft per EM385-USCG approved Complete float plan-shore support and communication	PPE Documented crane inspection TVA TSP 306 TVA TSP 802 Float Plan
	Crane failure	Complete critical lift plan before lift occurs Follow Jacobs guidelines for lift capacity	Completed lift plan
	Water Craft Operation	Watercraft to be inspected by USCG or Registered Marine Surveyor PE to evaluate barge for stability for equipment placement Load rating adhered to Watercraft to have approved lighting and signaling devices Pilots to be familiar with rules that regulate boat traffic	USCG license
Debris Removal Operations	Caught between/struck by	Minimize number on dredges Follow plan for debris removal	Dredging Plan TVA TSP 603
	Work over or near water	All persons to remain seated when not working Wear USCG approved PFDs All means of boat access to be properly secured and guarded Adequate number of throw rings available-US CG approved style Dredges and barges equipped with guard rails Shore support available and radio contact maintained All personnel trained in man overboard emergencies Railings around boat deck	Float Plan PPE PFDs and throw rings TVA TSP 306 TVA TSP 603
	Noise	All exposed workers > 85 dB to wear hearing protection Mufflers on engines	PPE, hearing protection
	Heat stress	Work/rest cycles according to ACGIH tables Heat and worker monitoring Shade and drinks available for hydration	Shade and liquids ACGIH tables Wet bulb thermometers

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Debris Removal**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 2 of 4

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Debris Removal Operations	Striking overhead utilities	Utility check performed beforehand Crane mast at least 20 ft from overhead line Set up lift to avoid power lines	Utility clearance permit
	Striking underground or underwater utilities	Identify underground utilities-clearance permit in work area Cease work if unknown utilities are identified Keep at least 5 feet away from known utilities or remove manually	Utility clearance permit
	Watercraft operation	All watercraft to be inspected by USCG or Registered Marine Surveyor Load ratings strictly adhered to USCG approved All watercraft to have approved lighting and signaling devices Operation only by those personnel who have successfully completed the required boating course All dredges and boat pilots to be familiar with rules that regulate boat traffic	USCG license TVA TSP 603
	Unauthorized entry into exclusion zone	Include appropriate warning signs designated area as a work zone.	Warning signs
	Barge Instability	Understand weight limits Tie down equipment when necessary Personnel to wear PFDs	Calculation of barge stability PPE
	Struck by/against	Personnel to be out of swing radius of equipment Keep good eye contact with operators Personnel to wear ANSI High vis vests and coat guard PFDs	PPE Good line of vision
	Severe Weather	Weather forecasts to be monitored for predicted inclement weather. All personnel to be aware of forecasts Work to be stopped in event of high winds, rough water, lightning or thunder identified	Communication devices Weather forecasting equipment

### ACTIVITY HAZARD ANALYSIS

**SITE: TVA Kingston**  
**Activity: Debris Removal**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 3 of 4

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Potential exposure to constituents of fly ash	Material removed from the river will be wet, but may dry as it sits on the debris barge. This material should be moved while wet, and dust control implemented to minimize the potential exposure to nearby workers. Dust control measures should be implemented when the debris is removed from the barge and transported to stockpiles if it has been allowed to dry out.	Dust control measures.

### ACTIVITY HAZARD ANALYSIS

**SITE: TVA Kingston**  
**Activity: Debris Removal**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 4 of 4

<b>Equipment to be Used</b>	<b>Inspection Requirement</b>	<b>Training Requirements</b>
Dredges, support boats	Initial inspection by qualified person (USCG) Daily inspections of engines and boat structures will be conducted	Boating safety training per TVA requirements. Subcontractor to have expertise Inspectors to be qualified
Fire Extinguishers	Monthly inspections will be performed.	Subcontractors to have knowledge of proper use
Heavy equipment	Inspect before use and document	Subcontractors to have knowledge of proper use
PPE=Level D	Inspect before use	Subcontractors to have knowledge of proper use

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 1 of 8

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Maintenance and repair of hydraulic dredge auger, booster pumps, dredge	Slip/Trip/Fall	Work Areas and means of access shall be maintained safe and orderly. Tripping and poor footing hazards will be repaired as they are discovered or clearly identified. Fall protection will be used when working at unprotected heights greater than 6'. Standard railings will be installed on all process equipment decks greater than 4'.	Fall protection systems Standard railings Proper handrails on stairs
	Vehicular Traffic/Problems	Spotters will be used when backing up trucks and moving equipment. Heavy equipment will be equipped with back-up alarms. When work areas impact vehicle ways, traffic control markings and/or a flagman will be used.	Working back-up alarms
	Weather	Personnel will be instructed in heat stress/cold stress recognition and prevention. Personnel must notify the HSO if symptoms of cold/heat stress are perceived in any member of the crew, including self. Work/rest regimes and personnel monitoring for workers will be instituted per the HSO based on ambient conditions and condition of personnel. Air temperature, humidity and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary. Drinking liquids will be available and used for rehydration during breaks. Work will be conducted during warmer/cooler hours of the day, if necessary and feasible. Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, lightning.	Drinking fluids Shaded break areas Emergency communication

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

**Page 2 of 8**

Maintenance and repair of hydraulic dredge auger, booster pumps, dredge	Back Injuries	Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting. Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used when mechanical devices are not appropriate for use. Proper paths of travel will be noted and followed during manual material handling.	
	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area. All radios, cell phones and equipment will be secured. Tools and parts will be lifted or carried , not tossed Personnel will not climb ladders while carrying equipment in hand..	Steel toe boots
	Overhead Hazards	All overhead hazards will be identified prior to commencing work operations. Personnel will wear hard hats that meet ANSI Standard Z-89.1.	Hard hats
	Noise	Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85dBA (ear muffs or plugs). All equipment will be equipped with manufacturer's required mufflers Proper use of vibratory hammer to minimize noise generation.	Ear plugs / ear muffs
	Eye/Face Injury	Safety glasses with side shields meeting ANSI Standard Z-87 will be worn. Face-shields will be worn over safety glasses during grinding, wire wheel work or other activities posing face hazards.. Proper guards will be used on all equipment such as grinders, cut-off wheels and saws.	Safety glasses Face-shields Equipment guards

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 3 of 8

	Struck By/Against	<p>Personnel will understand and review hand signals.                  All personnel will wear ANSI type II high visibility vests.                  Workers will be made aware of potential pinch-points during operation and maintenance of equipment (bolting flanges, process piping, etc) and keep hands free from potential pinch points.                  Proper lockout procedures will be followed when personnel are required to work on mechanical equipment. Equipment will be reduced to a zero energy state prior to workers removing guards, entering or placing bodies within areas of operation.                  When necessary, equipment will be blocked, chocked or supported to prevent movement while workers are in danger areas.</p>	<p>High-vis vests                  LOTO equipment and procedures</p>
	Electrical	<p>All electrical tools and equipment will be equipped with GFCI                  All Electrical work will be done by licensed electricians                  Electrical equipment will be properly locked out during equipment installation and connection.                  Each worker involved in lockout will have their own uniquely keyed lock installed on the lockout device.                  Equipment will not be energized until it has been verified that all connections are properly secured and all personnel have removed their own locks from the lockout device.                  Tags will not be used in lieu of lockout devices.                  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 outlets will accommodate a 3-prong plug.                  Portable generators will placed on solid ground prior to starting, generators will not be run from the back of trucks unless properly grounded.</p>	<p>Functioning GFCI                  LOTO as required                  3-prong extension cords                  Grounding means when necessary for generators.</p>

### ACTIVITY HAZARD ANALYSIS

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

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	Hot work/fire	<p>All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids, allowable container size will comply with TVA TSP 906.</p> <p>Fire extinguishers will be installed at all areas designated for flammable and combustible storage.</p> <p>Internal hot work permits will be issued by the SSHO or HSS.</p> <p>A fire watch will remain in the vicinity during hot work and for at least 30 minutes after hot work has been completed.</p> <p>Flammables will remain at least 50' away from hot work activities, combustibles at least 35'.</p> <p>Fire extinguishers will be inspected at least monthly and re-certified annually.</p> <p>Hot work will not occur in confined spaces without SSHO approval.</p> <p>Proper flammable storage areas will be utilized as necessary and as a minimum comply with TVA TSP 906, section 3.</p> <p>Oxyfuel Gas Welding and Cutting equipment shall be configured and maintained per the requirements of TVA TSP 815, section 8.</p>	<p>Safety can for flammables Hot work permits Fire extinguishers Fire watch</p>
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### ACTIVITY HAZARD ANALYSIS

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

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	Spills	Secondary containment will be utilized for all fuel/chemical storage areas. Appropriate spill kits will be available, consideration will be taken for spills on water. All spills will be reported to the SSHO or appropriate designee. Verification will be made that spill volume does not exceed reportable quantities. Spills will be promptly controlled, contained and cleaned. Contaminated materials will be properly containerized and labeled while awaiting disposal. Disposal will be in accordance with appropriate local, state and federal regulations.	Containment and clean-up materials
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**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

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	<p>Falling Overboard and/or Stranding</p>	<p>All persons on board will remain seated, except when working. All personnel shall wear United States Coast Guard (USCG) Approved Personal Flotation Devices per the requirements of TVA TSP 306.</p> <p>Non slip surfaces will be provided on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways. All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards. An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of TVA TSP 306 section 6. All throw rings will be U.S. Coast Guard approved.</p> <p>Maximum weight capacity for watercraft will not be exceeded. Dredges and barges will be equipped with perimeter guard rails. Watercraft will not be used without shore support personnel. Personnel on board watercraft must be in radio contact with shore personnel.</p> <p>All personnel working on watercraft will be trained in man overboard emergencies. Drills will be conducted to verify personnel are aware of their responsibilities.</p>	<p>PFDs                  Throw rings                  Guard rails</p>
	<p>Water Craft Operation</p>	<p>All dredge and boat pilots shall be familiar with the "Rules of the Road" that regulate movement of boat traffic within the river. Water craft will be operated only by those personnel who have successfully completed the required boating safety course. Charts of the study areas, with depths for mean low water, will be obtained and watercraft pilots will be familiar with their use. Locations of rocks, ledges and manmade surface obstructions will be noted within the study area. These will be given a wide berth.</p> <p>All River boating regulations will be strictly observed. All watercraft must have required Coast Guard approved lighting and signaling devices.</p>	<p>Properly inspected and maintained equipment</p>

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

**Page 7 of 8**

<p>Maintenance and repair of hydraulic dredge auger, booster pumps, dredge</p>	<p>Sinking Boat/Dredge Damage</p>	<p>All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor. The load ratings of dredges/boats will be strictly adhered to; overloading of vessels is prohibited. In the event the boat becomes grounded at times of low water, no attempt will be made to move the boat until enough water returns to re-float it. Oil absorbent booms will be kept on board in the event of a spill. No unnecessary fuel cans will be onboard.</p>	
	<p>Exposure to chemical constituents of fly-ash</p>	<p>Equipment should be wet cleaned prior to maintenance work. Areas such as radiators, bushings, fittings, etc. must not be blown-out with compressed air. Upon completion of tasks and prior to exiting the contamination reduction zone, wash hands and face thoroughly, remove materials from boots and work clothing.</p>	<p>Power washer as necessary.</p>

**ACTIVITY HAZARD ANALYSIS**

**SITE: TVA Kingston**  
**Activity: Equipment Maintenance and Repair**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

**Page 8 of 8**

<b>Equipment to be Used</b>	<b>Inspection Requirement</b>	<b>Training Requirements</b>
Dredges, support boats	Initial inspection by qualified person (USCG) Daily inspections of engines and boat structures will be conducted	Boating safety training per TVA requirements. Subcontractor to have expertise Inspectors to be qualified
Fire Extinguishers	Monthly inspections will be performed.	Subcontractors to have knowledge of proper use
Heavy equipment	Inspect before use and document	Subcontractors to have knowledge of proper use
PPE=Level D	Inspect before use	Subcontractors to have knowledge of proper use
Hand tools	Before use	Per manufacturer recommendations
GFCI	Before use	Not applicable

**SITE: TVA Kingston**  
**Activity: Hydraulic Dredging**

**ACTIVITY HAZARD ANALYSIS**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

Page 1 of 2

PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Dredge launching and setup using crane	Struck by/against	Demarcate and stay clear of swing radius Only licensed qualified operators, certification required by TVA Crane inspection – annual, daily Use tag lines Work crews wear ANSI high vis vests	PPE Documented crane inspection TVA TSP 802
	Crane failure	Complete lift plan before lift occurs Follow guidelines for lift capacity	Completed lift plan
	Striking overhead utilities	Crane mast at least 20 ft from overhead line Set up lift to avoid power lines	
Dredging Operations	Caught between/struck by	Minimize number on dredges Follow plan for dredging	Dredging Plan TVA TSP 603
	Work over or near water	All persons to remain seated when not working Wear USCG approved PFDs All means of boat access to be properly secured and guarded Adequate number of throw rings available-US CG approved style Dredges and barges equipped with guard rails Shore support available and radio contact maintained All personnel trained in man overboard emergencies Railings around boat deck	Float Plan PPE PFDs and throw rings TVA TSP 306 TVA TSP 603
	Noise	All exposed workers > 85 db to wear hearing protection Mufflers on engines	PPE, hearing protection
	Heat stress	Work/rest cycles according to ACGIH tables Heat and worker monitoring Shade and drinks available for hydration	Shade and liquids ACGIH tables Wet bulb thermometers

**SITE: TVA Kingston**  
**Activity: Hydraulic Dredging**

**ACTIVITY HAZARD ANALYSIS**

**PROJECT NO. 05DJ5400**  
**DATE OF ANALYSIS: 5/12/09**

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	Watercraft operation	All watercraft to be inspected by USCG or Registered Marine Surveyor Load ratings strictly adhered to USCG approved All watercraft to have approved lighting and signaling devices Operation only by those personnel who have successfully completed the required boating course All dredges and boat pilots to be familiar with rules that regulate boat traffic	USCG license TVA TSP 603
	Unauthorized entry into exclusion zone	Include appropriate warning signs designated area as a work zone.	Warning signs
	Severe Weather	Weather forecasts to be monitored for predicted inclement weather. All personnel to be aware of forecasts Work to be stopped in event of high winds, rough water, lightning or thunder identified	Communication devices Weather forecasting equipment
	Potential exposure to fly ash constituents	Minimal controls required, this is a closed, wet process. No dust is expected during routine operations. If dredge maintenance activities or other activities are incorporated, additional AHAs will be required.	None

Equipment to be Used	Inspection Requirement	Training Requirements
Dredges, support boats	Initial inspection by qualified person (USCG) Daily inspections of engines and boat structures will be conducted	Boating safety training per TVA requirements. Subcontractor to have expertise Inspectors to be qualified
Fire Extinguishers	Monthly inspections will be performed.	Subcontractors to have knowledge of proper use
Barricades, decon facilities	Inspect before use	Subcontractors to have knowledge of proper use
PPE=Level D	Inspect before use	Subcontractors to have knowledge of proper use

### Safe Plan of Action

**Project No.** 05DJ5400

**Activity/Task** Inspecting Fittings and Hoses

**Work Area:** Below Deck

**Date of Review** 5/12/09

**Page 1 of 3**

Steps of Activity/Task	Potential Hazard	Safe Plan	Resources
Stage equipment on Jon boat and dredge (drums, pump and hydraulic fittings)	Pinch points, heavy lifting, foot hazards	Use mechanical lifting when possible, wear proper hand and foot protection, use an adequate number of people for lift.	Leather gloves, steel toe boots
Remove water from below deck with hand pump	Working on water, spilling contaminated water	Wear PFDs, have spill containment readily available.	Type V PFD, spill clean-up equipment
Check atmosphere in confined space.	None	n/a	5 gas meter
Complete CSE permit and set up retrieval equipment	Pinch points	Watch pinch points on tripod, wear leather gloves	Leather gloves
De-energize and bleed pressure by moving controls, LOTO hydraulics	None, no fittings are removed	n/a	n/a
Enter confined space	Tight area, discharge pipe obstructions, electrical from lighting	Proper lighting, connection to retrieval system, GFCI for all electrical Adequate standby person, supervisor and contact to rescue squad	Lighting, GFCI protected electrical, standby and supervisor for confined space entry
Perform inspections and repairs	Use care when removing fittings, prevent potential uncontrolled pressure release	Trained mechanics to perform work	
Reconnect hydraulics, bleed air from lines	Line failure, connection failure, discharge of fluid, noise	No one to remain in space during start-up, test and bleeding, collect all fluid during bleed off activities, wear proper hearing protection	Spill containment materials, hearing protection
Demobilize equipment	Pinch points, heavy lifting, foot hazards	Use mechanical lifting when possible, wear proper hand and foot protection, use an adequate number of people for lift.	Leather gloves, steel toe boots

Remove drums from work boat using Lull	Equipment damage, pinch points, dropping loads	Keep all non-essential people clear of lift area, use proper rigging and rigging techniques, designated competent operators only	Proper rigging
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**Signatures of Persons Involved in Development of SPA**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Supervisors Signature: \_\_\_\_\_ Date \_\_\_\_\_

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

**SITE: TVA Kingston**  
**Activity: Pipeline Management**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Vehicle Loading/Unloading	Slippery surfaces on and around vehicle.	Check loading area and vehicle surfaces for water, oil, ice, frost etc. prior to moving equipment.	Ice melt, brooms, adsorbent towels for petroleum
	Moving heavy or awkward equipment.	Utilize adequate number of personnel to move equipment, use hand trucks if available. Use trucks with lift gates whenever possible.	Lift gates, hand trucks, loading dock if available
	Unsecured equipment	Properly secure all equipment with rope and anchor points on trucks. Load heaviest equipment farthest forward in vehicle.	Rope, anchor points
Travel to/from Site	Unfamiliarity with location distracting driver	Map out travel route and destination prior to departing, utilize a passenger to act as the navigator	Maps
	Difficult terrain	Use proper vehicles for accessing work location.	Four wheel drive vehicles as necessary
	General traffic hazards	Drive defensively, use seatbelts	Seat belts for all passengers
Site Set-up and Control	Pedestrians, children, vehicles etc.	Properly secure work area using caution tape, barricades and other appropriate hazard markings. In some instances fencing may be necessary. It may be necessary to back fill all excavations daily, particularly if work is being done in an area frequented by children.	Hazard markings, barricades, fencing
	Unauthorized entry into work zone	Include appropriate warning signs designated area as a work zones. Keep unauthorized personnel	Warning signs
	Potential exposure to fly ash constituents	Work in areas or on surfaces which are free from fly ash whenever possible. If this is not feasible, perform dust control measures in work area and minimize disturbance of materials, generation of dust. Thoroughly wash hands and face, remove materials from boots and clothing as necessary.	Dust control measures
Fabrication of dual wall and single wall HDPE pipelines using fusion welding system	Maneuvering pipe, awkward positioning	Proper positioning, team lifting, use of fork trucks and equipment to move and position pipe, wear gloves and steel toe shoes	Equipment to position pipe and welder PPE
	Contact of bare skin on heating elements	Cover exposed skin with protective clothing and gloves. Use first aid if exposure occurs	PPE, first aid kit with burn treatment

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Putting welded pipe into place	Fire	The gasoline-powered engine on the welder will only be fueled while off and after cooling down. Follow terms of hot work permit A 5BC extinguisher will be placed upwind within 25' of the operation.	Fire extinguisher TVA TSP 809
	Road traffic and heavy equipment in vicinity of welding operations	Perform welding in areas away from roads and travel paths, set up well-defined work zones Wear ANSI High vis vests	Caution tape or cones marking work areas PPE
	Maneuvering pipe, awkward positioning	Proper positioning, team lifting, use of fork trucks and equipment to move and position pipe, wear gloves and steel toed shoes	Equipment to position pipe and welder
		Site personnel will be instructed in and use proper lifting techniques. Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used when mechanical devices are not appropriate. Stretch before lifting.	PPE, awareness of other workers. Proper lifting techniques
	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Secure all radios, cell phones and equipment. Rigging will be inspected and sized for offloading pipe and valves etc.	PPE Means of securing load

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Watercraft being used to assist in placing pipe	Working on and around water, watercraft and barge movement	<p>All persons on board will remain seated, except when working.                      All personnel shall wear United States Coast Guard (USCG) Approved Personal Flotation Devices.                      Non slip surfaces on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways.                      All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards.                      An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of EM 385-1-1, Section 05.H.03A. All throw rings will be U.S. Coast Guard approved.                      Maximum weight capacity for watercraft will not be exceeded.                      Watercraft will not be used without shore support personnel.                      Personnel on board watercraft must be in radio contact with shore personnel.                      All personnel working on watercraft will be trained in man overboard emergencies. Drills will be conducted to verify personnel are aware of their responsibilities.                      A safety skiff (backup boat) will be available during on water activities.</p>	<p>PFDs-sufficient number and condition                      Knowledge of proper boating requirement                      Working communication devices                      TVA TSP 306                      TVA TSP 603</p>
Watercraft assist with burying pipe underwater	Watercraft Operations not consistent with US Coast Guard requirements-	<p>All boat pilots shall be familiar with the "Rules of the Road" that regulate movement of boat traffic within the harbor.                      Charts of the study areas, with depths for mean low water, will be obtained and watercraft pilots will be familiar with their use.                      Locations of rocks, ledges and manmade surface obstructions will be noted within the study area. These will be given a wide berth.                      All Harbor boating regulations will be strictly observed.                      All watercraft must have required Coast Guard approved lighting and signaling devices.                      Float plan submitted for each watercraft operation each day.</p>	<p>Know boat requirements                      Boats in good working condition                      TVA TSP 603</p>

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Watercraft assist in laying process pipe	Sinking Boat	All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor. The load ratings of barges/boats will be strictly adhered to; overloading of vessels is prohibited. Oil absorbent booms will be kept on board in the event of a spill. No unnecessary fuel cans will be onboard	Boats in good condition Proper PPE for boating Inspections performed
	Cold/Heat Stress	Proper clothing and shade when needed Work/rest cycles from ACGIH based on monitoring Maintain dry clothing Stay hydrated	Wet bulb globe thermometer Shade ACGIH tables
	Severe Weather	National weather forecasts will be monitored daily for predicted inclement weather. . All personnel shall be aware of the forecast and keep an “eye to the sky.” Storms may also occur without warning. Work will be postponed in the event of strong winds, high seas, or at times of very poor visibility. In the event of lightning in the area, work will cease. .	Internet access to weather forecast Float Plan Communication Devices
Booster pump operation	Noise	Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85dBA (ear muffs or plugs). All equipment will be equipped with manufacturer’s required mufflers	PPE
	Fuel Spill	Secondary containment will be utilized for all fuel/chemical storage areas. Appropriate spill kits will be available, equipment will be suitable for use on water. All spills will be reported to the SSHO or appropriate designee. Verification will be made that spill volume does not exceed reportable quantities. Spills will be promptly controlled, contained and cleaned. Contaminated materials will be properly containerized and labeled while awaiting disposal. Disposal will be in accordance with appropriate local, state and federal regulations.	Spill kits available Secondary containment structures

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<b>Equipment to be Used</b>	<b>Inspection Requirement</b>	<b>Training Requirements</b>
Boats	Initial inspection by qualified person (USCG) Daily inspections of engines and boat structures will be conducted	Boating safety training per TVA requirements. Subcontractor to have expertise Inspectors to be qualified
Fire Extinguishers	Monthly inspections will be performed. Annual Inspection will be performed.	Subcontractors to have knowledge of proper use
Barricades,	Inspect before use	Subcontractors to have knowledge of proper use
PPE=Level D	Inspect before use	Subcontractors to have knowledge of proper use.

