PHASE 2 WORK PLAN FOR
SAMPLING ENVIRONMENTAL MEDIA FOR PFOA AT THE 3M DECATUR, AL PLANT

VOLUME 2 OF 3
APPENDIX A – HEALTH AND SAFETY PLAN

AUGUST 2004

Prepared for

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APPENDIX A

HEALTH AND SAFETY PLAN (HASP)

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LIST OF ACRONYMS

3M	Minnesota Mining and Manufacturing Company
AIHA	American Industrial Hygiene Association
AL	action level
ANSI	American National Standards Institute
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylene
COC	chain-of-custody
dB	decibel
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
eV	electron volt
EZ	exclusion zone
FLDs	Field Operating Procedures
GFCIs	ground fault circuit interrupters
HASP	Health and Safety Plan
HMTA	Hazardous Materials Transportation Act
IPE	isopropyl ether
IP	ionization potential
LEL	lower explosive limit
LOP	level of protection
MEK	butanone
MIBK	4-methyl-2-pentanone
MiniRAM®	Miniature Real-Time Aerosol Monitor
MOU	Memorandum of Understanding
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OSWER	Office of Solid Waste and Emergency Response
OVM	direct-reading instrument
PEL	permissible exposure limit
PFOA	Perfluorooctanoic acid
PID	portable photoionization detector
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
SCBA	self-contained breathing apparatus

LIST OF ACRONYMS (Continued)

SHSC	Site Health and Safety Coordinator
SI	site investigation
SZ	support zone
TWA	time-weighted average
UL	Underwriters Laboratories
V	volts
VOCs	volatile organic compounds
WESTON®	Weston Solutions, Inc.

SECTION 1

INTRODUCTION

1.1 SCOPE OF WORK

This site-specific Health and Safety Plan (HASP) defines the safety and health requirements necessary to perform investigation activities, including sampling of various media, associated with the Phase 2 Perfluorooctanoic Acid (PFOA) Characterization Program at the 3M Company (3M) Decatur facility located in Decatur, Alabama. This HASP presents the minimum requirements for health and safety that must be met by site personnel engaged in site operations. This HASP does not in any way relieve site personnel, contractors, or subcontractors from responsibility for the health and safety of their personnel. Contractors will be required to review site conditions and work to be performed to determine specific health and safety requirements for their personnel. Any visitors to the site will be required to comply with the approved HASP to gain entry into work sites.

This HASP has been prepared by the Supervising Contractor, Weston Solutions, Inc. (WESTON®), on behalf of 3M. This HASP was written to be consistent with all applicable federal, state, and local health and safety requirements. Specific references consulted in assembling this HASP include the following:

- 29 Code of Federal Regulations (CFR) 1910 and 1926 (Occupational Safety and Health Administration [OSHA] General Industry and Construction Standards, respectively).
- National Institute for Occupational Safety and Health (NIOSH) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985.
- 40 CFR 260-270 (U.S. Environmental Protection Agency [EPA] Solid Waste Standard).
- EPA Standard Operating Safety Guides, Office of Solid Waste and Emergency Response (OSWER), June 1992.
- 3M Decatur Plant Site RCRA Emergency Plan, January 1988.
- 3M Decatur Plant Contractor Safety Requirements, December 1996.

- Applicable state and local regulations.
- Weston Solutions, Inc. (WESTON®) Corporate Health and Safety Program.

Table 1-1 presents a summary of the tasks to be completed during the site investigations. This HASP specifically covers the tasks presented in Table 1-1 as described in detail in the *Phase 2 Work Plan for Sampling Environmental Media (Phase 2 Work Plan).*

1.2 SITE DESCRIPTION AND BACKGROUND

3M owns and operates a major specialty chemical and polymer film manufacturing facility in the vicinity of Decatur, AL. The location of the facility is shown on the map included as Figure 1-1. 3M is entering into a Memorandum of Understanding (MOU) with the U.S. Environmental Protection Agency (EPA) and other interested parties to conduct a PFOA characterization program at its Decatur facility. Under this MOU, 3M will perform field sampling of various environmental media including soils, groundwater, sediment, surface water and biota at and in the vicinity of its Decatur facility. As part of this ongoing evaluation, 3M retained WESTON to perform the PFOA Characterization Program at the facility.

This HASP covers the activities to be performed under the Phase 2 Work Plan. The HASP defines the hazards, and methods to protect personnel from these hazards, as identified during previous site work or in background information.