**SITE: TVA Kingston**  
**Activity: Process Oversight and Management**

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<b>PRINCIPAL STEPS</b>	<b>POTENTIAL SAFETY/HEALTH HAZARDS</b>	<b>RECOMMENDED CONTROLS</b>	<b>RESOURCES</b>
Vehicle Loading/Unloading	Slippery surfaces on and around vehicle.	Check loading area and vehicle surfaces for water, oil, etc. prior to moving equipment.	Adsorbent towels for petroleum
	Moving heavy or awkward equipment.	Utilize adequate number of personnel to move equipment, use hand trucks if available. Use trucks with lift gates whenever possible.	Lift gates, hand trucks, loading dock if available
	Unsecured equipment	Properly secure all equipment with rope and anchor points on trucks. Load heaviest equipment farthest forward in vehicle.	Rope, anchor points
Travel to/from Work Areas	Heavy Equipment Operation	Be aware of heavy equipment operation and movement, consider extensive blind spots in heavy equipment when approaching moving equipment.	Awareness of equipment, proper communication and coordination with flagmen.
	Difficult terrain	Use proper vehicles for accessing work locations.	Four wheel drive vehicles as necessary
	Drop offs at roadway edges	Be aware of roadway markings, maintain proper speeds	Roadway awareness
	General traffic hazards	Drive defensively, use seatbelts	Seat belts for all passengers
Site walk downs and oversight	Uneven ground, holes, stumps,	Be aware of surroundings, wear appropriate boots. Stand still during videotaping or photography or use a buddy system / spotter while walking.	Proper work boots
	Motor vehicle traffic / heavy equipment	Access vehicle and equipment from passenger side, not road side of vehicle. Wear reflective vests, set up traffic warnings as appropriate, particularly on blind corners and hills.	Reflective vests, traffic markers
	Overhead and eye hazards	Avoid walking through wooded areas. Whenever possible, stay out of active work areas such as drill sites and areas where heavy equipment is operating. Wear hard hats and eye protection.	Hard hats, eye protection.
	Chemical hazards / exclusion zones	Do not enter exclusion zones unless it is absolutely necessary to perform activity. If exclusion zone entry becomes necessary, compliance with 29 CFR 1910.120 will be necessary including training, and appropriate PPE usage. Upon exiting exclusion zones, thoroughly wash hands and face, remove materials from clothing.	Level C or D PPE
	Biological hazards: ticks, spiders, bees, wasps, mosquitoes, poison ivy/oak/sumac	Check area for obvious signs of poison ivy, oak, sumac. Also be aware of areas that are likely to contain bees/wasp nests, use DEET as necessary to prevent exposure to ticks, tape pant legs to boots if necessary and wear light colored clothing	DEET, duct tape, light colored clothing, ivy-bloc

**SITE: TVA Kingston**  
**Activity: Process Oversight and Management**

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<b>EQUIPMENT TO BE USED</b>	<b>INSPECTION REQUIREMENTS</b>	<b>TRAINING REQUIREMENTS</b>
Vehicles	Daily inspections will be conducted	Subcontractor to have driving skills and licenses
Surveying, photography or videotaping equipment	Inspect before use, inspect after use for potential contamination	Subcontractors to have knowledge of proper use

**SITE: TVA Kingston**  
**Activity: Railcar Loading**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Walk rail line to identify and remove debris and obstructions	Slip/Trip/Fall	Work Areas and means of access shall be maintained safe and orderly. Avoid walking on rail tracks Tripping and poor footing hazards will be repaired as they are discovered or clearly identified.	
	Vehicular Traffic/Problems	Trackmobile and railcars stationary for this task.	
	Back Injuries	Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used when mechanical devices are not appropriate for use.	
Locomotive Operation	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Secure all radios, cell phones and equipment.	
	Eye Injury	Safety glasses with side shields that meet ANSI Standard Z-87 will be worn.	
	Slips, Trips, Falls	No passengers on trackmobile Spotters to assess footing while performing job. Don't walk on tracks, clear ice and snow. Operator use 3 points of contact when climbing into and out of the cab.	

**SITE: TVA Kingston**  
**Activity: Railcar Loading**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Struck Against/By	Operator to have completed training and have current heavy equipment license and driver's operator license. Personnel will understand and review hand signals. All personnel will wear ANSI type II high visibility vests. Personnel will keep 25 feet away from railcars and trackmobile when it is moving. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will not stand directly behind heavy equipment when it is in operation. Eye contact with operators will be made before approaching equipment. Clear the area of all non-essential personnel. All machines will be equipped with working backup alarms adequate for the background noise. No manual uncoupling of railcars.	
	Pinch Points	Manual connect of railcar to trackmobile Wear gloves while making connection, railcar and trackmobile stable before attempting connection.	
Stage, line, load, wrap, decon / inspect gondola empty gondolas Switching or cars	Struck Against/By	No manual uncoupling of railcars.	
	Vehicle Traffic, Public Roads	Proper signage on cars Defensive driving Clear visibility Awareness of crossing traffic	
	Slips, Trips, Falls	Use ladder to climb into gondola, maintain 3 points of contact while climbing in and out Keep plastic from walking paths	PPE Awareness of trip hazards
	Back Strain from Lifting	Assess load weight before attempting lift Obtain assistance when needed Lift with legs after securing load	Buddy system when lifting

**SITE: TVA Kingston**  
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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Struck Against/By	Personnel will understand and review hand signals. All personnel will wear ANSI type II high visibility vests. Personnel will keep 25 feet away from railcars and trackmobile. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will not stand directly behind heavy equipment when it is in operation nor stand under loads. Eye contact with operators will be made before approaching equipment. Clear the area of all non-essential personnel. All machines will be equipped with working backup alarms adequate for the background noise. Wear PPE-including gloves Use new straps with ratchet or buckle. Bungee cords or elastic straps not preferred.	Equipment to position pipe and welder PPE, awareness of other workers.
	Exposure to Dust –Silica	Wear level D PPE at levels up to exposure limit 0.050 mg/m <sup>3</sup> , above that concentration, Level C PPE will be required. Perform thorough cleaning of hands and face upon departing exclusion zone. Secondary containment for all hazardous materials. Stay upwind whenever possible, minimize dust generation	PPE Dust control measures
Weigh Full Railcars	Pinch points Struck by	Wear gloves Proper positioning Communication with locomotive operator	

Equipment to be Used	Inspection Requirement	Training Requirements
Front end loaders	Daily inspections will be conducted	Subcontractor to have driving skills and licenses
Fire Extinguishers	Monthly inspections will be performed.	Subcontractors to have knowledge of proper use
Rail equipment	Per railroad requirements	TVA HSE Training per procedure 445

**SITE: TVA Kingston**  
**Activity: Rim Ditch Management**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Manual Material Handling	Slip/Trip/Fall	Work Areas and means of access shall be maintained safe and orderly. Even terrain will be utilized as unloading areas. Tripping and poor footing hazards will be repaired as they are discovered or clearly identified. Fall protection will be used when working at unprotected heights greater than 4'.	Fall arrest / protection systems Proper stair railings
	Vehicular Traffic/Problems	Spotters will be used when backing up trucks and moving equipment. Heavy equipment will be equipped with back-up alarms. When work areas impact vehicle ways, traffic control markings and/or a flagman will be used.	Functioning back-up alarms
	Weather	Personnel will be instructed in heat stress/cold stress recognition and prevention. Personnel must notify the HSO if symptoms of cold/heat stress are perceived in any member of the crew, including self. Work/rest regimes and personnel monitoring for workers will be instituted per the HSO based on ambient conditions and condition of personnel. Air temperature, humidity and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary. Drinking liquids will be available and used for rehydration during breaks. Work will be conducted during warmer/cooler hours of the day, if necessary and feasible. Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, lightning.	Drinking liquids Shaded break areas Emergency coordination

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Back Injuries	Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting. Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used when mechanical devices are not appropriate for use. Proper paths of travel will be noted and followed during manual material handling.	
	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area. All radios, cell phones and equipment will be secured. Tools and parts will be lifted or carried , not tossed Personnel will not climb ladders while carrying equipment in hand. Stop blocks will placed and secured at an appropriate setback to prevent mobile heavy equipment such as lulls or loaders from approaching the bulkhead edge too closely.	Safety-toe boots
	Overhead Hazards	All overhead hazards will be identified prior to commencing work operations. Personnel will wear hard hats that meet ANSI Standard Z-89.1.	Hard hats
	Noise	Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85dBA (ear muffs or plugs). All equipment will be equipped with manufacturer's required mufflers Proper use of vibratory hammer to minimize noise generation.	Ear plugs / muffs
	Eye/Face Injury	Safety glasses with side shields meeting ANSI Standard Z-87 will be worn. Face shields will be worn over safety glasses during grinding, wire wheel work or other activities posing face hazards.. Proper guards will be used on all equipment such as grinders, cut-off wheels and saws.	Safety glasses

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Struck By/Against	Personnel will understand and review hand signals, flaggers will be used when loading trucks. All personnel will wear ANSI type II high visibility vests. Personnel will keep out of the swing radius of heavy equipment. The swing radius will be barricaded or delineated as appropriate Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will not stand directly behind heavy equipment when it is in operation. Eye contact with operators will be made before approaching equipment. All machines will be equipped with working backup alarms adequate for the background noise.	High-vis vests Hazard markings Flaggers Flags
	Electrical	All electrical tools and equipment will be equipped with GFCI All Electrical work will be done by licensed electricians 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 outlets will accommodate a 3-prong plug. Portable generators will placed on solid ground prior to starting, generators will not be run from the back of trucks unless properly grounded. All equipment will stay a minimum of 20 feet from overhead energized electrical lines (50kV or less). The distance will increase 4 feet for each additional 10kV above 50kV.	Functioning GFCIs

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Hot work/fire	All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids, allowable container size will comply with TVA TSP 906. Fire extinguishers will be installed at all areas designated for flammable and combustible storage. Internal hot work permits will be issued by the SSHO or HSS. A fire watch will remain in the vicinity during hot work and for at least 30 minutes after hot work has been completed. Flammables will remain at least 50' away from hot work activities, combustibles at least 35'. Fire extinguishers will be inspected at least monthly and re-certified annually. Hot work will not occur in confined spaces without SSHO approval. Proper flammable storage areas will be utilized as necessary and as a minimum comply with TVA TSP 906, section 3. Oxyfuel Gas Welding and Cutting equipment shall be configured and maintained per the requirements of TVA TSP 815, section 8.	Hot work permits Fire extinguishers Fire watch
	Spills	Secondary containment will be utilized for all fuel/chemical storage areas. Appropriate spill kits will be available, consideration will be taken for spills on water. All spills will be reported to the SSHO or appropriate designee. Verification will be made that spill volume does not exceed reportable quantities. Spills will be promptly controlled, contained and cleaned. Contaminated materials will be properly containerized and labeled while awaiting disposal. Disposal will be in accordance with appropriate local, state and federal regulations.	Spill containment / clean-up materials Emergency notification means

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Boom deployment or sampling	Falling into rim ditch	All persons within 6' of rim ditch edge shall wear Type V PFD per requirements of TVA TSP 306. Non slip surfaces will be provided on all working decks, stair treads, platforms, catwalks, and walkways. An adequate number of throw rings will be maintained along the rim ditch and be properly marked for quick identification.	PFDs Throw rings
Pipe relocation, movement	Struck By/Against	Personnel will understand and review hand signals. Personnel will stand clear of pipe as it is being moved; pipe will not be positioned by hand during movement. Pipe ends will be controlled and will not be allowed to "whip" as pipe is moved around bends. Personnel operating positioning winches will be protected from whip-back in the event of line failure.	
Fly Ash Removal From Rim Ditch	Heavy equipment	Area around rim ditch where equipment is in operation will be designated as no pedestrian. All personnel on site to wear high visibility vests Spotters, flagmen will be used when large numbers of trucks are being loaded.	High vis vests Flaggers Flags
	Wall collapse	Heavy equipment must remain adequately back from the edge of the rim ditch. During dipping operations, operators must be careful not to undercut their location within the rim ditch since this could destabilize their foundation. No personnel are to be in the area of the rim ditch edge during active dipping in the area.	
	Potential exposure to chemical constituents of fly ash	In the immediate area of the rim ditch, fly ash is wet, this will minimize the likelihood of exposure. In the event material begins to dry, dust control measures will be implemented. Operators must keep equipment doors and windows closed during operation. If necessary, HEPA HVAC filters can be installed in equipment.	Enclosed equipment cabs HEPA filters in HVAC Dust control measures

**SITE: TVA Kingston**  
**Activity: Rim Ditch Management**

**ACTIVITY HAZARD ANALYSIS**

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<b>Equipment To Be Used</b>	<b>Inspection Requirements</b>	<b>Training Requirements</b>
Spill Control materials	Daily Safety inspection of spill control materials will be conducted.	Personnel will be given training on how to respond to spilled materials.
Deck/Working Surfaces	Daily inspections for oil/grease buildup will be conducted	Requirements for house keeping will be reviewed
Lighting/Signaling Sys.	Daily inspections will be made.	Operators will be trained in proper use of these safety systems.
Crane, Cherry Picker, Lull All Terrain Forklift, Pickup Trucks	Inspections will be performed on equipment prior to each use. Daily crane inspections, annual certification Pre-lift checklist, critical lift paperwork as necessary	Qualified operators will be used for equipment operation. Document calculations, inspections and checklist.
Fire Extinguishers	Monthly inspections will be performed. Annual re-certification will be performed.	Personnel will be given instructions on proper use of fire extinguishers.
Fall protection: Harnesses, lanyards, anchor points	Daily inspection of all fall arrest systems will be conducted.	Personnel will be trained on fall protection requirements.
Wind, weather instruments	Annual calibration	Site safety personnel will review equipment specifications and manufacturer's documentation prior to using weather monitoring equipment
Rigging	Daily inspection for all rigging. Hoisting chains must have a documented inspection at least annually.	Personnel will be trained in proper rigging techniques and rigging inspection protocol.
Traffic control equipment	Routine inspections will be made.	Personnel will be trained in proper use and placement of these devices.

**SITE: TVA Kingston**  
**Activity: Sampling from Boats**

**ACTIVITY HAZARD ANALYSIS**

**PROJECT NO. 05DJ5400**  
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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Mobilization of Equipment and Supplies	Slip/Trip/Fall	Work Areas and means of access shall be maintained safe and orderly. Even terrain will be utilized as unloading areas. Tripping and poor footing hazards will be repaired as they are discovered or clearly identified. Ensure that loads are properly distributed in all small boats.	Adequate space for staging equipment.
	Vehicular Traffic/Problems	Spotters will be used when backing up trucks and moving equipment. When off loading a boat, never back the vehicle so far into the water that the back tail pipe is under water. Ensure you have sufficient power to pull the boat out of the water once it is trailered.	
	Back Injuries	Site personnel will be instructed in and use proper lifting techniques. Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used in lieu of mechanical devices.	
	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Secure all radios, cell phones and equipment.	Steel-toe boots
	Overheads Hazards	Personnel will be required to wear hard hats that meet ANSI Standard Z-87.	Hard Hats
	Eye Injury	Safety glasses that meet ANSI Standard Z-87 will be worn.	Safety glasses
	Struck By/Against	Personnel will understand and review hand signals. Caution will be used offloading the boat from the trailer-clear the area of all non-essential personnel. All boats will be securely anchored or docked – docked boats will be positioned with minimum 2 lines. Ensure the boat is properly secured to the boat trailer before transporting. Ensure there is sufficient room to drive through when trailering the boat on narrow streets. All machines will be equipped with backup alarms.	Hand signals Functioning back-up alarms

**SITE: TVA Kingston**  
**Activity: Sampling from Boats**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Boat (Watercraft) access, movement and sample collection	Uneven Terrain	Watercraft will be entered and exited from designated areas only. Personnel will avoid walking across rip rap areas or steep embankments to enter or exit watercraft.	Adequate boat access
	Falling Overboard and/or Stranding	All persons on board will wear USCG approved PFDs per the requirements of TVA TSP 306. A Float Plan will be completed by the operator and filed with reliable shore personnel. All persons on board will remain seated, except when sampling. Ensure the drain plug is tightly secured in the boat. Maximum weight capacity for watercraft will not be exceeded. Watercraft will not be operated without a minimum of two personnel on board. Watercraft will not be used without shore support personnel. Personnel on board watercraft must be in constant radio contact with shore personnel.	PFDs Float plan Adequate means of communication
	Heat Stress	Personnel will be instructed in heat stress recognition and prevention. Personnel must notify the HSO if symptoms of heat stress are perceived in any member of the crew, including self. Heat stress management will be conducted. Work/rest regimes and personnel monitoring for workers will be instituted per the HSO based on ambient conditions and condition of personnel. Air temperature and humidity will be monitored. Drinking liquids will be available and used for rehydration during breaks. Work will be conducted during cooler hours of the day, if possible	Drinking liquids Shaded and / or cooled areas for rest periods.

**SITE: TVA Kingston**  
**Activity: Sampling from Boats**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Struck By/Against	Personnel will understand and review hand signals. All machines will be equipped with backup alarms. Watch for other boats in area, avoid close calls or collisions. Watch for wake from other boats. Watch for (know their locations or mark with buoys) objects hidden under water at higher tides i.e., pilings, islands, anchor lines. Ensure the air horn on each boat used is in proper work order.	
	Exposure to Site Contaminants	Personal protective equipment will be worn if needed, at the discretion of the SSHO. For this activity it is not anticipated that fly ash exposures will be a concern.	

**SITE: TVA Kingston**  
**Activity: Sampling from Boats**

**ACTIVITY HAZARD ANALYSIS**

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<b>Equipment to be Used</b>	<b>Inspection Requirement</b>	<b>Training Requirements</b>
Support boats	Initial inspection by qualified person (USCG) Daily inspections of engines and boat structures will be conducted	Boating safety training per TVA requirements. Subcontractor to have expertise Inspectors to be qualified
Fire Extinguishers	Monthly inspections will be performed.	Subcontractors to have knowledge of proper use
Heavy equipment	Inspect before use and document	Subcontractors to have knowledge of proper use
PPE=Level D	Inspect before use	Subcontractors to have knowledge of proper use





**SITE: TVA Kingston**  
**Activity: Vibracore Sampling on Water**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
Setup and Vibracore (Sonic) Sampling	Boat Instability	An engineering review may be required to determine placement location of equipment on watercraft, allowable list and capacity. The craft will be completely spudded in or stabilized prior to extending equipment arms, booms or moving materials. Crane mats or similar material will be used to span across the shore area and watercraft equipment transfer. Once equipment is placed according to the engineering assessment, the equipment will be secured at appropriate anchor points.	Engineering review Crane mats Anchor points and tie-downs
	Work Zones	One end of the vessel will be designated as the support area for the storage of clean materials. This will include the head, drinking water, and entry/exit location on the watercraft. The support area will also be the location for the crew to stand while the spud hoisting/lowering is ongoing.	
	Slip/Trip/Fall	Work Areas and means of access shall be maintained safe and orderly. Even terrain will be utilized as unloading areas. On-shore walkways will be prepped prior to carrying materials on or off the watercraft. Tripping and poor footing hazards will be repaired as they are discovered or clearly identified.	Designated walkways maintained.
	Vehicular Traffic/Problems	Spotters will be used when backing up trucks and moving equipment in congested areas. Heavy equipment will be equipped with back-up alarms. When work areas impact vehicle ways, traffic control markings and/or a flagman will be used.	Spotters Back-up alarms Flagman

**SITE: TVA Kingston**  
**Activity: Vibracore Sampling on Water**

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<b>PRINCIPAL STEPS</b>	<b>POTENTIAL SAFETY/HEALTH HAZARDS</b>	<b>RECOMMENDED CONTROLS</b>	<b>RESOURCES</b>
	Inclement Weather	Personnel will be instructed in heat stress/cold stress recognition and prevention. Personnel must notify the SSHO if symptoms of cold/heat stress are perceived in any member of the crew, including self. Cold/Heat stress management will be conducted in accordance with the site Cold/Heat stress program (Temperature Extremes). Work/rest regimes and personnel monitoring for workers will be instituted per the SSHO based on ambient conditions and condition of personnel. Air temperature, humidity and wind will be monitored; controls will be implemented per ACGIH guidelines as necessary. Drinking liquids will be available and used for rehydration during breaks. Hoisting activities will be suspended during the following weather conditions: Sustained winds at or above 25 mph, freezing rain, and lightning. UV protection for eyes and skin should be utilized when working on the water.	Drinking fluids Cooled / heated break areas Ambient monitoring results UV protection Daily forecast
	Back Injuries	Site personnel will be instructed in and use proper lifting techniques including stretching prior to lifting. Mechanical devices will be utilized when possible to reduce manual handling of materials. Team lifting will be used when mechanical devices are not appropriate for use. Proper paths of travel will be noted and followed during manual material handling.	Adequate walkways for traveling with manual loads

**SITE: TVA Kingston**  
**Activity: Vibracore Sampling on Water**

**ACTIVITY HAZARD ANALYSIS**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Dropped Objects	Steel toe boots meeting ANSI Standard Z-41 will be worn. Hard hats meeting ANSI Standard Z-89 will be worn by all personnel in the work area. Crane capacity will be verified for utilized configuration and equipment pick/placement positions. If pick or placement locations change, re-verification of capacity must be made prior to lifting. All cranes will have appropriate annual inspections and only be operated by personnel possessing an appropriate level equipment operator's license. All rigging will be performed by TVA qualified personnel. All rigging (slings, cables, chokers, etc.) will be inspected prior to use. Engineered lifting lugs or appropriate slings shall be used for lifting. Softeners will be used on equipment corners when lifting with synthetic slings. Critical lift procedures will be initiated for lifts involving >75% of the cranes capacity, on/over water picks or other criteria outlined in the TVA Safety Manual. All radios, cell phones and equipment will be secured. Tools and parts will be lifted or carried, not tossed. Personnel will not climb ladders while carrying equipment in hand.	Steel-toe boots Hard Hats Inspected cranes Trained operators, riggers Critical lift procedures when applicable.
	Overhead Hazards	All overhead hazards will be identified prior to commencing work operations. Personnel will wear hard hats that meet ANSI Standard Z-89.1. All ground personnel will stay clear of suspended loads and overhead work. Work areas will be barricaded and/or posted showing the limits of overhead hazards including load path of travel. . All equipment will be provided with guards, canopies or grills to protect the operator from falling objects. Appropriate protection from falling equipment/materials will be utilized in the event workers are required to work below other crews.	Hard hats

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Noise	Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85dBA (ear muffs or plugs). All equipment will be equipped with manufacturer's required mufflers.	Hearing protection Equipment mufflers
	Eye/Face Injury	Safety glasses with side shields meeting ANSI Standard Z-87 will be worn. Face-shields will be worn over safety glasses during grinding, wire wheel work or other activities posing face hazards. Proper guards will be used on all equipment such as grinders, cut-off wheels and saws.	Safety glasses Face-shields
	Struck By/Against	Personnel will understand and review hand signals. All personnel will wear ANSI type II high visibility vests. Personnel will keep out of the swing radius of heavy equipment. The swing radius will be barricaded or delineated as appropriate Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will not stand directly behind heavy equipment when it is in operation. Eye contact with operators will be made before approaching equipment. All machines will be equipped with working backup alarms. Tag lines will be used to help control suspended loads. Workers will be made aware of potential pinch-points during offloading and assembly of equipment (bolting flanges, process piping, etc) and keep hands free from potential pinch points. Proper lockout procedures will be followed when personnel are required to work on mechanical equipment. When necessary, equipment will be blocked, chocked or supported to prevent movement while workers are in danger areas. Pneumatic lines will be properly secured with fittings pinned when necessary. If the line pressure does not drop when connections are parted there will be whip checks installed.	High-vis vests Barricades or caution / danger tape Tag lines LOTO equipment Whip checks

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Electrical	All electrical tools and equipment will be equipped with GFCI All Electrical work will be done by licensed electricians Electrical equipment will be properly locked out during equipment installation and connection. Each worker involved in lockout will have their own uniquely keyed lock installed on the lockout device. Equipment will not be energized until it has been verified that all connections are properly secured and all personnel have removed their own locks from the lockout device. Tags will not be used in lieu of lockout devices. 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 outlets will accommodate a 3-prong plug. Portable generators will placed on solid ground prior to starting, generators will not be run from the back of trucks unless properly grounded. 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.	GFCI outlets Proper extension cords
	Hot work/fire	All flammable and combustible liquids will be stored in appropriate metal containers with self closing lids, allowable container size will comply with TVA requirements. Fire extinguishers will be made available on each watercraft and placed within 15 feet of an operating engine. Internal hot work permits will be issued by the SSHO. Flammables will remain at least 50' away from hot work activities, combustibles at least 35'. Fire extinguishers will be inspected at least monthly and re-certified annually. Hot work will not occur in confined spaces without SSHO approval.	Safety cans for flammable / combustible liquids Hot work permits Fire extinguishers

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Spills	Secondary containment will be utilized for all fuel/chemical storage areas. Appropriate spill kits will be available, equipment will be suitable for use on water. All spills will be reported to the SSHO or appropriate designee. Verification will be made that spill volume does not exceed reportable quantities. Spills will be promptly controlled, contained and cleaned. Contaminated materials will be properly containerized and labeled while awaiting disposal. Disposal will be in accordance with appropriate local, state and federal regulations.	Spill response materials Emergency communication means
Barge and Boat (Watercraft) Movement	Falling Overboard and/or Stranding	All persons on board will remain seated, except when working. All personnel shall wear United States Coast Guard (USCG) Approved Personal Flotation Devices per the requirements of EM 385-1-1, Figure 5-1. Non slip surfaces will be provided on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways. All means of boat access shall be properly secured, guarded, and maintained free of slipping and tripping hazards. An adequate number of throw rings will be maintained on each watercraft and will comply with the requirements of EM 385-1-1, Section 05.H.03A. All throw rings will be U.S. Coast Guard approved. Maximum weight capacity for watercraft will not be exceeded. Dredges, barges and decks will be equipped with perimeter guard rails. Watercraft will not be used without shore support personnel. Personnel on board watercraft must be in contact with shore personnel. All personnel working on watercraft will be trained in man overboard emergencies. Drills will be conducted to verify personnel are aware of their responsibilities. A safety skiff (backup boat) will be available during on water activities.	PFD Throw rings Safety skiff

**SITE: TVA Kingston**  
**Activity: Vibracore Sampling on Water**

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PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS	RESOURCES
	Water Craft Operation	All boat pilots shall be familiar with the "Rules of the Road" that regulate movement of boat traffic within the harbor and will have appropriate TVA training. Locations of rocks, ledges and manmade surface obstructions will be noted within the study area. These will be given a wide berth. All watercraft must have required Coast Guard approved lighting and signaling devices. Float plan submitted for each watercraft operation each day.	Float plan
	Sinking Boat/Barge Damage	All watercraft not subject to USCG inspection and certification or not having a current American Bureau of Shipping classification will be inspected by a Registered Marine Surveyor. The load ratings of barges/boats will be strictly adhered to; overloading of vessels is prohibited. In the event the barge/boat becomes grounded, no attempt will be made to move the barge/boat until the load is lightened or enough water returns to re-float it. Oil absorbent booms will be kept on board in the event of a spill.	Boat inspections Spill response materials
	Struck By/Against	Personnel will understand and review hand signals. Boats will not enter areas between the operating dredge craft and their anchor points without explicit clearance from the dredge operator. Watch for other boats in area, avoid close calls or collisions. Watch for wake from other boats. Ensure the air horn on each boat used is in proper work order.	Air horn Means of communication with other craft
	Severe Weather	National weather forecasts will be monitored daily for predicted inclement weather. The field investigations lead will call for local conditions and forecast each morning. All personnel shall be aware of the forecast and keep an "eye to the sky." Work will be postponed in the event of strong winds, or at times of very poor visibility. In the event of lightning in the area, work will cease at the direction of the Jacobs field supervisor or SSHO, and will not proceed further until return to work permit is issued.	Daily forecast Means of communication

**SITE: TVA Kingston**  
**Activity: Vibracore Sampling on Water**

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<b>Equipment To Be Used</b>	<b>Inspection Requirements</b>	<b>Training Requirements</b>
Barge	Initial inspection by a Registered Marine Surveyor. Daily inspection checklist thereafter.	Personnel will be trained in inspection checklist use.
Fire Extinguishers	Monthly inspections will be performed. Annual re-certification will be performed.	Personnel will be given instructions on proper use of fire extinguishers.
Spill Control materials	Daily Safety inspection of spill control materials will be conducted.	Personnel will be given training on how to respond to spilled materials.
Barge Deck/Working Surfaces	Daily inspections for oil/grease buildup will be conducted	Requirements for house keeping will be reviewed
Tender Boat Engines	Daily maintenance (fueling, oil, grease) will be conducted.	Operators/pilots will be trained in engine maintenance.
Tender Boats and Skiffs	Initial review/training prior to commencement of field activities.	Operators will be familiar with Coast Guard regulations for watercraft. Personnel will have successfully completed the boating safety course. Float plan submitted for each watercraft operation each day.
Lighting/Signaling Systems	Daily inspections will be made.	Operators will be trained in proper use of these safety systems.
Cherry Picker	Inspections will be performed on equipment prior to each use. Load and capacity calculations done prior to lift Daily crane inspections and pre-lift checklist	Qualified operators will be used for equipment operation. Document calculations, inspections and checklist.
Wind, weather instruments	Annual calibration	Site safety personnel will review equipment specifications and manufacturer's documentation prior to using weather monitoring equipment
Rigging	Daily inspection for all rigging. Hoisting chains must have a documented inspection at least annually.	Personnel will be trained in proper rigging techniques and rigging inspection protocol.



## JOB SAFETY ANALYSIS FORM

<b>No.</b>	<b>Job: Trailer Operations</b>			<b>Date: May, 1999</b>
<b>Section: RSO&amp;E/RS</b>	<b>Craft: All Employees</b>	<b>Analysis by: JSA Task Team</b>	<b>Reviewed by: RS Certified H&amp;S Committee</b>	<b>Approved by: Mike McCombs</b>
<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
2. Pre-trip Inspection. (Continued)  3. Hook-Up.	Failure to properly engage the hitch mechanism and securely lock the latch mechanism can cause the trailer to become detached from the tow vehicle while traveling which could cause serious injury or property damage.		Refer to Appendix I for an optional trailer inspection checklist.  Methods for hooking trailer to vehicle differ from manufacturer to manufacturer, but certain, basic rules always apply. Learning these rules now can prevent big problems later.  If at all possible, use two people when connecting the trailer. From the vehicle, the driver watches in the rear view mirror as the assistant direct him/her. Whatever you do, never get between the vehicle and trailer.  Mirrors on the truck should be of adequate size and type and be properly adjusted to provide good visibility of the trailer load.  During trailer hook-up, set manual transmissions in first or reverse, automatic transmissions should be set in park. Turn off the ignition and set the parking	

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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
Sequence of Basic Job Steps	Potential Exposure or Hazards	Recommended Safe Job Procedure		
3. Hook-Up. (Continued)	<p>Failure to properly engage the hitch mechanism and securely lock the latch mechanism can cause the trailer to become detached from the tow vehicle while traveling which could cause serious injury or property damage. (Continued)</p> <p>Mismatching the ball-coupler sizes can cause the trailer to uncouple as you travel which could cause serious injury or property damage.</p>	<p>brake. The tires of the unattached trailer should be chocked front and back.</p> <p>Attach the trailer and secure it in place. Attach the two safety chains, which all trailers shall have, crossing them beneath the hitch with just enough slack to allow the vehicle to turn easily. Some vehicle/trailer connectors are equipped with an air-powered locking system. It's necessary to attach the breakaway switch cable or airline connections.</p> <p>Also acquaint yourself with the ball-coupler hitch. It comes in different sizes, which do not interconnect. Check the outside of the coupler for the manufacturer's suggested size and weight limit of the hitch.</p>		

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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
Sequence of Basic Job Steps	Potential Exposure or Hazards	Recommended Safe Job Procedure		
3. Hook-Up. (Continued)	Failure to properly engage the hitch mechanism and securely lock the latch mechanism can cause the trailer to become detached from the tow vehicle while traveling which could cause serious injury or property damage. (Continued)	Verify that the hitch lock mechanism is down and secured and that any pins or locking devices are in place. Check the lighting plug for rear running lights, brake lights, and turn signals. Is it clean and securely installed? Does everything on the vehicle and trailer operate correctly?  The trailer jack should be at least eight inches off the ground to accommodate dips and bumps in the road.		
4. Trailer Loading.	Serious injury or property damage can result from improper trailer loading.	Loading requires getting on and off the trailer bed. When possible, use the three-point stance for safe mounts and dismounts. This means that at least three limbs should be touching the trailer at all times for maximum stability. Use handholds and footholds on your equipment, whenever possible, for additional safety.		





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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
5. Securing The Load. (Continued)	Failure to secure the load properly can result in serious injury or property damage. (Continued)		place binders/tension adjusters on the passenger side of the trailer.  Hook binders/tension adjusters so that you pull downward to tighten. Tighten binders/tension adjuster snugly, but do not use your-body weight to tighten.	
6. Loading Materials.	Shifting of the load and exceeding the rated capacity of the trailer or tow vehicle can lead to serious personal injury or property damage. When loading materials by hand, back injuries are possible.		You'll have to do a little arithmetic before you load implements or materials to ensure that the weight of the load does not exceed what the trailer can handle.  As a TVA vehicle and trailer operator you will run up against several standard equipment transportation terms that will help you when you are loading.  <b>Gross axle weight rating</b> is the maximum weight the trailer axle or axles should carry.	

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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
6. Loading Materials. (Continued)	Shifting of the load and exceeding the rated capacity of the trailer or tow vehicle can lead to serious personal injury or property damage. When loading materials by hand, back injuries are possible. (Continued)		<p><b>Gross vehicle weight rating</b> is the most the trailer, plus everything on it, should weigh. The gross vehicle weight of some older trailers was based on a 35-mph limit. Make sure the rating of your trailer is figured at today's highway speeds.</p> <p>Most of today's trailers are also rated according to <b>maximum load weight</b>, which is the trailer's actual load-carrying capacity. For example, if the maximum load weight is 4,800 pounds and your equipment weighs 4,500 pounds, you know that you are just within weight limits.</p> <p>The vehicle must also be capable of handling the <b>tongue load</b>, which is the amount of weight placed on the vehicle hitch by the loaded trailer. Your trailer should have a federal; I.D. tag, giving the <b>tongue load rating</b> and <b>gross vehicle weight rating</b>.</p>	

## JOB SAFETY ANALYSIS FORM

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<b>Section: RSO&amp;E/RS</b>	<b>Craft: All Employees</b>	<b>Analysis by: JSA Task Team</b>	<b>Reviewed by: RS Certified H&amp;S Committee</b>	<b>Approved by: Mike McCombs</b>
<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
6. Loading Materials. (Continued)	Shifting of the load and exceeding the rated capacity of the trailer or tow vehicle can lead to serious personal injury or property damage. When loading materials by hand, back injuries are possible. (Continued)		<p>In a nutshell, the vehicle's towing capacity must meet or exceed the combined weights of the trailer and the equipment and materials being towed.</p> <p>Determining the weights of all materials and implements makes you job much easier.</p> <p>When lifting and carrying, use River System Operations and Environment Lifting Techniques.</p> <p>Lift the load slowly and carefully, so that it cannot swing into or fall on top of the person steadying the load. The helper can use a stay pole to steady the load from a safe distance.</p>	
7. Tie-Down And Securing Of Materials.	A load that is improperly secured can fall off the trailer and result in stiff fines or a traffic accident.		Well secured cargo not only stays on the trailer bed, it does not shift at all. Most state department of transportation regulations require that the breaking strength of the	



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Sequence of Basic Job Steps	Potential Exposure or Hazards	Recommended Safe Job Procedure		
7. Tie-Down And Securing Of Materials. (Continued)	Overloading your trailer can cause injury, property damage, traffic accidents, or state fines.	Typically, loads extending four to eight feet beyond the tail lights require a red flag. Loads extending eight feet or more require a caution light and a state permit. Most states have laws limiting the width of a trailer and the maximum overhang allowed on the sides. Check with your state department of transportation if you have questions.		
8. Safely Backing The Trailer.	Unsafe trailer backing can cause personal injury or property damage.	Before you back up with a trailer, walk the area you'll be backing through. Check for small obstacles and obstructions that might not be visible from inside the vehicle. Move anything that is not permanently fixed and mentally visualize obstacles that remain, such as fire hydrants, traffic signs and utility poles. Also check the condition of the terrain. It is easy to get a loaded trailer stuck in a rut or mud hole. If you are backing into or through traffic use a flagman to stop the traffic while you maneuver.		

## JOB SAFETY ANALYSIS

### FORM

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<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
8. Safely Backing The Trailer. (Continued)	Unsafe trailer backing can cause serious injury or property damage. (Continued)		<p>Backing a trailer can be tricky. To back a trailer, turn the steering wheel in the opposite direction of where you want the trailer to go. A good way to simplify the procedure is to grasp the steering wheel with one hand. When you want the trailer to go right, turn the wheel counter clockwise. To make the trailer go left, turn the wheel clockwise. Turn gradually. The biggest mistake beginners make is over compensating and creating a series of "S" curves.</p> <p>Know the width of your trailer and the width of the area you are passing through. Choose a post or fixed object on the driver's side of the vehicle and use it as a reference point. By staying relatively close to your reference point you can avoid hitting anything on the blind side of the trailer.</p>	

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<b>Sequence of Basic Job Steps</b>	<b>Potential Exposure or Hazards</b>		<b>Recommended Safe Job Procedure</b>	
8. Safely Backing The Trailer. (Continued)	Unsafe trailer backing can cause serious injury or property damage. (Continued)		<p>You may need to jack-knife the trailer or turn it very sharply to position it appropriately for unloading. As you begin the jack-knife, watch the trailer come around in the opposite mirror. Do not over extend the angle at which the trailer is jack-knifed or you could pull on the safety chains or light plug, damaging the hitch.</p> <p>Beware of blind spots. You may have to stop, set the parking brake and get out to see what the condition is behind the vehicle. If you have a helper, he/she can check for you.</p>	
9. Transporting The Loaded Trailer.	A load that is improperly secured can fall off the trailer and result in fines or a traffic accident. Shifting loads may also cause serious injury or property damage.		<p>Transporting often causes the load to shift and settle so you may need to cautiously pull off the road, check the load, and retighten or rebind the load.</p> <p>A vehicle pulling a loaded trailer requires a much greater stopping distance than a conventional vehicle. Always put additional</p>	

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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
Sequence of Basic Job Steps	Potential Exposure or Hazards	Recommended Safe Job Procedure		
9. Transporting The Loaded Trailer. (Continued)	A load that is improperly secured can fall off the trailer and result in fines or a traffic accident. Shifting loads may also cause serious injury or property damage. (Continued)	<p>space between yourself and the vehicle in front of you.</p> <p>As you drive, check your mirrors frequently for loose assemblies. The minute you notice a tiedown or connection coming loose, pull over at the first safe opportunity and re-secure the load.</p> <p>Listen for thumps, bumps and rattles, smell for odors such as burning insulation, hot metal, burning rubber and hot oil, look for defects in wiring, lighting, cables and couplings. Report any problem to your supervisor right away.</p> <p>A weaving trailer is a major warning sign. If your trailer starts to weave, the load is probably unbalanced. Put on the directional signal, wait for the first safe opportunity and pull off the road to check the trailer and load.</p>		

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<b>Required Personal Protective Equipment (PPE): PPE items may be necessitated at the discretion of the manager, supervisor or foreman to help protect employees from hazards caused by special field conditions.</b>				
Sequence of Basic Job Steps	Potential Exposure or Hazards		Recommended Safe Job Procedure	
10. Storage.	<p>Dirt, rocks, and debris left on trailers can become flying objects creating personal injury and property damage.</p> <p>Debris left on the trailer has the potential to cause slips, trips, and falls.</p>		<p>Clean and inspect trailer before storage.</p> <p>For cleaning, park the trailer in an area where cleaning operations will not create house-keeping problems.</p> <p>Remove all accumulation of dirt, debris, dust and grease before retiring the trailer for the day.</p> <p>A stiff broom should be used to remove dry materials.</p> <p>A water hose may then be used, with detergent if necessary, to remove any excessive grease or soil deposits. Do not cause water to be forced into bearing seals, electrical components, or fluid reservoirs by use of high velocity streams. Note any dirt accumulations caused by leakage of fluids or lubricants and report to supervisor.</p>	

Trailer Safety Inspeicton Checklist

Location_____		Trailer Tag Number_____		
Date_____		Inspector_____		
	Items to be Inspected	OK	Needs Repair	Comments/Recommendations
	<b>Trailer Hitch</b>			
1	Fifth wheel and mount			
2	Pintle hook eye			
3	Pintle hook and safety latch			
4	Ball and hitch			
5	Ball shank receiver			
6	Safety chains			
7	Jack stand and caster			
8				
9				
	<b>Lights</b>			
10	Tail/stop/turn - Operation			
11	Clearance/marker			
12	Reflectors			
13	7-way connector and wire			
14	Wiring			
15				
	<b>Brakes</b>			
16	Surge brake			
17	Air hoses if brakes are air powered			
18				
19				
	<b>Trailer Frame/suspension</b>			
20	Suspension/springs			
21	Wheel bearings maintained			
22	Tires/inflation			
23	Wheels			
24	Lug Nuts			
25				
	<b>Other</b>			
26	GVW rating tag			
27	Axle condition			
28	Fenders			
29	Loading ramp/tail gate			
30	Rollers/runners			
31	Winch/cable/safety hook			
32	Flooring/Bed			

## **APPENDIX F**

# **EMERGENCY RESPONSE AND CONTINGENCY PLAN**

**APPENDIX F**

**EMERGENCY RESPONSE**

**AND**

**CONTINGENCY PLAN**

**TVA FLY ASH RESPONSE**

**KINGSTON, TENNESSEE**

May 2009

Prepared by

Jacobs Engineering Group  
125 Broadway Ave  
Oak Ridge, TN 37830

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## ACRONYMS AND ABBREVIATIONS

CMC	Corporate Medical Consultant
EC	Emergency Coordinator
EMS	Emergency Medical Services
EPA	U.S. Environmental Protection Agency
ERCP	Emergency Response and Contingency Plan
IDLH	Immediately Dangerous to Life and Health
mg/Kg	milligrams per kilogram
mg/l	milligrams per liter
mph	miles per hour
MSDS	Material Safety Data Sheet
NCP	National Contingency Plan
NPL	National Priorities List
NRC	National Response Center
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration
PESM	Project Environmental and Safety Manager
PFD	Personal Flotation Device
PHSM	Program Health and Safety Manager
POL	Petroleum, oil and lubricants
PPE	personal protective equipment
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RQ	Reportable Quantity
SM	Site Manager
SOHM	Safety and Occupational Health Manager

SSHO	Site Health and Safety Officer
SWSHP	Site Wide Safety and Health Plan
SWP	Severe Weather Plan
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
UL	Underwriters Laboratories
USCG	U.S. Coast Guard

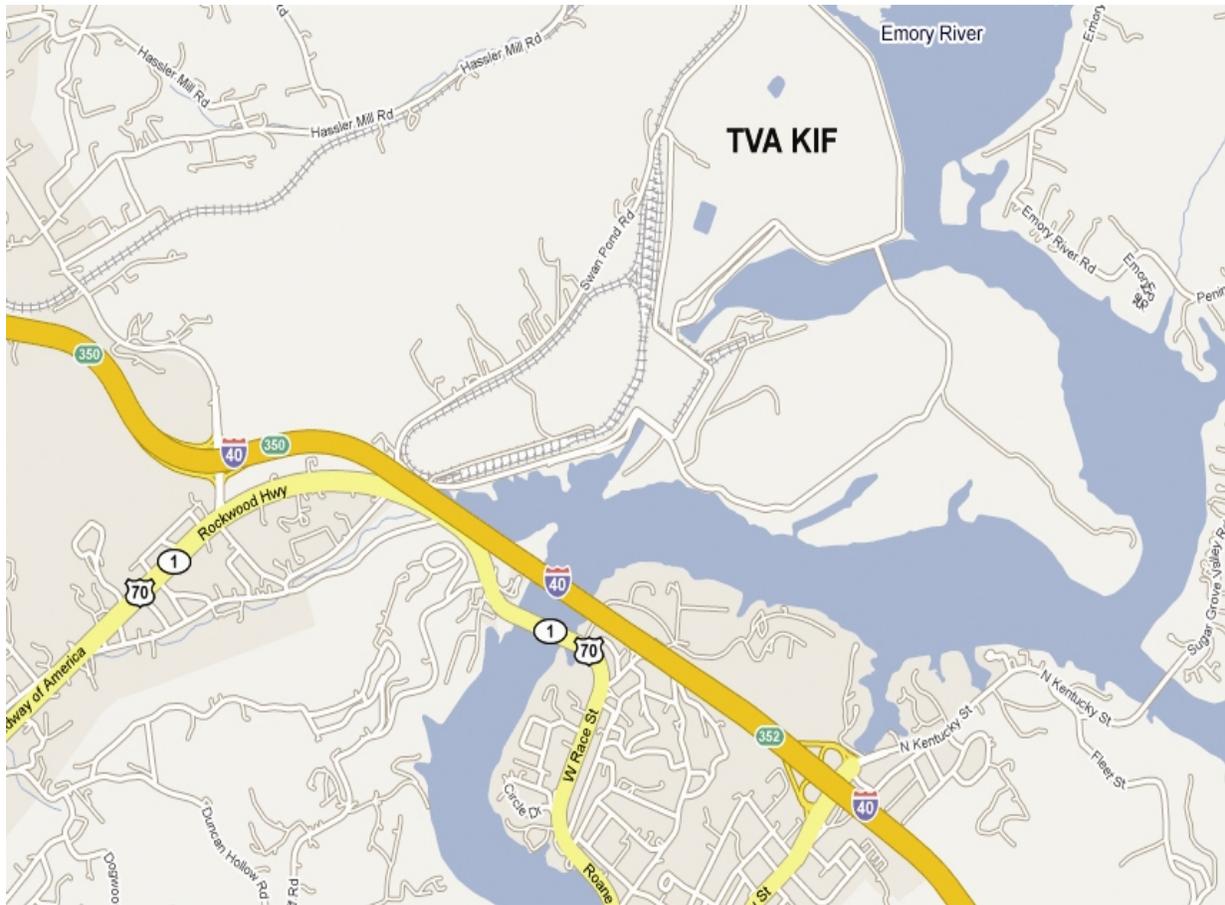
## 1.0 INTRODUCTION

This revision of the Emergency Response and Contingency Plan (ERCP) for the Tennessee Valley Authority (TVA) Fly Ash Response Site establishes procedures and provides information for use during an emergency at all work locations during project activities. Emergencies occur unexpectedly and quickly, and require an immediate response. Therefore, contingency planning and advanced training of staff is essential.

The site encompasses a fairly large geographic area in Eastern Tennessee (Figure 1-1, Aerial Photo and Figure 1-2, Site Map) and may have many tasks occurring in discrete, diverse locations concurrently. This attribute increases the difficulty of maintaining a current and concise ERCP that is as simple as possible in format and complexity to allow for rapid, efficient use in an emergency. Therefore, this ERCP will be updated as necessary to ensure that emergency response procedures remain current and applicable with the work being performed during all phases of the project.

**FIGURE 1-1 AERIAL PHOTO**





**FIGURE 1-2 SITE MAP**

## **2.0 SCOPE**

This ERCP has been prepared for the TVA Fly Ash Response Site in Kingston, TN (KIF). The project involves fly ash removal, dredging, windrowing, railcar load-out, sampling support activities, from the Emory River and environs. Jacobs is the PM / CM contractor, and manages the site for the TVA.

Project-related activities will be conducted in many areas on the waters of the river and surrounding on-land locations in the areas immediately adjacent to and on the Emory River.

The scope of this ERCP encompasses all work on this project conducted by Jacobs and TVA Subcontractors under this contract and the CERCLA order signed on May 11, 2009.

Additional information is contained in the Master SWSHP and Task-Specific Activity Hazard Analysis. These are complimentary documents and should be referenced in concert with this ERCP.

The TVA office address is:

JACOBS  
715 SWAN POND ROAD  
KINGSTON, TN 37748  
ROANE COUNTY

### **3.0 RESPONSIBILITIES**

#### **3.1 PROGRAM HEALTH AND SAFETY MANAGER (PHSM)**

The PHSM is Sean Healey CIH, CSP.

The PHSM has the following responsibilities:

- Reviews and approves the ERCP by signature.
- Performs inspections to determine that the ERCP is in effect and that all pre-emergency requirements are met.
- Acts as a liaison to applicable regulatory agencies and notifies the U. S. Occupational Safety and Health Administration (OSHA) of reportable accidents.
- Remain available for project emergencies.
- Develop modifications to the ERCP as needed.
- Evaluate occupational exposure monitoring as necessary.
- Serve as a quality control (QC) staff member.

#### **3.2 SITE SAFETY AND HEALTH OFFICERS (SSHO)**

The SSHOs are Kirk Morris and Tom Bock. The SSHO has the following responsibilities:

- Be on site during response operations.
- Acts as the alternate Emergency Coordinator and alternate Casualty Control Officer.
- Ensures that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation.
- Immediately notifies the PHSM and any fatalities or catastrophes (three or more workers injured and hospitalized) so that the PHSM can notify OSHA within the required time frame.
- Notifies the PHSM of all OSHA recordable injuries, fires, spills, releases, or equipment damage in excess of \$2500 within 24 hours.
- Assists in coordination with the U.S. Coast Guard (USCG), TVA Management, State and Local Police, TVA and Local Fire.

- Provides immediate advice to those at the scene of an emergency.
- Determines the probable movement of released contaminants.
- Initiates or continues monitoring of air and continually advises emergency responders of special requirements such as personal protective equipment (PPE).
- Inspects site activities to identify safety and occupational deficiencies and ensure they are corrected.
- Coordinates changes or modifications to the ERCP with the PHSM, site manager, and contracting officer.
- Conducts project specific training.

### **3.3 EMERGENCY COORDINATOR (EC)**

The EC is John Moebes. The EC has the following responsibilities:

- Makes contact with local emergency response personnel prior to beginning work on the site.
- Informs interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants.
- Locates emergency phone numbers and identifies hospital routes prior to beginning work on-site.
- Makes necessary arrangements to be prepared for any emergencies that could occur.
- Implements the ERCP whenever conditions at the site warrant such action.

### **3.4 SITE MANAGER (SM)**

The SM is Jack Howard. His primary responsibility and function is to compile the necessary resources and materiel to address any incidents as soon as feasible.

### **3.5 COMMUNICATIONS COORDINATOR**

The Communications Coordinator is Mr. Bill Sawrey. He will provide for maintaining coverage of the site telephones during a site emergency.

### **3.6 CASUALTY CONTROL OFFICER**

Kirk Morris is the Casualty Control Officer for the Site. His primary responsibility is to coordinate incoming medical services along with the EC.

### **3.7 SITE PERSONNEL**

All site personnel are responsible for the following:

- Knowing the ERCP and the procedures contained herein.
- Notifying the EC of situations that could constitute a site emergency.

### **3.8 SUBCONTRACTORS**

On-site Subcontractor personnel have been informed of their roles and responsibilities in regard to contingency planning and emergency response. This training was covered during initial site specific orientation and will be reinforced during associated emergency response drills as necessary.

### **3.9 OFF-SITE PERSONNEL**

Work activities will be conducted in various locations on and around the river; emergency response assistance may be required from several local agencies therefore, all of these municipalities will be involved in emergency planning. This is further discussed in Section 5.0.

### **3.10 FEDERAL RESPONSE ORGANIZATION**

In the event of a chemical release which requires Federal reporting, the National Response Center (NRC) in Washington, DC will be contacted (Telephone 800-424-8802) by the TVA Environmental Coordinator or their designated representative. The NRC will activate the Federal response under the National Contingency Plan (NCP). If the release is also to navigable waters, the USCG will be contacted by the TVA Environmental Coordinator concurrently with the NRC report.

## 4.0 PRE-EMERGENCY PLANNING

In order to handle emergencies effectively, planning is essential, and site personnel must know their roles and responsibilities. Equipment must be on hand, in good working order and staged in key locations.

Pre-emergency planning including anticipation of different emergency scenarios and thorough preparation for contingencies are essential to protect worker and community health and safety. This ERCP has been created for this purpose.

### 4.1 COMMON SITE EMERGENCIES

Incidents and emergencies may occur during the project. Some types of emergencies are more likely to occur; Table 4-1 summarizes the relative probability and severity of potential emergencies in a matrix format. It should be noted that the primary chemical hazards at the project site include crystalline silica, a component of fly ash, ammonia (a process chemical used at the power plant) fuels, and lubricants.

Contingency plans for emergencies are outlined in various sections of the ERCP including:

Personnel Roles and Lines of Authority	Section 3.0
Contingency Planning Procedures	Section 4.0
Training	Section 9.0
Emergency Recognition and Prevention	Section 10.0
Communications	Section 11.0
Emergency Alerting and Response	Section 16.0

**TABLE 4-1  
 PROBABILITY AND SEVERITY OF POTENTIAL EMERGENCIES**

		Probability		
		Low	Medium	High
S E V E R I T Y	High	<ul style="list-style-type: none"> <li>• Explosions</li> <li>• Electrocutation</li> <li>• Capsizing watercraft</li> <li>• Drowning</li> <li>• Ammonia release</li> </ul>		
	Medium	<ul style="list-style-type: none"> <li>• Struck by, equipment entanglement</li> </ul>	<ul style="list-style-type: none"> <li>• Floods</li> <li>• Fire</li> <li>• Motor vehicle accidents</li> </ul>	<ul style="list-style-type: none"> <li>• Personal Injury slips/trips/falls, temperature extremes</li> </ul>
	Low		<ul style="list-style-type: none"> <li>• Chemical Exposure</li> </ul>	

**4.2 MARINE EMERGENCIES**

In addition to unique hazards presented by marine work, many emergency and incident scenarios that occur on land may also occur in the marine environment. The severity and response actions for incidents may be very different when they occur on the water.

Marine applications of emergency planning and response have been included in this document, however marine response will be dependent on the type of equipment and watercraft being used. Individual vessels may have distinctly different features, which cannot be addressed in a single plan. Therefore, the cooperation and assistance in providing specific plans and information is required of all Subcontractors for marine activities.

All Subcontractors operating watercraft in the performance of work on the TVA project must provide details which address response to marine emergencies such as fire, sinking, flooding, severe weather, person overboard, and hazardous materials. The plan must include escape procedures, escape routes, employee accounting following an evacuation, rescue and medical duties, means of reporting emergencies, emergency coordinators, off-site emergency support coordination, and alarm/notification systems.

## 5.0 GENERAL EMERGENCY RESPONSE POLICY

An ERCP is required for all Jacobs projects involving fieldwork per Jacobs Health and Safety Program HSEP 2-11 and TVA HSE Procedure 219.

Jacobs prohibits its employees from responding to emergency situations that would require the respondent being exposed to physical dangers. Jacobs personnel have made arrangements for emergency response with local and/or marine responders. Prior to site activities, the SSHO and project staff will meet with the outside response agencies to coordinate response efforts. Topics include:

- Names, responsibilities, training, and authority of personnel implementing the ERCP
- Scope of work at the site and means of communication
- Emergency recognition and prevention by site personnel
- Operations requiring the use of hazardous substances
- Safe distances and places of refuge for nonessential personnel
- Site contaminants and methods of detection and quantification
- Decontamination and PPE requirements for various response situations
- Site access control measures
- Types of incidents for which response may be required
- Emergency response procedures including emergency medical treatment and first aid
- Location and schedule of work
- Role of emergency responders and estimated response times and resources
- After action critique with lessons learned

As needed, project personnel will be available to outside response groups for pre-planning activities. Contacts from each responder will be kept informed as site activities or conditions change during remediation.

For the TVA Project, the response for each of the following types of emergency situations will include:

- In the event of chemical spills or hazardous material releases, Jacobs will ensure subcontractors have the necessary supplies and training to contain, control, and cleanup the spill or release. If the spill or release is beyond the response capabilities of the subcontractor, subcontractors will have an outside emergency cleanup service available for such a contingency.
- In the event of personnel injury or the need for rescue services, the Roane County Emergency Response number 911 will be called.

On Land:

1. Call 911 – Identify general location of incident. Remind operator that the incident is not at the Main Plant.
2. Call TVA Police with information. Command Center – 800-824-3861. Make the arrangements with Police to escort responder to incident scene.

If more than 2 people are at the scene, have one meet responders at the spilt at Swan Pond Road, just past underpass.

If a crew member is not available to meet responders, have Police meet and escort the responders.

On Water:

1. Call TVA Police on marine radio channel 10 – They will coordinate rescue.

## 6.0 NOTIFICATION PROCEDURE

For a new release of any amount of oil or hazardous materials into navigable waterways that causes a film, sheen or discoloration on the water, initial notification to the Jacobs and TVA project management team must be made immediately. TVA will then determine Federal and State reporting requirements. Presented below in Table 6-1 are general spill reporting requirements for POL constituents such as oils, fuels and hydraulic fluids.

**TABLE 6-1 SPILL REPORTING SUMMARY**

Spilled Material	RQ	Reporting Required		Report To:				
		On Site	Private Property	TVA	NRC	DEP	EPA	USCG
POL <sup>1</sup>	25 gallons	Yes	Yes	X		X		X

### Report Requirements

When TDEC notification is required, a written report must be submitted within seven (7) days of the incident. The report will include the following:

1. Name, address, and phone number of the owner or operator.
2. Name, address, and phone number of the site.
3. Date, time, and type of incident (e.g., fire, explosion).
4. Name and quantity of material involved.
5. Extent of injuries, if any.
6. Assessment of actual or potential hazard to public health, safety, welfare, or the environment, when this is applicable.

7. Estimated quantity and disposition of recovered material that resulted from the incident.
8. All differences between the emergency response activities actually taken and those prescribed in the ERCP, and the reasons for each difference.
9. Proposed measures to prevent similar incidents in the future.

### **Discharge of Oil or Hazardous Materials**

In the event of a discharge of oil or other hazardous material into the navigable waters of the United States, the EC will immediately notify TVA and Jacobs Program Management.

When required, external agency reporting will include the following:

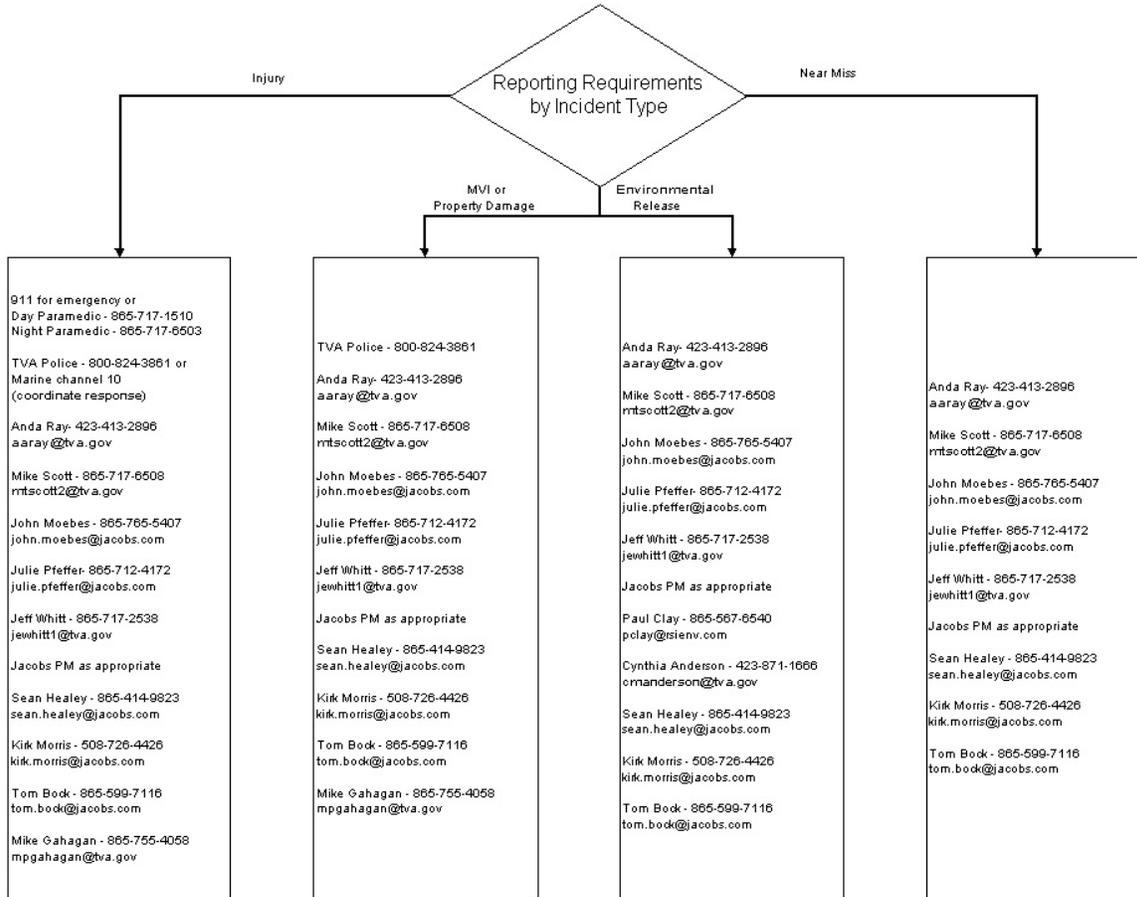
1. Name, address, and phone number of person reporting release.
2. Exact location of spill.
3. Company name and location.
4. Material spilled.
5. Estimated quantity.
6. Source of spill.
7. Name of body of water involved, nearest body of water to the spill area.
8. Action taken for containment and cleanup.

### **6.1 JACOBS ACCIDENT/INCIDENT REPORTING PROCEDURE**

As soon as first aid and/or emergency response needs have been met, the notification table shown in Figure 6-1 must be followed. Site personnel will then follow the procedures specified in TVA TSP 1801 Accident Investigation and Reporting. If the

injured party is a Jacobs employee, Jacobs investigation and reporting procedures will be followed.

Figure 6-1



## 7.0 EMERGENCY EQUIPMENT

### 7.1 GENERAL SITE EMERGENCY EQUIPMENT

Table 7-1 lists an inventory of equipment, which will be maintained for emergency response and spill control. The equipment and materials listed in Table 7-1 will be maintained on-site in a continuous state of readiness to respond to spills, and other emergency incidents. Where spills, leaks, or ruptures are possible, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area.

### 7.2 MARINE EMERGENCY EQUIPMENT

#### 7.2.1 GENERAL

- All watercraft having gasoline or liquid petroleum gas power plants or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic CO<sub>2</sub> or other equally effective type of fire extinguishing system.
- Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately. Extinguisher requirements are as follows:

Length of Watercraft	Extinguisher Type	Minimum Number Required
26 feet or less	1-A:10-B:C	1
26 feet or more	1-A:10-B:C	2

- All watercraft shall carry at least one air horn or similar sound-signaling device.
- All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light. No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.
- All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded

carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc.). The tool kit shall be maintained by the watercraft operator, and expended supplies shall be replaced immediately.

- Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.
- All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems - shall be located so that they are protected against accidental operation but are readily accessible in an emergency.
- General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person. Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, which will automatically furnish the required energy during an electrical system failure.

**TABLE 7-1  
 REQUIRED EMERGENCY, SPILL, AND DISCHARGE CONTROL EQUIPMENT AND  
 MATERIALS**

<b>Equipment</b>	<b>Location</b>
Communications	
Telephone-Hardwire Cellular	Individual Office Trailers Key Personnel
Two-Way Radios (Marine)	With Key Site Personnel
Horn	Each Work Crew and Office
Binoculars	Health and Safety Office
Monitoring Equipment	
Air Monitoring Equipment (i.e., PID etc.)	Health and Safety Office
Explosimeter/Oxygen Meter	Health and Safety Office
Dust Monitor	Health and Safety Office
Personal Protective Equipment	
Personal floatation device (PFD)	Watercraft, Shoreline Locations
Ring Buoys with Ropes	All Watercraft, Shoreline Locations
Spill Response Equipment	
Fire Extinguisher	Trailers, Boats, Vehicles, Heavy Equipment, Active Work Zones
Turbidity Curtain and Absorbent Boom	Deployed Around Specific On-Water Work Areas
Absorbent Booms and Pads	Storage Trailer/Barges
Shovels, Brooms, and Squeegees	Storage Trailer
Pressure Washer	Storage Trailer
Empty Drums	Adjacent to Storage Trailer
First Aid	
First Aid Kits	Various – Trailers and Work Areas
Blankets	Storage Trailer
Emergency Eye Wash	Work Areas Where Chemicals are Present, Fueling Stations
Dust Control	
Source of Clean Water	Work Areas
Spray Equipment	Work Areas

- A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck. All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.
- Smoke and carbon monoxide alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.
- All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.
- Escape hatches and emergency exits shall be marked on both sides with letters, at least 2.5 cm (1 in) high, stating "EMERGENCY EXIT - KEEP CLEAR."
- Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.
- Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.
- A shutoff valve shall be installed at the fuel tank connection; arrangements shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.
- A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 1.8 m (6 feet) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.
- Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with Naval Facilities Command (NAVFAC) DM-22, Petroleum Fuel Facilities. In lieu of a dike or curb, other means complying with USCG requirements in 46 CFR Parts 64, Marine Portable Tanks, and 98.30, Handling and Storage of Portable Tanks, may be used.
- Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For un-inspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

## 7.2.2 LIFESAVING SKIFFS

At least one lifesaving skiff (a powered johnboat 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).

OSHA has established the following criteria for determining when a lifesaving skiff is to be considered as being 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 times 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.
- The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff and get underway.
- The communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency and to inform the operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars as a secondary means of propulsion:
  - a. Personnel trained in launching and operating the skiff shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill before the initiation of work at the site and periodically thereafter as specified by the SSHO.
  - b. Skiffs shall be kept afloat or ready for instant launching.
  - c. Skiffs shall be equipped as follows:
    - Four oars (two if the skiff is motor powered);
    - Oarlocks attached to gunwales or the oars;
    - One ball-pointed boat hook; and
    - One life ring with at least 70 feet (21 meters) of 3/8 (1 centimeter) solid braid polypropylene line, or equivalent, attached.
    - PFDs in number equaling the skiff rating for the maximum number of personnel allowed on board.

- In locations where waters are rough, swift, or where manually operated boats are not practical, a powerboat suitable for the waters shall be provided and equipped for lifesaving.
- Skiffs shall have flotation tanks or buoyant material capable of floating the boat and its equipment and the crew.
- On vessels (e.g., skiffs) without permanently mounted navigation lights, portable battery-operated navigation lights will be available and used for night operations.
- According to OSHA's directive relative to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:
  - The number of work locations where there is a danger of falling into water;
  - The distance to each of those locations;
  - Water temperature;
  - Currents; and
  - Other hazards such as, but not limited to, rapids, dams, and water intakes.

In addition to the proceeding, the employer is required to comply with all other applicable standards including, but not limited to, the requirement that the injured employee is promptly treated by medical personnel or an employee certified in first aid. This could mean that medical treatment might have to begin in the lifesaving skiff.

### **7.2.3 FLOTATION DEVICES**

#### **7.2.3.1 PERSONAL**

A USCG approved PFD shall be provided to and properly worn by all persons in the following circumstances:

- On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc.
- On structures extending over or next to water.
- Any work on or near water where falling into the water is a potential hazard.
- Working alone at night where there are drowning hazards, regardless of other safeguards provided.
- Wherever there is a drowning hazard.

- PFDs are required for all marine work. Refer to the SWSHP, Appendix K for further specifications and requirements.

### **7.2.3.2 LIFE RINGS – WATERCRAFT**

- Each watercraft 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 rescued. A life ring or horseshoe buoy are two common examples of a Type IV PFD. All Type IV PFDs must be approved by the SSHO prior to use. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached. Throw bags may be used in addition to life rings or ring buoys.
- Life rings or ring buoys shall be readily available and shall be provided as follows:
  - A minimum of one on each vessel.
  - A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats 40 feet (12 meters) in length or longer.
  - A minimum of two on any other piece or group of floating plant up to 100 feet (30 meters) in length and one additional for each increase in length of 100 feet (30 meters) or fraction thereof.

### **7.2.3.3 LIFE RINGS – SHORELINE LOCATIONS**

Life rings (Type IV PFD) with at least 90 feet of line, shall be provided and readily available for emergency rescue operations as follows:

- A minimum of one life ring at intervals of not more than 200 feet (60 meters). Examples of applicable locations include floating pipelines, walkways, wharves, piers, bulkheads, scaffolds, platforms, and similar structures extending over or immediately next to water.

## **8.0 SITE DESCRIPTION**

Activities relative to the TVA Fly Ash Response Site in Kingston, TN will be conducted on the land, at the shoreline, and in the waters of the Emory River. The Project office is located at 715 Swan Pond Road, Kingston, TN 37748. Work locations are depicted in the Site Wide and Task-Specific SSHPs and Addenda.

## **9.0 TRAINING**

All site personnel, visitors and regulatory personnel will undergo an emergency training overview as part of their site specific orientation. Depending on the intended role of the individual, the training may range from notification and evacuation procedures to incident emergency response. Personnel will be trained to the level of response action expected in emergency situations. Training will be refreshed annually or whenever significant changes in this plan occur.

### **9.1 SITE PERSONNEL**

All site personnel will be required to have site-specific emergency training. The training will take place as part of the site-specific training outlined in the SSHP. The training will continue for the duration of the project, with information included in the daily health and safety briefings and specific training modules developed on-site. Specific response teams will be identified, if needed, and trained accordingly.

The training program will include:

- Hazard Recognition
- Crystalline Silica
- Volatile organic compounds (VOCs)
- Arsenic
- Ammonia
- Physical hazards
- Hazards of work on water
- Chemicals on HAZCOM inventory
- Unknown chemicals
- Heavy equipment operations
- Project Activity Hazard Analyses (if applicable)
- Signaling an Emergency (Section 11.1 of this Plan)
- The alarm signal system used
- How to summon help

- What information to give and whom to give it
- Evacuation Routes and Refuges
- The Person or Station to Report to when an Alarm Sounds
- Emergency Chain of Command
- Communication Methods and Signals
- Off-Site Support and How to Use It

## **10.0 EMERGENCY RECOGNITION AND PREVENTION**

### **10.1 RECOGNITION**

On a day-to-day basis, individual personnel will be instructed to 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. Immediate recognition of dangerous situations can avert an emergency. Emergency training will be incorporated into regular safety training and be included in the daily Health and Safety Briefings. Discussion should include:

- Tasks to be performed;
- Types of potential emergencies;
- Hazards that may be encountered, along with their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals; and
- Emergency procedures, which are addressed in this plan.

### **10.2 EMERGENCY PREVENTION**

One of the most dangerous and devastating emergency situations that can develop is due to fires. A small fire can quickly escalate and engulf a larger area. Fires involving vessels that contain volatile organic liquids (including gasoline and diesel fuels) can cause explosions. The major fire hazards are described below, as are related preventive maintenance procedures to reduce or eliminate the potential for fires.

The major workplace fire hazards are:

- Heavy equipment/vehicle malfunctions;
- Dredge engine room;
- Watercraft malfunctions;
- Fuels (diesel, gasoline) and lubricants;
- Office trailers (electrical, HVAC); and
- Electrical fire in pump motors

Serious fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials;
- Storage of flammable liquids and gases away from oxidizers;
- No smoking in the work zones or any flammable storage area;
- No hot work without a properly executed hot work permit;
- Shutting off and cooling engines before refueling;
- Grounding and bonding containers during transfer of flammable liquids;
- Use of UL approved flammable storage cans and metal funnels;
- Placing fire extinguishers rated at least 10 pounds ABC on all heavy equipment, watercraft, in all trailers, and near all hot work activities;
- Monthly inspections of all fire extinguishers; and
- Monthly inspections of office areas.

All subcontractors are responsible for the maintenance of fire prevention and/or control equipment in addition to the control of fuel source hazards in addition to the control of fuel source hazards.

### **10.2.1 POSTINGS**

The emergency notification information and procedures are posted in each work trailer location.

### **10.2.2 WORK ZONES OPERATIONAL SETUP**

This project has been designed, constructed, and executed in a manner as to prevent and minimize the possibility of any threat to the public health, safety, welfare, and environment, from a fire, explosion, or any other unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, surface water, or groundwater.

## **10.3 EMERGENCY PROCEDURES**

The on-site activities that could result in the need for an emergency response include various operations such as watercraft operation, geophysical work, drilling on land and water, dredging, earth moving, building construction, and other less significant tasks. The following sections describe emergency procedures for potential scenarios of serious consequence.

### **10.3.1 GENERAL EMERGENCY MEDICAL TREATMENT**

The procedures and rules in this ERCP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to their supervisor immediately. First aid equipment will be available on site at the locations detailed in Section 7.0.

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that have been set up. Unless they are in immediate danger, injured persons will not be moved until Emergency Medical Service (EMS) can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Only in non-emergency situations will an injured person be transported to the hospital or clinic by means other than an ambulance.

### **10.3.2 MINOR INJURY TO PERSONNEL**

- Affected personnel must immediately report the injury to their supervisor.
- The SSHO or other First Aid trained supervisory personnel will evaluate the injury and treat as needed.
- If the injury is not an emergency but requires treatment (i.e., stitches) beyond basic First Aid, then a supervisor or other designated personnel will transport the injured party by automobile/site truck to the on-site paramedics office. The transporting individual will accompany the injured party into the treatment facility and remain with the injured party.
- An incident report/investigation will be completed as soon as possible.

### **10.3.3 CHEMICAL EXPOSURE AND CONTAMINATED INJURED PERSONNEL**

#### **10.3.3.1 OVERT CHEMICAL EXPOSURE**

The following are standard procedures to treat chemical exposures. If available for virgin chemicals, specific procedures detailed on the manufacturer's Material Safety Data Sheet (MSDS) shall be followed. The Jacobs Corporate Medical Consultant (CMC) may also be consulted if necessary.

#### SKIN AND EYE CONTACT:

Use copious amounts of soap and water for skin exposure. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics (sodium hydroxide), acids (ferric sulfate) or hydrogen peroxide occurs.

INHALATION:

Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION:

Decontaminate and transport to emergency medical facility.

INJECTION INTO OPEN WOUND:

Decontaminate and transport to emergency medical facility.

**10.3.3.2 DECONTAMINATION OF INJURED PERSONNEL DURING MEDICAL EMERGENCIES**

The SSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

Decontamination or disposal of all equipment used during the emergency must be performed. The decontamination will consist of the wiping down of all surfaces of equipment that contaminated material may have contacted. In some cases an appropriate detergent or disinfectant may be used. The areas will be decontaminated until they are visibly clean. Potential blood borne pathogens will be removed per standard procedures.

- Gross decontamination will be performed at the exclusion zone perimeter.
- The injured party will be transported to the decontamination facility.
- Standard decontamination procedures will be performed.

- After decontamination, observe the injured party for major or serious injury.

#### **10.3.4 SERIOUS INJURY TO PERSONNEL ON THE WATER**

A significant amount of work at the site is performed on or from watercraft, and it is possible that an employee may become sick or injured while located on a watercraft in the river. In the event that an employee becomes disabled while on a vessel, then the following procedures should be followed:

- Contact the on-water TVA Police Patrol via marine radio.
- Verify TVA Police will contact emergency dispatch for an EMS response. The nature of the injury/illness will be described.

**IMPORTANT:** The logistics of the rescue must be communicated to the emergency responders.

- If the watercraft on which the person is located can maneuver to a shoreline rendezvous point, then the location must be provided to the emergency responders.
- Shoreline meeting point locations to be used in emergencies must be planned in advance by project management personnel, as they may vary depending on the location of work.
- The TVA should also be notified by the Site Manager or EC immediately after off-site emergency personnel notification has been made.
- If the injured employee can be transported on the watercraft where the incident occurred, or in the case of an immobile watercraft, the employee can be transferred to another boat; then the employee should be transported to the pre-determined meeting point to rendezvous with the emergency responders.
- If, in the judgment of the First Aid/CPR competent person, the injured individual cannot be moved, the emergency responders will be transported by a site boat or Fire Department boat to the scene of the incident. If necessary, CPR and First Aid will be administered while awaiting the arrival of the emergency response personnel.
- Supervisory personnel will meet the emergency responders at the rendezvous point and direct them to the injured party.
- The emergency response personnel will evaluate the patient's condition.
- The site boat or other watercraft used in a rescue will be secured to the barge or other vessel prior to the removal of and placement of the injured person into the rescue boat.

#### **10.3.5 PERSON IN WATER (OVERBOARD)**

When working on vessels or near water, the possibility exists that a person could fall from the vessel or other location adjacent to water such as bulkheads, bridges, and piers.

Since no work on water is to be conducted by one person alone, there will typically be another person to act in the event of an overboard incident. If there is occasion where a single person is working on, over, or adjacent to water, then the person must be equipped with a means of communication with another party. Regular well-being checks should be made using this communication method. If a person does go overboard from a vessel or otherwise falls into a water body, then the following applies.

- Small Watercraft (on boats, skiffs, etc.)
  - If a person goes overboard, immediately stop the motor and throw the life ring (Type IV PFD) to the person. If the boat has traveled too far from the person, maneuver the boat closer before throwing the ring. Stop motor.
  - Instruct the person to hold the ring, and slowly bring the person to the side of the boat. Depending on the boat size and configuration, the person may be able to climb back into the boat with assistance. For smaller boats like johnboats, it is almost impossible to bring someone on board without capsizing the boat.
  - If the person cannot get into the boat because of the boat limitations, injuries, or unconsciousness, then have the person stay with the boat, or tie them off so they do not drift away. Drop anchor to keep boat in one location.
  - Notify the land-based EC by radio and await assistance.
- Large Watercraft (barges, dredges, ships)
  - If a person goes overboard, immediately throw them a life ring (Type IV PFD).
  - Give the order to stop all engines.
  - Notify the captain or crewmember in charge and the land-based EC.
  - With assistance, use the rescue or lifesaving skiff to reach the person.
  - If the skiff is suitably configured, and assistance is available, the person may be able to be brought onto the skiff.
  - If the person cannot get into the boat because of the boat limitations, injuries, or unconsciousness, then have the person stay with the boat, or tie them off so they do not drift away.
  - On large vessels so equipped, the person may be able to be winched back onto the vessel after a line and sling has been placed around and under their arms.
  - Await assistance.

- Land-Based Areas (docks, piers, bulkheads)
  - If a person goes into the water, throw them a life ring (Type IV PFD).
  - Notify the EC.
  - Depending on the configuration of the area, the person may, with the assistance of the life ring and line, be able to come to the shoreline and exit the water.
  - If the person cannot exit the water, with assistance, use the lifesaving skiff to reach the person.
  - Instruct the person to hold the ring, and slowly bring the person to the side of the skiff. Depending on the skiff size and configuration, the person may be able to climb into the skiff with assistance.
  - If the person cannot get into the skiff because of the skiff's limitations, injuries, or unconsciousness, then have the person stay with the boat, or tie them off so they do not drift away.
  - Await assistance.

#### **10.3.6 SERIOUS INJURY TO PERSONNEL ON LAND**

- Depending on the work location where the person is located, the appropriate emergency responders should be notified by calling 911. (The nature of the injury/illness will be described).

**IMPORTANT:** The emergency responders notified logistics of the rescue must be communicated to the emergency responders and coordinated with TVA Police.

- The location of the employee must be described to the emergency responders.
- The EC shall also notify TVA and SSHO immediately after off-site emergency personnel notification has been made.
- On-site CPR and First Aid trained personnel will administer First Aid while waiting for the arrival of the off-site emergency personnel.
- The EC or designate will meet the off-site emergency personnel at the main entrance or other agreed-upon specified location, and direct the emergency personnel to the injured party.
- The emergency medical personnel will evaluate the patient's condition and take appropriate action.

#### **10.3.7 CHEMICAL RELEASE**

It is anticipated that the chemicals and potentially hazardous materials used in general site activities will be gasoline, diesel, oil, and grease. For all chemical releases, the Jacobs and TVA Project Management Team must be contacted.

All small spills (i.e., less than 10 gallons hazardous spills/environmental releases) shall be contained as close to the source as possible. The MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and to aid recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed of per applicable regulations. An exclusion zone of 50-100 feet around the spill area should be established, depending on the size and type of the spill.

In the event of a chemical release the following seven steps should be taken by EC:

1. Determine the nature, identity and amounts of major spill components;
2. Make sure all unnecessary persons are removed from the spill area;
3. Notify appropriate response teams and follow the procedures outlined in Section 6.0;
4. Use proper PPE in consultation with the SSHO;
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
6. If possible, try to stop the leak with appropriate material; and
7. Remove all surrounding materials that can react or compound with the spill.

If a release is large and, in the opinion of the EC, may present a hazard to workers, the response will be limited to steps designed to reduce or contain the release. Steps to be taken may include:

- Shut off source;
- Evacuate nearby areas
- Contain release with earthen berms or booms; and
- Block nearby storm and sewer drains.

The TVA Police Department(s) and/or USCG will be notified and escorted to the scene. If the release is in, or reaches the water, the USCG will be contacted.

Emergency equipment such as decontamination area setup, spill containment supplies, and PPE will be assembled at a point near the spill site.

When the spill includes VOCs or similar chemicals the SSHO will initiate air monitoring to determine the extent of airborne contamination.

#### **10.3.7.1 MINOR SPILL LESS THAN RQ**

On Vessels:

- Contain the spill on the vessel and clean up with absorbents or absorbent pillows in order to prevent the spill from reaching the water. The EC will follow the notification procedures outlined in Section 6.0 of this ERCP.

In the Water:

- Contain and cleanup the spill with an absorbent boom, absorbent pillows, or pads. The EC will follow the notification procedures outlined in Section 6.0 of this ERCP.

On Land:

- Prevent the spill from reaching the water or storm drains using an earthen berm or other barrier in order to prevent the spill from reaching the water. Remediate spill area according to State and Federal regulations. The EC will follow the notification procedures outlined in Section 6.0 of this ERCP.

#### **10.3.7.2 LARGE SPILLS ABOVE THE RQ**

- Contain spill to the smallest area possible using booms, berms, or any other effective barrier. The EC will follow the notification procedures outlined in Section 6.0 of this ERCP.
- In the event that additional emergency cleanup help is needed, Jacobs will request assistance from off-site response contractors.
- Jacobs will ensure the collection all material discharged including contaminated booms and absorbent materials. All residue discharged will be disposed of in accordance with all applicable Federal and State regulations.
- All emergency equipment will be decontaminated prior to being placed back into routine service.

- Decontamination water, waste solutions, or residues generated from decontaminating the equipment will be collected and disposed of in compliance with all applicable State and Federal regulations.
- Jacobs will keep all records related to the spill of hazardous waste for a period of at least three years after the spill has been cleaned up or for longer periods of time, if required as part of any unresolved enforcement action.

### **10.3.7.3 FIRE OR EXPLOSION**

- Identifying potential ignition source(s) to eliminate the possibility of an ignition will minimize the likelihood of a fire or explosion.
- If a fire is controllable, workers will take steps in extinguishing the fire if trained to do so. Steps will include use of fire extinguishers, covering the fire with dirt, or removing source of combustion.
- The appropriate fire departments and the TVA PM will be notified simultaneously.
- Workers will attempt to minimize the spread of the fire if the fire is in the incipient stage, while awaiting emergency response personnel.
- Workers may be able to remove the source of combustion by moving vehicles and flammable products and or constructing non-flammable barriers.
- The EC or designate will be stationed at the meeting point to direct the emergency response personnel to the site of the emergency.
- The procedures outlined in Section 16.0 - Emergency Alerting and Response, will be implemented.
- A head count will be made at the rally point area by the EC, alternate EC, or SSHO to determine if all workers are accounted for.
- If a fire occurs on board a watercraft the following applies:
  - Notification must immediately be made to the EC, who will notify the appropriate emergency responders.
  - If a fire is controllable, crewmembers will take steps in extinguishing the fire if trained to do so. Steps will include use of fire extinguishers, water hoses, or any other appropriate equipment on board.
  - If the fire is uncontrollable, then the captain or crew member in charge should instruct the crew to abandon ship (also notifying the land-based EC), by using a raft or skiff. If that is not possible, then crewmembers should go into the water (with PFDs donned), and swim away together from the vessel to await rescue.

#### **10.3.7.4 UNDERGROUND UTILITIES**

Underground Utilities present a variety of hazards whenever intrusive activities are conducted. The possibility of the existence of underground utilities must be evaluated as early as possible in the planning phase of any intrusive activity. The requirements for conducting intrusive activities relative to underground utilities are outlined in TVA TSP 804, Excavation and Trenching. This procedure details the means for underground utility identification, location, protection, and avoidance.

In the event that encountering or contacting an underground utility occurs, it is imperative that the appropriate actions are taken to minimize damage to the utility, prevent personal injury, and minimize indirect effects. Response measures to be followed in the event of underground utility contact/near contact are outlined below.

#### **10.3.7.5 ENCOUNTERING UNDERGROUND UTILITIES**

It is possible that underground utilities will be encountered in locations that have previously been “cleared” of having underground utilities by the locating service, or are found outside of the area that has been marked as having underground utilities. In either case, if this occurs, the following applies:

- Intrusive activities must be stopped immediately.
- The SM and EC must be notified.
- No further intrusive activities may be conducted until:
  - The One-Call agency/private location service and/or the subject utility owner visit the site;
  - Identification of the utility owner and the type of material/energy being conveyed by the utility has been made; and
  - The orientation and depth of the subject utility has been determined and suitably marked.
- An Incident Report and Investigation form must be completed per TVA TSP 1801. The report should be accompanied by photographs clearly showing the marking(s) and the actual location with a distance gauge to document how far off the mark the utility was encountered.

#### **10.3.7.6 CONTACTING UNDERGROUND UTILITIES**

If excavation or other equipment being used for intrusive activities makes contact with an underground utility, the following guidelines apply:

- Intrusive activities must be stopped immediately.
- Observe the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, scratched coatings, cathodic protection compromise, material leakage, obvious electrical energy.
- Move all personnel to the evacuation meeting point as described in the SSHP
- EXCEPTION: If an electrical line has been contacted and it is your belief that equipment (such as an excavator) is electrically energized, do not approach the equipment. Order the operator to remain in the equipment until emergency personnel can de-energize the source (unless the equipment is on fire, at which time the operator should jump off of the vehicle and shuffle along the ground to a safe area).

Shuffling is required because current flows outward through the soil in a ripple pattern called a power gradient, creating a pattern of high and low potential. Shuffling decreases the chance that these gradients could be bridged, causing current to flow through the body, resulting in electrocution.

- Secure the area to prevent the public from entering.
- Contact emergency responders as specified in the SWSHP.
- The TVA and Jacobs PM and PHSM must be notified.
- No further intrusive activities may be conducted until:
  - The utility owner inspects the scene and after repairs, verifies that all danger has passed.
  - The orientation and depth of the subject utility has been determined and suitably marked.
  - Permission from the emergency responders to resume work has been given.
- A TVA Incident Report and Investigation form must be completed per TVA TSP 1801. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.
- State and local regulations must be reviewed to determine if reporting to any additional agencies is required.



## **11.0 COMMUNICATIONS**

In an emergency, crucial messages must be conveyed quickly and accurately. Site staff must be able to communicate information such as the location of injured personnel, notice of blocked evacuation routes, and other response requirements and directives. If necessary, outside support sources must be contacted, and help obtained. To accomplish this, internal and external emergency communications must be developed and maintained.

### **11.1 INTERNAL COMMUNICATIONS**

Internal emergency communication systems are used to alert workers to danger, convey safety information, and maintain site control.

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

#### **11.1.1 MARINE RADIO COMMUNICATION**

The primary form of communication during an emergency between field groups and the TVA Police will be marine radio communications. Each field team on the water shall be equipped with at least one marine radio. During an emergency situation, radio transmissions will be kept to a minimum so that all field teams can receive instructions.

#### **11.1.2 TELEPHONE COMMUNICATION**

The project is equipped with telephones as follows:

- Landline telephones are maintained in the Jacobs Office on Swan Pond Road
- Cellular telephones are assigned to various project personnel. Key phone number should be provided at the daily safety meeting or listed on the AHA maintained by each task crew.

#### **11.1.3 AIR HORNS**

Air horns will be used to alert site personnel of emergencies. The following signals will be used:

- Two short blasts - shut down equipment, clear radio channels, await instructions;

- Three short blasts - injured employee, first aid providers respond; and
- One continuous blast - site evacuation: Additional information will be passed over the 2-way radios with specific instructions.

Air horns will be maintained in the following locations:

- Active work zones;
- Barges/watercraft; and
- Support zones.

The procedure to activate the air horns consists of depressing the air horn button or switch while pointing it in the direction of the area to be signaled.

#### **11.1.4 HAND SIGNALS**

Personnel may employ hand signals during emergency situations if radio or telephone communication is not possible. Hand signals are described in the SSHP.

#### **11.1.5 PLANT ALARMS**

The KIF utilizes an alarm system that is audible from most areas on site.

### **11.2 LOCAL EMERGENCY SUPPORT UNITS**

In order to be able to contact appropriate responders during any emergency that might occur at the site, information aids specific to each work area must be posted. The aid includes emergency contacts and phone numbers and response actions to fire, gas leak, medical emergencies, spills, severe weather, and evacuation during civil unrest, bomb threats and bioterrorist threats.

## **12.0 SITE LOCATIONS AND HOSPITAL ROUTE**

Attachment B contains a route map from the TVA site to the Roane County Medical Center. These maps must be maintained in all work areas and in all on-site vehicles.

### **13.0 SAFE DISTANCES AND REFUGES**

No standard single recommendation can be given for evacuation or safe distances because of the variety of incidents which may occur at a project this large and complex.

Meeting Points for emergency evacuation purposes must be established for all long-term work areas. This information should be stated daily at the safety meeting.

In an emergency, it has been established that all employees are to assemble at the designated meeting points. If the meeting point is downwind, then an alternate location will be established 500 feet upwind of the incident's location.

## **14.0 SITE SECURITY AND CONTROL**

The TVA police force provides security services for the site 24 hours per day, 7 days per week. Open communication and cooperation with the TVA Police has been established and maintained throughout this project.

## **15.0 EVACUATION PROCEDURES AND EMERGENCY DRILLS**

In order to mobilize the resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority has been established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the situation, and direct whatever efforts are necessary until the emergency response units arrive. At their discretion, the EC also may order the closure of the site for an indefinite period.

During the initial site safety meeting, all project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers. If an emergency occurs, including but not limited to fire, explosion, or chemical release, an air horns or similar alarm will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at pre-determined locations. Follow-up actions will be communicated by mobile phone calls or field radios.

The EC or designee will remain at the site to provide any assistance requested by emergency response personnel as they arrive to deal with the situation.

After the emergency is over, the emergency response Incident Commander, the SSHO, and the EC will evaluate the area to determine if re-entry is safe. If so, the TVA and Jacobs PM will be informed, and they will then give the orders for all site personnel to return to work.

### **15.1 EMERGENCY DRILLS**

#### **15.1.1 GENERAL SITE EMERGENCIES**

- A site emergency drill will be conducted at least quarterly to test the site emergency systems.
- The drill(s) will simulate emergency situations and evacuation scenarios that might occur on-site, and may include mock spill responses and cleanup. In some cases, local outside emergency responders may participate.
- A critique of the drill(s) according to Jacobs HSEP 1.4 and 2.11 will be conducted.

### 15.1.2 MARINE EMERGENCIES

- Person overboard or rescue drills will be conducted at the start of work and at regular intervals wherever marine rescue equipment is required. This would involve locations on the water and immediately adjacent to water, such as piers, docks, and bulkheads. The man overboard drill is presented in Attachment A.
- On all vessels which have a regular crew, or on which people are quartered, the following drills will be held: abandon ship/boat drills, fire drills, and person overboard or rescue drills.
  - Drills will include, where appropriate, how to handle a pump shell or pipe rupture, or failure within the hull (proper shutdown procedures, system containment, etc.) and how to handle leaks or failures of the hull or portions of it (what compartments to secure, how to handle power losses, pulling spuds to move to shallow water, etc.).
- Emergency lighting and power systems will be operated and inspected monthly to ensure proper operation. Internal combustion engine driven emergency generators will be operated under load for at least two hours each month. Storage batteries for emergency lighting and power systems will be tested once per month.
- Marine drills will also be critiqued, which will include any deficiencies noted and the associated corrective actions taken.

## **16.0 EMERGENCY ALERTING AND RESPONSE PROCEDURES**

Response operations usually follow a sequence that starts with the notification of an emergency and continues through the emergency to the end, followed by preparation of the equipment for the next emergency.

### **16.1 RESPONSE ACTIVATION**

Air horns and the site radio system will be utilized for general warning of all site personnel to initiate the evacuation of the site, communicate an injury, and/or to signal the shut down of all equipment.

Key site personnel will have portable marine radios. They will receive detailed instructions from the EC or designee over these radios after the alarm horn has been sounded. Workers will check with their supervisors for clarification, if necessary. In the event of a medical emergency, personnel will take direction from the EC and notify the appropriate emergency organization.

Radio communications will be maintained between on-water and shore personnel on a continuous basis during the emergency via dedicated channels.

#### **16.1.1 PROCEDURES TO FOLLOW FOR RESPONSE ACTIVATION**

- Alert personnel to the emergency. Sound the site alarm to:
  - Notify personnel
  - Stop work activities if necessary
  - If possible lower background noise in order to enhance communication quality
  - Begin emergency procedures
- Notify on-site emergency response personnel about the emergency and include the following preliminary information:
  - What happened
  - Where it happened

- Whom it happened to
- When it happened
- How it happened
- The extent of damage
- What aid is needed
- Potential obstacles for EMS personnel

The EC will notify the appropriate emergency response personnel, and emergency contacts per Section 6.0 of this ERCP.

## **16.2 INCIDENT ASSESSMENT**

After the initial alarm notification, additional and more detailed information about the incident and emergency response capabilities should be evaluated. The following information should be determined by applicable site personnel and conveyed to the EC:

- Details of what happened
  - Type of incident
  - Cause of incident
  - Potential for additional immediate problems
  - Mitigation measures which can be enacted without endangering Jacobs personnel
- Casualties
  - Victims (number, location, and condition)
  - Treatment required

- Missing personnel
  
- Damages

### **16.3 RESCUE/RESPONSE ACTION**

The type of action required should be decided by the EC and the necessary steps implemented. In medical emergencies, victims should be stabilized and attended by the First Aid/CPR qualified personnel. The victims should be stabilized in place if it does not endanger the victim or the rescuer. Victims should only be moved if their lives are endangered by hazards, which cannot be controlled or removed. Unless specifically trained to do so no personnel should attempt emergency response or rescue from hazardous conditions until EMS/response personnel arrive. Jacobs personnel will assist EMS personnel in any way possible, but no Jacobs personnel should put their lives at risk as part of rescue operations.

## 17.0 RESTORATION AND CRITIQUE OF RESPONSE AND INCIDENT REPORTING

Subsequent to a site emergency, and before normal site activities are resumed, personnel must be fully prepared and equipped to handle another emergency.

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers;
- Refilling medical supplies;
- Recharging eyewashes and/or showers;
- Replenishing spill control supplies;
- Replacing used air horns;
- Restocking all equipment and supplies;
- Replacing or repair damaged equipment;
- Decontaminating and refueling equipment for future use;
- Reviewing and revising all aspects of the ERCP according to new site conditions and lessons learned from the emergency response.
- Ensuring all Corporate incident notifications have been made per HSEP 2.11.
- Filing an Incident Report and Investigation per TVA TSP 1801 and Jacobs, Health and Safety Procedure 1-7, Incident Reporting and Investigation.

## **18.0 TERRORIST ACTS**

Terrorist acts may occur at any time, with or without advance notice. Since this is a U.S. Government project site, there is a greater chance that it may be targeted for terrorism. Terrorism can be carried out in many ways and forms, and it is very difficult to prepare specific response plans for all of the conceivable methods or means of terrorist assault.

Two types of terrorism that have been encountered in the United States recently include the use of bombs and bomb threats, and the dissemination of biological hazards through the public mail system. Any information relative to these threats must be immediately relayed to the TVA police and program management.

## **19.0 SEVERE WEATHER**

In the event of adverse weather conditions, the SSHO or designee will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related working conditions (hail, rain, lightning, snow, ice, or high winds);
- Rough water;
- Limited visibility (fog);
- Potential for electrical storms;
- Tornadoes; and
- Other major incidents.

The Site Project Manager and SSHO will determine the need to cease field operations, if necessary, in case of severe inclement weather conditions.

All Subcontractors must work closely with site management in order to ensure that pre-planning for, and response to, severe weather conditions are adequate. Subcontractors engaged in marine activities must adhere to the Severe Weather Plan (SWP) provided in Attachment C.

### **19.1 THUNDER STORMS, SQUALLS, AND SHORT DURATION WIND STORMS**

The following actions should be taken to secure the site whenever there is a threatening storm that includes lightning or the chance of winds over 45 miles per hour (mph):

- Secure all loose materials, supplies and equipment;
- Employees working in high wind conditions must be protected from airborne contaminants and flying debris using engineering controls such as wetting of dry soil to prevent particle dispersion and securing all loose objects;
- Stop all work and bring all workers indoors when lightning is within view of the site. Work will not commence until 30 minutes after last sighting of the lightning;

- Shut down and disconnect all electrical equipment in an orderly manner. The purpose is to protect the equipment from electrical surges and abrupt power loss; and
- Anchor barges and other immovable watercraft with anchor and spuds. Evacuate barge and take shelter from the storm on shore. All other watercraft will return to shoreline locations.

## **19.2 TORNADOES**

Due to the unpredictable nature of tornadoes, elevated awareness and readiness must be maintained during periods tornadoes are most likely. For this part of the state, that would include the spring and summer months (May – September).

- Be sure all site personnel are aware of the locations of storm shelters.
- Prepare or update an emergency phone list showing home phone numbers of all key personnel and supervisors. Ask key personnel and supervisors to prioritize which of their employees they might need in an emergency.
- Maintain housekeeping and routinely remove trash from the job site.
- Check tie-downs of trailers, barricades, and other temporary facilities.
- Store all loose equipment and material in storage trailers or tie down.
- Secure all barges and boats.
- Lay all ladders on the ground and secure. Remove all boards from scaffolding if not secured, and tie down all rolling scaffolds.
- Take photographs of each job feature on the site. This will aid in documenting damages after the storm and will show precautions that have been take to prevent damage.
- Keep an adequate supply of radios and phones fully charged.
- Shut down and disconnect all electrical equipment on the site, if feasible.

## **19.3 SPECIAL MARINE CONSIDERATIONS**

Pre-planning and response to extreme weather conditions in a marine environment, especially for vessel operations, is very dependent on the specific operations being conducted and the particular equipment involved. Therefore, in addition to the information presented in the above sections, there are additional severe weather elements, which must be considered for marine operations.

Special extreme weather considerations for marine activities are discussed below.

### **19.3.1 HIGH WINDS**

Of particular concern during periods of high winds are: (1) the limited communications between persons on vessels to others via the two-way radios; and (2) the potential of strong winds knocking persons on small craft, rafts and barges over. Sustained wind speeds of 20 knots will initiate the start of the appropriate precautions for suspending operations due to high winds. Should gale force winds (34-47 knots or 39-54 mph) be announced over the VHF marine radio, all operations will cease work a minimum of one half-hour before the storm arrives, depending upon the work being performed.

Any specific equipment or high-risk equipment (i.e., cranes, derricks, or barges) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the SWP. All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked at a marina or removed from the water, and all personnel will be transported to shore. All rafts and johnboats will be removed from the water prior to gale force wind conditions.

The watercraft must be equipped with sufficient weight trip anchors, and each anchor must have sufficient chain and line for anchoring. At a minimum, when mooring, one anchor will be put down for windy conditions. For barges and rafts, a minimum of two spuds will be put down to a sufficient depth to secure the barge in place. Should vessel captains, or the SSHO determine that additional anchoring/spudding/securing of the boats are needed, additional trip anchors/spuds or lines will be used. Some conditions may require a three point anchoring system or a minimum of three spuds to secure the watercraft. If this requirement cannot be met, then the watercraft must be pulled from the water.

Should it be determined by the onboard personnel and the captain that the weather conditions being encountered on the watercraft are dangerous and are worsening, all operations will cease, all equipment will be lashed to the deck or placed in the storage area, and all personnel will be transported to shore.

Additionally, when operations are conducted to secure watercraft and other vessels for protection against weather events such as high winds a meeting will occur with all responsible parties to discuss proper docking and securing procedures. Provisions and assignments for monitoring the integrity of the secured/docked watercraft at regular intervals, including weekends and nights during the event must be specified and approved by the TVA and Jacobs PM.

### **19.3.2 HEAVY DOWNPOURS**

In the event heavy downpours (where visibility is obscured), are encountered, all operations will be suspended until the heavy rains end. Personnel may remain on the watercraft during heavy rain events only when leaving poses greater danger. The watercraft will be left in place, secured by anchors. Should it be determined by the TVA and Jacobs personnel and the captain that the weather conditions being encountered on the watercraft are dangerous and are worsening, all operations will cease, all equipment will be lashed to the deck or placed in the storage area, and all personnel will be transported to shore.

### **19.3.3 THUNDERSTORMS**

In the event a thunderstorm is forecasted, the SSHO, or designee, will monitor the activity on the NWS local Doppler Radar. Additionally, all site personnel will keep an “eye to the sky”, observing conditions. Operations will cease when it is determined that thunderstorm cells are within five miles of the site, based on NWS Doppler Radar, or if lightning is observed from any location. All equipment will be lashed to the deck or placed in the storage area and all personnel will be transported to shore or retain in protective areas on water craft. No personnel will remain on open decks or open boats during an electrical storm. Operations will restart in 30-minutes after the last lightning is observed, unless NWS local Doppler Radar shows other storms approaching.

### **19.3.4 GENERAL**

- All vessels and personnel will maintain radio and cellular telephone communications/contact with the field offices. Radio communication/contact will occur via VHF marine radios. The channels to be used must be coordinated in advance and noted on the Task-Specific Job Hazard Analysis.
- NWS local weather forecasts will be monitored daily by Jacobs and Subcontractor personnel, for predicted inclement weather. Local weather forecasts will be discussed at the daily health and safety meeting.
- All personnel shall be aware of the forecast and keep an “eye to the sky”. Unpredicted storms may also occur without warning. The SSHO will also monitor NWS Local Doppler Radar as required and vessel captains will monitor marine forecasts on the NWS radio frequencies.
- Work will be suspended when a sustained wind of 26 knots or 30 mph is encountered or in the event of Gale force winds (34 – 47 knots or 39-54 mph).
- Use of any 12 to 16-foot Aluminum-hulled tender boat during small craft advisories or greater warnings (18 – 33 knots or 20 – 38 mph) will not be allowed.



## **Attachment A - Man Overboard Drill**

All Captains will practice this procedure initially as a table-top drill. Once the sequence and responsibilities are established an actual drill will be held on the water.

Please be advised that in Cold Weather rescues, time is of the utmost importance. When a person falls into the water – the first person to see him will maintain visual contact while alerting the ship's Captain to the person's location (If the person spotting the man overboard can maintain visual contact reach the nearest Type Four PFD (Life Ring/Cushion) and summon the Captain. The person spotting the man overboard will continually point out the location of the man overboard-if other personnel are available they will be summoned to help toss the life ring/cushion and notify the Captain. All work on board the vessel will immediately cease when a "man overboard situation" exists.

The Captain will turn the screws (propellers) of the boat away from the location of the man overboard and will attempt to stay within 50 feet of the overboard person. The Captain will alert the SSHO immediately, about the Man Overboard situation and keep the SSHO posted as to the person's condition as the rescue progresses. A man overboard may be a Medical Emergency and the SSHO/Emergency Coordinator may need to summon EMS to the dock/rally point or in extreme injury cases to the location of the boat (per the SHSP Emergency Response and Contingency Plan).

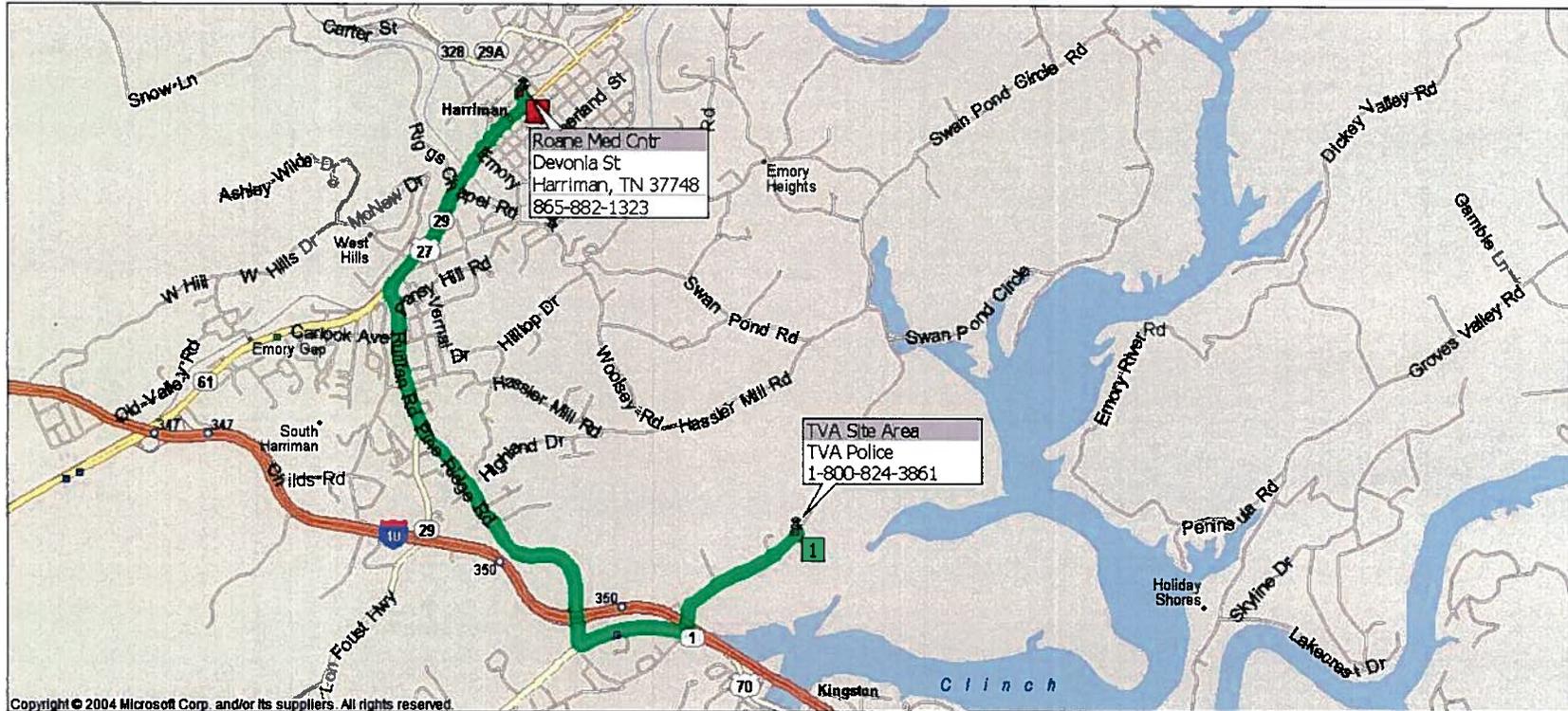
Personnel tossing the Life Ring/Cushion must remember to try to aim accurately for the person in the water-so they only have to swim a minimum distance. Personnel tossing the Life Ring/Cushion must also remember to secure the end of the rope, so they can pull the overboard person back to the watercraft.

When personnel are retrieving the overboard individual they must remember that person will be heavy and may be a dead weight. Personnel will perform team lifting when available and will exercise caution so they are not also a man overboard.

Only as a last resort will other personnel jump into the water and these people will only do this if they have donned appropriate survival gear and have a second Life Ring/Cushion that has a line secured to the watercraft.

Once the overboard person is rescued the boat will immediately proceed to the Emergency Evacuation Rally point Dock. Simultaneously the overboard person's condition will be monitored and the person will be treated for shock/hypothermia. Upon arrival at the dock, the overboard person will immediately be transported to the paramedic station or the waiting ambulance.

ATTACHMENT B



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Mile	Instruction	For
0.0	Depart TVA Site Area on Swan Pond Rd (South-West)	0.8 mi
0.8	Road name changes to Swan Pond Circle	0.1 mi
0.9	Turn RIGHT (West) onto US-70 [SR-1]	0.5 mi
1.4	Take Local road(s) (RIGHT) onto Pine Ridge Rd	1.7 mi
3.0	Keep STRAIGHT onto SR-29 [Ruritan Rd]	0.7 mi
3.8	Take Local road(s) (RIGHT) onto US-27 [SR-29]	1.3 mi
5.1	Turn LEFT (North-West) onto Queen Ave	109 yds
5.1	Arrive Roane Med Cntr [Devonia St, Harriman, TN 37748]	

## **ATTACHMENT C – SEVERE WEATHER PROCEDURES**

### **THUNDER STORMS**

Stop all work and bring all workers indoors or into lightning safe locations, such as vehicles, when lightning is within view of the site. Work will not resume until 30 minutes after last sighting of lightning.

### **TORNADOES**

Tornado Watch – Indicates conditions are favorable for a tornado to occur. Situation rarely occurs without severe thunderstorms therefore protocol for thunderstorms will be followed for tornado watch conditions. All personnel must remain within ready access of a tornado shelter such as the plant.

Tornado Warning – Indicates there has been a tornado spotted on the ground. All site personnel should report to their designated storm shelter.

Shelters have been identified. Some possibilities:

- Plant ammonia shelter areas
- Basements in a house owned by TVA
- Anchored storage connex boxes

### **SPECIAL MARINE CONSIDERATIONS**

Gale force winds (34-47 knots or 39-54 mph) – No field work is to proceed during gale forced wind events. In addition, all areas will cease work a minimum of one half-hour before the storm arrives. Any specific equipment or high-risk equipment (i.e., cranes, derricks) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the AHA. All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked or removed from the water.

Use of any 12 to 16-foot Aluminum-hulled tender boat during small craft advisories or greater warnings (18 – 33 knots or 20 – 38 mph) will not be allowed.

Fog, heavy rain - If visibility is decreased to less than 10', all boat movement must stop with the exception of emergency situations. During boat operations in fog / heavy rain with visibility greater than 10', operation speed must be maintained to an appropriate level given the amount of visibility.

Should it be determined by the TVA / Jacobs personnel and the captain that the weather conditions being encountered on the watercraft are dangerous and are worsening, all

operations will cease, all equipment will be lashed to the deck or placed in the storage area, and all personnel will be transported to shore.

### **GENERAL MARINE CONSIDERATIONS**

All vessels and personnel will maintain radio and cellular telephone communications/contact with the field offices. Radio communication/contact will occur via the site UHF radios and VHF marine radios. The channels to be used must be coordinated in advance and noted on the Task-Specific SWP.

NWS local weather forecasts will be monitored daily by Jacobs and Subcontractor personnel, for predicted inclement weather. Local weather forecasts will be discussed at the daily health and safety meeting.

All on-water personnel shall be aware of the forecast and keep an “eye to the sky”. Unpredicted storms may also occur without warning. The SSHO will also monitor NWS Local Doppler Radar as required and vessel captains will monitor marine forecasts on the NWS radio frequencies.

**ATTACHMENT D**

**Emergency Phone Lists**

<b>Project Notification<sup>1</sup> – All Personnel Should be Contacted</b>		
Name	Organization	Number
Mike Scott	TVA – PM	423-240-5025
John Moebes	Jacobs – PM	865-765-5407
Mike Gahagan	TVA – HSE Manager	865-755-4058
Sean Healey	Jacobs – HSE Manager	865-414-9823
Kirk Morris	Jacobs – HSE Officer	508-726-4426
Tom Bock	Jacobs – HSE Officer	865-599-7116
<b>Medical Support Contacts</b>		
Plant Nurse <i>(Mon – Thu; 0600 – 1600)</i>	TVA	865-717-2589
Advatech Paramedics <i>(7 days week; 24 hours per day)</i>	Advatech	Days: 865-717-1510 865-567-6740
		Nights: 865-717-6503 865-567-6740
TVA Police	TVA	800-824-3861
<b>Fire Response Contacts</b>		
Roane County Fire <sup>2,3</sup>	Roane County	911

- 1: Provide initial medical care and initiate emergency control activities prior to making project notifications.
- 2: If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
- 3: TVA has a dedicated fire brigade for in-plant response. For activities occurring out on site, Roane County Fire will provide primary response.

## **APPENDIX G TRAINING MATRIX**

### APPENDIX G

#### Health and Safety Training Course Matrix

Procedure Number	Course Title	ATIS Number	Frequency	Duration
402	Accident Investigation for Supervisors	00059100	Initial	2 hours
403	Aerial Lifts	00059101	Initial / 3 years	4 hours
404	All Terrain Vehicle (ATV) Safety	00059102	Initial	1 hour
405	Ammonia Awareness	00059103	Initial	1 hour
406	Boating Safety	00059104	Initial	3 hours
407	Chain Saw Safety	00059105	Initial	32 hours
	Chain Saw Safety Refresher	00059106	2 years	4 hours
408	Chemical Cleaning of Boilers	00059107	Initial / Annual	½ hour
409	Chemical Hygiene Orientation	00059108	Initial	2 ½ hours
410	Confined Space Entry	00059109	Initial / 5 years	3 hours
410	Confined Space Test Instruments	00059159	Initial / 5 Years	2 hours
411	Crane Safety (Mobile)	00059110	Initial / 3 years	24 hours
412	Crane Safety (Overhead)	00059111	Initial / 5 years	8 hours
413	Crane Safety (Pendant)	00059112	Initial / 3 years	1 hour
414	Defensive Driving	00059113	Initial	6 hours
415	Arc Flash Hazard Calculation & Required Protection	00059114	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional)	00059192	Initial	½ hour
416	Electrical Safety per OSHA 1910.269	00059115	Initial	2 hours
417	General Employee Safety Orientation Note: This course standard was titled Employee Safety Orientation, ATIS Number 00059116. The course has been revised to include employee safety orientation and personal protective equipment. See also 441	00059164	Initial	2 hours
418	Ergonomics	00059117	Initial	3 hours
419	Excavating & Trenching (Affected Person)	00059118	Initial	1 hour
420	Excavating & Trenching (Competent Person)	00059119	Initial	4 hours
421	Fall Protection Systems	00059120	Initial	1 ½ hours
422	Flagging Motor Vehicle Traffic	00059121	Initial	1 hour
423	Forklift Operations	00059122	Initial / 3 years	4 hours
424	Grounding Safety Procedures <b>INACTIVE</b> This course has been replaced by Temporary Protective Grounding for Generating Stations 00059213	00059123	Initial	4 hours
424	Grounding Safety Procedures - Refresher	00059189	Annual	2 hours
425	Hand & Portable Power Tools	00059124	Initial	1 hour
426	Handling & Storage of Compressed Gases / Flammable / Combustible Liquids	00059125	Initial	1 hour
427	Hazard Communication	00059126	Initial	2 hours
428	Hazard Recognition and Control	00059127	Initial	1 hour
429	Health & Safety Committee	00059128	Initial	1 hour

Procedure Number	Course Title	ATIS Number	Frequency	Duration
430	Hearing Conservation	00059129	Initial / Annual	½ hour
431	Heat Stress	00059130	Initial	1 hour
431	Heat Stress Monitor (IST Sensor Lynx)	00056163	Initial	1 hour
431	Heat Stress Monitor (Metrosonics hs-32)	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214)	00059187	Initial	1 hour
432	Herbicide / Pesticide Applicator	00059131	Initial	1 hour
433	Inorganic Arsenic	00059132	Initial / Annual	2 ½ hours
434	Inorganic Lead	00059133	Initial / Annual	2 ½ hours
435	Interlocking Safety Audits (INACTIVE) Replaced by Safety Coaching Visits	00059134	Initial	1 ½ hours
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
436	Job Safety Analysis	00059135	Initial	3 hours
437	Ladder Safety	00059136	Initial	1 hour
438	Lockout / Tagout (FM)	00059137	Initial	2 hours
439	Machine & Equipment Safety	00059138	Initial	1 hour
440	Mercury Awareness	00059139	Initial	1 hour
441	Personal Protective Equipment See TVA Safety Procedure 417	00059140	Initial	2 hours
442	Powder Actuated Tools	00059141	Initial	1 hour
443	Radiation Boundary	00059142	Initial	1 hour
444	Radio Frequency (RF) and EMF	00059143	Initial	½ hour
445	Railroad Safety	00059144	Initial	2 hours
446	Refractory Ceramic Fibers	00059145	Initial	2 hours
447	Respiratory Protection (Non-Nuclear)	00059146	Initial / Annual	2 hours
448	Safe Rigging Principles and Requirements	00059147	Initial	16 hours
449	Rivers and Decks Skills Rivers and Decks Skills Refresher	00059148 00059149	Initial Annual	24 hours 3 hours
450	Scaffolds (Built-up & Suspended)	00059150	Initial	2 hours
451	Supervisory Safety Orientation	00059151	Initial	3 hours
452	Introduction to the TVA Safety Manual	00059152	Initial	½ hour
453	How to Use the TVA Safety Manual	00059153	Initial	½ hour
Appendix B	Block Safety Training for Supervisors (Option A) <del>Deleted - No Longer Available as Block Training</del>	00059154	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option A) <del>Deleted - No Longer Available as Block Training</del>	00059155	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option B) <del>Deleted - No Longer Available as Block Training</del>	00059156	As needed	4 hours
Appendix B	Block Safety Training for Employees (Option C) <del>Deleted - No Longer Available as Block Training</del>	00059157	As needed	24 hours
Appendix B	Block Safety Training for Employees (Option D) <del>Deleted - No Longer Available as Block Training</del>	00059158	As needed	16 hours
410	Confined Space Test Instruments see also at 410	00059159	Initial / 5 Years	2 hours
454	Serious Accident Investigation	00059160	Initial	8 hours
Appendix B	Block Safety Training for Employees (Option E) <del>Deleted - No Longer Available as Block Training</del>	00059161	As needed	4 hours

Procedure Number	Course Title	ATIS Number	Frequency	Duration
Appendix B	Block Safety Training for Employees (Option F) <b>Deleted - No Longer Available as Block Training</b>	00059162	As needed	8 hours
431	Heat Stress Monitor (IST Sensor Lynx) <i>see also at 431</i>	00059163	Initial	1 hour
455	OSHA Construction Safety Training	00059165	Initial	10 hours
	OSHA General Industry Safety Training	00059166	Initial	10 hours
411	0-20 Ton Hydraulic Telescoping Boom Crane	00059167	Initial / 3 years	Skills
411	21-90 Ton Hydraulic Telescoping Boom Crane	00059168	Initial / 3 years	Skills
411	91 Ton & Larger Hydraulic Telescoping Boom Crane	00059169	Initial / 3 years	Skills
411	Crawler Mounted Hydraulic Crane	00059170	Initial / 3 years	Skills
411	Commercial Truck Mounted Hydraulic Crane	00059171	Initial / 3 years	Skills
411	Articulating Boom Hydraulic Crane	00059172	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane	00059173	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane with Tower Attachment	00059174	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane	00059175	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane	00059176	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Tower Attachment	00059177	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Tower Attachment	00059178	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Ringer Attachment	00059179	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Ringer Attachment	00059180	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Luffer Attachment	00059181	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Luffer Attachment	00059182	Initial / 3 years	Skills
411	Mobile Crane Field Coordinator	00059183	Initial / 3 years	Skills
411	Mobile Crane Skills Evaluator	00059184	Initial / 3 years	Skills
411	Mobile Crane Annual Inspector	00059185	Initial / 3 years	Skills
431	Heat Stress Monitor (Metrosonics hs-32) <i>see also at 431</i>	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214) <i>see also at 431</i>	00059187	Initial	1 hour
456	Formaldehyde Awareness	00059188	Initial / Annual	¼ hour
424	Grounding Safety Procedures – Refresher <i>see also at 424</i>	00059189	Annual	2 hours
	Plan Jobs Safely	00059190	Initial	3 hours
457	Recording, Reporting and Classifying Occupational Injuries and Illnesses	00059191	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional) <i>see also at 415</i>	00059192	Initial	1 hour
458	Safety Orientation for Staff Augmented Contractors	00059193	Initial	1 hour
459	Clearance Procedure (Responsible / Qualified Employee)	00059194	Initial / Annual	8 hours
459	Clearance Procedure (Primary Authorized Employee)	00059195	Initial / Annual	4 hours
459	Clearance Procedure (Authorized Employee)	00059196	Initial / Annual	1 hour
	High Hazard Lifts	00059197	Initial	1 hour

Appendix B	Block Safety Training for Employees (Option G)	00059198	As needed	4 hours
Procedure Number	Course Title	ATIS Number	Frequency	Duration
459	Clearance Procedure (Affected Employee)	00059199	Initial / Annual	1 hour
403	Articulating Boom Aerial Lift Platforms	00059200	Initial / 3 years	Skills
403	Extendable / Telescoping Boom Aerial Platforms	00059201	Initial / 3 years	Skills
403	Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	00059202	Initial / 3 years	Skills
403	Scissor Lifts	00059203	Initial / 3 years	Skills
403	Insulated Aerial Devices	00059204	Initial / 3 years	Skills
460	Hexavalent Chromium	00059205	Initial / Annual	2 hours
461	Equipotential Grounding	00059206	Initial	5 hours
424	Placing & Removing Grounds in 4160 & 6900 Volt Cubicles	00059207	Initial	Skills
424	Placing & Removing Grounds on Hydroelectric & Combustion Turbines	00059208	Initial	Skills
461	Equipotential Grounding - Refresher	00059209	Initial / 2 years	4 hours
424	Placing & Removing Temporary Protective Grounding Devices in 4160 & 6900 Cubicles	00059210	Initial	Skills
424	Placing & Removing Protective Grounds on Hydro Plant Main Transformers	00059211	Initial	Skills
461	Transmission Line Equipotential Work Zone	00059212	Initial / 2 years	Skills
424	Temporary Protective Grounding for Generating Stations	00059213	Initial	4 hours
407	Chain Saw Safety	00059214		
448	Rigging Lab	00059215	Optional	8 hours
461	Placing and Removing Protective Grounds on Substation Breaker	00059216		Skills
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
448	Safe Rigging Principles and Requirements Refresher	00059218	Annual	4 hours
448	Advanced Rigger Training	00059219	Initial	

## **APPENDIX H**

### **MARINE REQUIREMENTS**

## Appendix H

### Marine Operations HSE Requirements

#### TVA Fly Ash Dredge and On-Water Activities

1. Float Plan
  - 1.1. Completed every day before going boating
  - 1.2. File with company Point of Contact (POC) on land
  - 1.3. Communicate between boat and POC
  - 1.4. Keep copies
  
2. Watercraft Operations
  - 2.1. The sections of water we will be working are under jurisdiction of US Coast Guard. As such, all equipment and operating personnel will meet or exceed U.S. Coast Guard requirements for safety equipment.
  - 2.2. Issue a Notice to Mariners to USCG Marine Safety Office
  - 2.3. Operators demonstrate they are experienced and knowledgeable in operating watercraft or will be required to complete the TVA Boating Safety course ATIS Number 00059104.
  - 2.4. Pilots license may be required depending on craft operated.
  
3. Weather Conditions
  - 3.1. Evaluate weather before venturing out on boat
  - 3.2. Vessels to be available to tow stranded vessels against current and winds
  
4. Emergency Response
  - 4.1. See Emergency Response and Contingency Plan
  - 4.2. Rescue drills or man overboard drills to be completed
  
5. Safety Rules
  - 5.1. All barges and floating watercraft moored overnight must display lighting, be sufficiently illuminated
  - 5.2. Cables and lines that cross waterways must be clearly marked
  - 5.3. All watercraft to carry at least one air horn or similar sound signaling device.
  - 5.4. All watercraft to carry fire extinguishers. Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.
    - 5.4.1. 26 feet or more in length = 2 extinguishers
    - 5.4.2. < 26 feet = 1 extinguisher
    - 5.4.3. All watercraft having gasoline or liquid petroleum gas power plants, or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic CO<sub>2</sub> or other equally effective type of fire extinguishing system.

## Appendix H Marine Operations HSE Requirements TVA Fly Ash Dredge and On-Water Activities

- 5.5. USCG approved personal flotation device provided to and properly worn by each person
- 5.6. Type I, III, or V shall be worn. Most Type III and V are not as effective as Type I in turning an unconscious wearer face-up. But are less bulky and restrictive.
- 5.7. Life rings with at least 90 feet of line shall be provided and available at an interval of not more than 200 feet immediately next to water.
6. Pipeline both submerged and floating is to be marked as such, along entire length.
7. At least one lifesaving skiff (powered john boat or other smaller boat ) shall be immediately available where employees are working adjacent to water. Required equipment for rescue skiff:
  - 7.1. Four oars (2 if skiff is motor powers)
  - 7.2. Oarlocks attached to gun-whales
  - 7.3. One ball-pointed ball hook
  - 7.4. One life ring with at least 70 feet of solid braid polypropylene line
  - 7.5. PFDs in number equaling the maximum number of personnel on board
  - 7.6. Lighting on skiff
8. Employees should not stand up in boat when starting the motor. In boats 16 feet or less, occupants should not stand up or move around when boat is underway.
9. Always carry a secondary means of propulsion
10. At least 2 people in the boat when it is on open water
11. Dock Work-hot work permits needed before starting
12. Equipment Requirements
  - 12.1. All watercraft shall carry at least one air horn or similar sound-signaling device.
  - 12.2. Each watercraft operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise.
  - 12.3. Navigational lighting shall be in compliance with USCG and USACE requirements.
  - 12.4. Watercraft shall be operated at reduced speeds at night and when visibility is reduced.
  - 12.5. All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals.
    - 12.5.1. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares.

## Appendix H

### Marine Operations HSE Requirements

#### TVA Fly Ash Dredge and On-Water Activities

- 12.5.2. Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light.
- 12.5.3. No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.
- 12.6. All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc). The tool kit shall be maintained by the watercraft operator and expended supplies shall be replaced immediately.
- 12.7. Fenders shall be provided to prevent damage and sparking and to provide safe areas for workers exposed to pinching situations caused by floating equipment.
- 12.8. Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.
- 12.9. A signal device shall be provided on all vessels to give signals required by the navigation rules applicable to the waters on which the vessel is operated.
- 12.10. All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems shall be located so that they are protected against accidental operation but are readily accessible in an emergency.
- 12.11. Electric lights used on or around gasoline and oil barges or other marine locations where a fire or explosion hazard exists shall be explosion-proof.
- 12.12. General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person.
  - 12.12.1. Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, that will automatically furnish the required energy during an electrical system failure.
  - 12.12.2. A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck.
  - 12.12.3. All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.
- 12.13. Smoke alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.
- 12.14. All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

## Appendix H Marine Operations HSE Requirements TVA Fly Ash Dredge and On-Water Activities

- 12.15. Escape hatches and emergency exits shall be marked on both sides with letters, at least 2.5 cm (1 in) high, stating “EMERGENCY EXIT - KEEP CLEAR.”
- 12.16. Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.
- 12.17. Shore power receptacles shall have a grounding conductor to prevent potential difference between the shore and the vessel.
- 12.18. Circuits with GFCI protection shall be provided in grounded 120 volt or 240 volt systems in toilet/shower spaces, galley, machinery spaces, weather deck, exterior, or near any sinks.
- 12.19. Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.
- 12.20. Gauge glasses or try cocks shall not be installed on fuel tanks or lines unless they meet the requirements of 46 CFR 58.50-10.
- 12.21. A shutoff valve shall be installed at the fuel tank connection: arrangement shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.
- 12.22. A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 1.8 m (6 ft) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.
- 12.23. All carburetors on gasoline engines shall be equipped with a backfire trap or flame arrestor.
- 12.24. All carburetors except down draft type shall be provided with a drip pan, with flame screen, which is continuously emptied by suction from the intake manifold or by a waste tank.
- 12.25. Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with NAVFAC DM-22, *Petroleum Fuel Facilities*. In lieu of a dike or curb, other means complying with USCG requirements in 46 CFR Parts 64, *Marine Portable Tanks*, and 98.30, *Handling and Storage of Portable Tanks*, may be used.
- 12.26. Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For uninspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

## **Type V Personal Flotation Device Inspection and Testing Frequency <sup>1</sup>**

1. Inspect before each use:
  - a. Inflation Mechanism Status Indicators
  - b. CO<sub>2</sub> cylinder cap
  
2. Inspect at beginning of each season and every 2 months afterwards during use:
  - a. Inflatable chamber for leaks
  - b. PFD for rips, tears and puncture
  - c. CO<sub>2</sub> cylinder for damage
  
3. Inspect at beginning of every season:
  - a. Automatic Inflation system
  - b. Function test of oral valve
  
4. Test at beginning of every season:
  - a. Automatic inflation
  - b. Manual inflation
  - c. Oral inflation

<sup>1</sup> Owner's manual for Model 1339 and 1341 Type V PFD by Coleman Company , Inc.

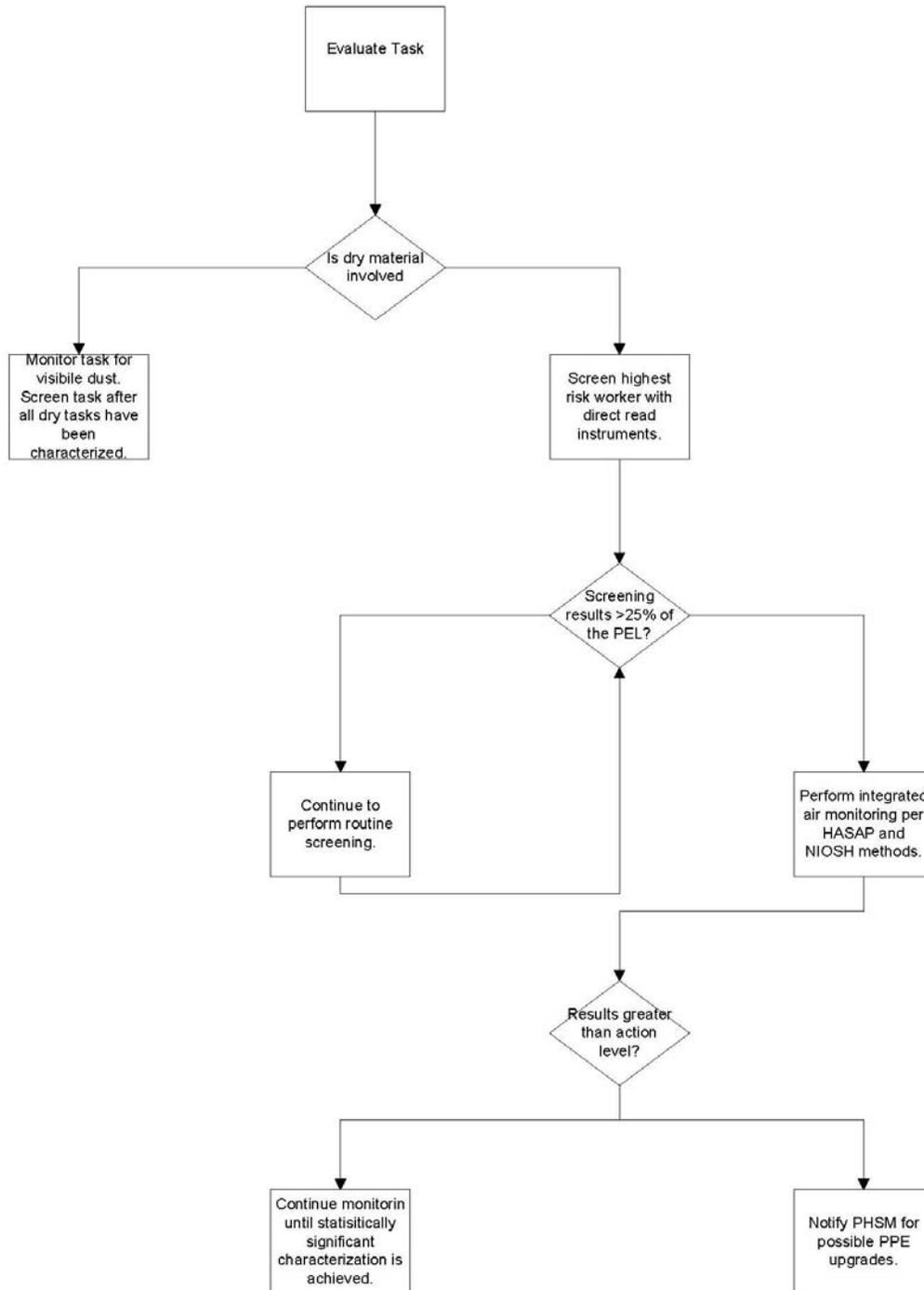
## **APPENDIX I FIGURES**

### Incident Reporting Matrix

<b>Project Notification<sup>1</sup> – All Personnel Should be Contacted</b>		
Name	Organization	Number
Mike Scott	TVA – PM	423-240-5025
John Moebes	Jacobs – PM	865-765-5407
Mike Gahagan	TVA – HSE Manager	865-755-4058
Sean Healey	Jacobs – HSE Manager	865-414-9823
Kirk Morris	Jacobs – HSE Officer	508-726-4426
Tom Bock	Jacobs – HSE Officer	865-599-7116
<b>Medical Support Contacts</b>		
Plant Nurse <i>(Mon – Thu; 0600 – 1600)</i>	TVA	865-717-2589
Advatech Paramedics <i>(7 days week; 24 hours per day)</i>	Advatech	Days: 865-717-1510 865-567-6740
		Nights: 865-717-6503 865-567-6740
TVA Police	TVA	800-824-3861
<b>Fire Response Contacts</b>		
Roane County Fire <sup>2,3</sup>	Roane County	911

- 1: Provide initial medical care and initiate emergency control activities prior to making project notifications.
- 2: If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
- 3: TVA has a dedicated fire brigade for in-plant response. For activities occurring out on site, Roane County Fire will provide primary response.

Table 5-1: Air Monitoring Logic





**APPENDIX J**  
**RESPONSE TO EPA COMMENTS**

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
B. Kovak HASP Comments, 6/1/09	1. Should have Daily Safety meeting between Gulf Strike Team and Jacobs/RSI staff. Include contractor safety representatives if possible or as needed (can follow staff meeting or in field).	Additional daily meetings are not recommended, safety is discussed in the daily 1600 meeting and at the 1630 staff meeting as necessary. In addition, the Jacobs site HSE staff interacts with the subcontractor HSE staff in the field on a daily basis.  The GST representatives are welcome to join the Jacobs HSE staff during field visits as necessary. If the GST representatives require assistance or have specific concerns, they are welcome to discuss them with the on-site HSE Manager (Sean Healey) at any time.
B. Kovak HASP Comments, 6/1/09	2. Need additional safety officers assigned in the field for observing specific operations—other than dredging, driving, etc. Can the samplers be used for this as ASO's? Possibly another GST?	Supervisors and foremen are directly responsible for implementing the HSE requirements on site for their work activities. Support and oversight is provided by the on-site HSE staff. Starting June 15, the staffing will consist of 5 HSE professionals during day shift and one HSE professional during night shift. These 5 plus 2 GST personnel is sufficient coverage.
B. Kovak HASP Comments, 6/1/09	3. Training programs – boat safety? On hour course on-line? Documented?	Will add boat safety training as a requirement for “novice” boaters required to operate boats on the river.
B. Kovak HASP Comments, 6/1/09	4. Personal hygiene – showers? Where located? Who for?	Showers are not currently required. In the event air monitoring indicates the need for end of shift showering, details will be added to the SWSHP and facilities will be obtained as necessary.
B. Kovak HASP Comments, 6/1/09	5. Medical monitoring – where located? Who included?	Medical monitoring is not currently required. If air monitoring indicates the need for physicals, it will be the responsibility of each subcontractor to obtain providers to perform medical examinations at the clinic of their choosing per the requirements of their companies and 29 CFR 1910.120.  During various pre-bid meetings with subcontractors this was discussed and it was recommended to the subcontractors that although it is not currently a requirement, it is a best practice to provide medical

Comment Source	Comment	Response to Comment
		monitoring for their personnel.
B. Kovak HASP Comments, 6/1/09	6. Vehicles – wheel wash.	Discussed in section 8 and locations identified in Appendix I. Further details are provided in the dust control plan.
B. Kovak HASP Comments, 6/1/09	7. Page 42 – decon personnel needing medical attention first.	Added to section 8.4
B. Kovak HASP Comments, 6/1/09	8. TVA safety procedures – referenced in HASP, where located?	Available on the TVA LAN homepage as a PDF document.
B. Kovak HASP Comments, 6/1/09	9. Navigation changes to river – USCG approved?	Any navigation changes to the river will be coordinated with appropriate state and federal agencies including the USCG.
B. Kovak HASP Comments, 6/1/09	10. Decon – Table 8-1, should address respirator cartridges and coveralls.	It already addresses this for Levels C and B decontamination procedures. There are no respirators or coveralls required for Level D PPE.
B. Kovak HASP Comments, 6/1/09	11. Coordinate decontamination during medical emergencies in advance with EMS and local hospitals to see their policies.	Routine pre response coordination will be done with all of the local agencies including the fire department, hospitals and police.
B. Kovak HASP Comments, 6/1/09	12. Zones should be better defined – exclusion, CRZ, etc.	The definition of exclusion zone, contamination reduction zone and support zone are clearly defined in section 8.0
B. Kovak HASP Comments, 6/1/09	13. JSA's (7.2) superintendent or foreman prepare these? Assistance from safety staff.	Yes as noted in section 7.2.
B. Kovak HASP Comments, 6/1/09	14. Emergency drills — annually? Should be monthly or quarterly and check air horns.	Changed to quarterly in ERCP section 11.
B. Kovak HASP Comments, 6/1/09	15. Need to address driving in HASP and boat operations.	Vehicle operation addressed in section 4.1.9. Boat operation addressed in section 4.1.5. Appendix H is dedicated to on-water and boat operations.

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	1. Should formalize the safety role of the NSafe staff. Currently performing informal safety function.	Since December, EnSafe has been providing industrial hygiene monitoring and general HSE support at the direction of TVA. A transition to reporting directly to the Jacobs HSE manager is underway.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	2. Develop an organizational chart for safety listing personnel and roles. Jacobs staff works close with safety function (3-4 staff assigned).	A Jacobs specific version of this is in the project execution plan. A multi agency compilation of the various org charts on site was completed by B. Poley, USCG
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	3. Daily Meetings are at 4 pm to review status of operations for the day. A next day planning meeting will be held following that meeting (4:30 pm?) for Jacobs Project Managers. Tom or Kirk (safety) will attend 4:30 pm meeting and then meet with GST to discuss safety.	<p>Additional daily meetings are not recommended, safety is discussed in the daily 1600 meeting and at the 1630 staff meeting as necessary. In addition, the Jacobs site HSE staff interacts with the subcontractor HSE staff in the field on a daily basis.</p> <p>The GST representatives are welcome to join the Jacobs HSE staff during field visits as necessary. If the GST representatives require assistance or have specific concerns, they are welcome to discuss them with the on-site HSE Manager (Sean Healey) at any time.</p>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	4. SWS conducting the HAZWOPER training off-site. Respiratory protection training is part of the 40 hour training but respiratory clearance, fit test not being done yet.	Approximately 200 personnel are attending off-site training. If respiratory protection is required, fit testing and site specific respiratory protection training will be conducted per 29 CFR 1910.134 for those needing to wear respirators and possessing proper medical clearance to do so. This will not be provided to the general site population.

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	5. Plans being finalized on medical monitoring not started yet. Should add to HASP.	<p>Medical monitoring is not currently required. If air monitoring indicates the need for physicals, it will be the responsibility of each subcontractor to obtain providers to perform medical examinations at the clinic of their choosing per the requirements of their companies and 29 CFR 1910.120.</p> <p>During various pre-bid meetings with subcontractors this was discussed and it was recommended to the subcontractors that although it is not currently a requirement, it is a best practice to provide medical monitoring for their personnel.</p>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	6. Training records being collected and maintained on-site for all contractors.	No comment required.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	7. Proposed setting up mini CRZ's inside large EZ areas to allow for breaks of workers without coming all the way out of EZ. Will include decon and air monitoring. Need to work out logistics in advance.	This is already established in the SWSHP, general locations are identified in Appendix I.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	8. TVA safety program documents referenced in HASP will be accessible on site (currently just on-line). Will ID location in HASP and safety orientation.	The TVA HSE procedures are approximately 1800 pages long and will not be maintained in hard copy on site because the hard copy document would not be considered a controlled copy. They are readily accessible on the TVA LAN and HSE office computer hard drives.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	9. Off-site operations such as cenosphere recovery is occurring 20 miles or so downstream. They develop separate ER plan for this operation and not included in HASP. Should add this operation as an appendix to HASP.	<p>Task specific emergency response procedures are developed and discussed in the associated JSA for those types of tasks.</p> <p>This approach prevents having multiple ERCPs for one site.</p>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	10. Need to coordinate/drill with TVA plant paramedics(Advantage) for medical emergency. May need to locate and AED at trailers or out on-site.	Agreed on the drill, the AED is located with paramedics.

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	11. Need to run evacuation drills and test air horns and fine tune fire/evacuation plan. HASP will be revised and consolidated when finalized and workers will read and sign off.	Actual responses and drills are evaluated during and after these types of events. Best practices noted during the response / drill is documented on form, "Emergency Response Best Practice". As needed, changes are and will be made to the Site Emergency Response and Contingency Plan.  Workers do not read, nor "sign-off" on the Site Wide Health and Safety Plan. Currently site specific orientation is provided to all site personnel. The orientation is derived from the SWSHP. Attendance at orientation is documented for each person.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	12. HASP will be revised and consolidated when finalized and workers will read and sign off.	This is an ongoing process.
B. Kovak Jacobs/TVA Safety Program Comments, 6/2/09	13. Safety orientation will include reference to HASP requirements.	The safety orientation material comes directly from the SWSHP.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	1. Page 4-3 Working on or near water- use 6' rule unless otherwise posted.	Added comment to section.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	2. Biological hazards- list & emphasize local/regional hazards.	These are already listed in Section 4.3 – Biological Hazards.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	3. Page 6-2 Specify long-sleeve coveralls/shirt.	Long sleeve shirts are not a requirement on the site.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	4. Page 8-1, 5, 6 Need to address "break zones" procedures- decon, what activities are permitted (smoking, eating, etc?), air monitoring?	Changed terminology from break area to support zone.

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	5. Page I-3 Should have a better diagram of zones. Consider reducing the number of “break zones” and locate in lowest-risk areas.	Break areas will be operationally based and are associated with the type of tasks being performed and the equipment involved. The number may decrease if conditions warrant.  The break areas will be maintained in a manner that is consistent with the requirements of a support zone. If work area conditions prevent this from being feasible, the break areas will be relocated as necessary.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	6. Page 8-4 If you don't address Level B dress out in section 6-2, don't address B decon.	Level B column removed.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	7. Page 15-1 Ensure that contractor reps turn in tailgate sign-in sheets & other applicable paperwork (JSA copies?) every Monday.	That is already specified in Section 15.2 – Weekly Reports.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	8. Page 15-5 Excavation permit = zero tolerance. Other permit requirements?	Permit requirements are established in the associated sections in section 4 of the SWSHP. For example, 4.1.6 discusses utility clearance permits, 4.1.11 discusses lift permits, 4.1.16 discusses hot work permits.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	9. Appendix B & E Should address major known ops- diving, boat operations, sampling & monitoring, construction, dike reinforcement. PPE=PPD/life jacket for water ops.	AHAs were developed for major known recovery operations relating to the recovery of the ash. Numerous ancillary tasks exist, AHAs and / or JSAs are developed for those as needed.  The same is true for the health hazard evaluation process.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	10. Page C-9, 26 Cartridge change frequency- at least after each shift unless breathing resistance increases.	Every shift change-out is not required for the selected type of filter.

<b>Comment Source</b>	<b>Comment</b>	<b>Response to Comment</b>
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	11. F-7-1 List general pollution response equipment	Equipment had already been identified in table 7-1.
Brittany Poley & Dustin Fitzgerald, USCG Gulf Strike Team, 6/2/09	12. F-10-8 Should reference oil discharges and hazardous substance releases (terminology change).	Chemical release is a broader term since not all potential releases fall into oil or hazardous substances. An example of this is Chevron Clarity Hydraulic Fluid.