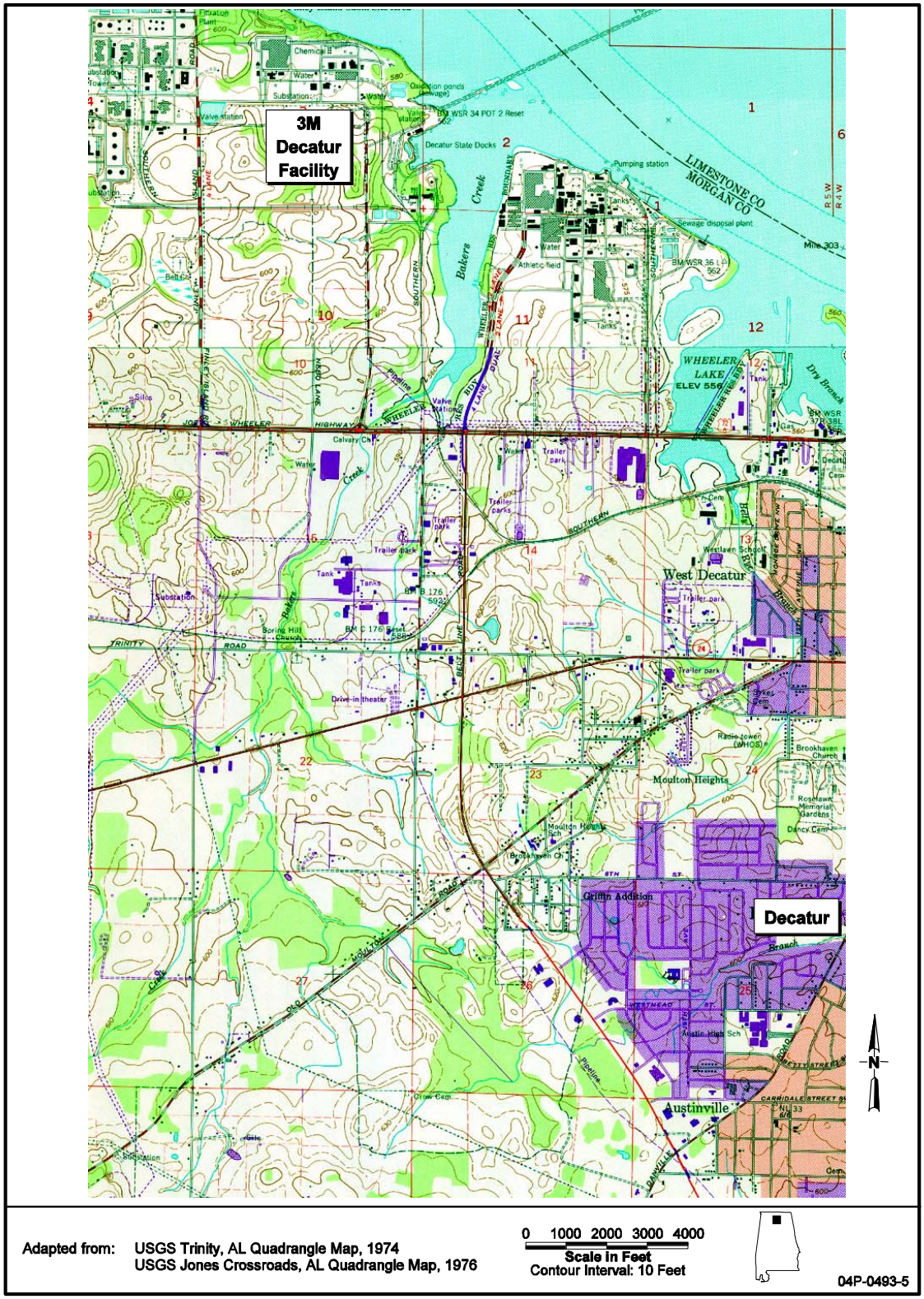
The categories of suspected and specific chemicals and materials identified from a review of available historical information and the results of the Resource Conservation and Recovery Act (RCRA) Facility investigation (RFI, Weston 2003) are as follows:

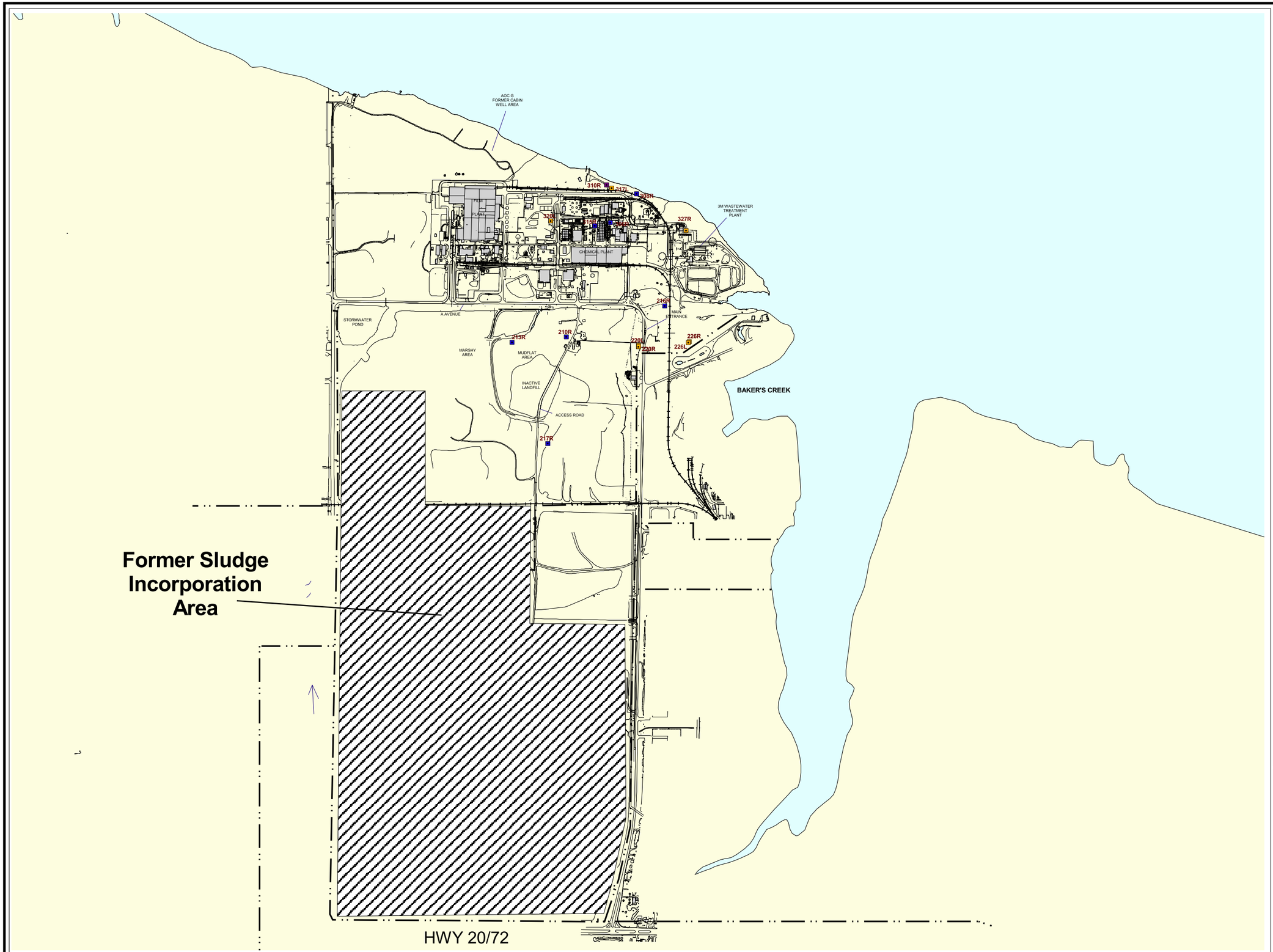
- Perfluorooctanoic acid (PFOA)
- Chlorinated solvents: 1,1-DCE, 1,1,1-TCA, 1,1-DCA, 1,2-DCA, chloroform, methylene chloride, chloroethane and vinyl chloride.
- Volatile organic compounds (VOCs): acetone, isopropyl ether (IPE), 4-methyl-2-pentanone (MIBK), 2-butanone (MEK), and benzene, toluene, ethylbenzene, xylene (BTEX).
- Inorganic compounds or metals: arsenic, chromium, cadmium, lead, and mercury.

Additional information regarding the potential hazards associated with, as well as examples of known concentrations of, these contaminants of potential concern is presented in Section 3 of this HASP.

In the preparation of this HASP, the assumption was made that the chemicals identified in the previous sampling efforts are representative of the contaminants present at the locations north of the railroad track (see Figure 1-2) that will be investigated at the facility. Not all of the contaminants are expected to be present at every location to be investigated, as discussed in Section 3. Attachment 1 of this HASP provides Chemical Hazard Data Sheets for contaminants of concern at the investigation study sites associated with the PFOA characterization program.

Figure 1-1 Vicinity Map, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, Alabama





LEGEND

- Monitor well Sampled 3/28/01
- Monitor well Sampled 7/16/03
- Monitor well Sampled 3/28/01 and 7/16/03

N

700 0 700 1400 Feet

3M Decatur Site
Morgan County, Alabama

FORMER SLUDGE INCORPORATION AREA

SECTION 2

STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

Personnel must be aware of the staff organization, and the responsibilities and qualifications of each organization member. Figure 2-1 presents a diagram of the staff organization for the Phase 2 characterization program activities at the 3M Decatur, AL facility. The organizational structure will be reviewed and updated periodically by the Project Manager. The general health and safety responsibilities of key Phase 2 characterization program team members are discussed in the following subsections.

All personnel must have the necessary qualifications consisting of sufficient knowledge gained through experience and training to effectively execute the duties of their position. Specific training requirements are discussed in Section 5 of this HASP.

2.1 3M PROJECT DIRECTOR

At the top of the site organizational structure is the 3M Project Director, Mr. Michael Santoro. The 3M Project Director is the primary off-site contact. The responsibilities of the 3M Project Director include defining project objectives, allocating resources, determining the chain of command, evaluating the program outcome, and ultimate responsibility for implementation of the site health and safety program.

2.2 3M FIELD MANAGER

The 3M Field Manager, Mr. Phillip Wirey, will be the primary contact for all on-site activities. The 3M Field Manager will be responsible for coordinating clearance for all field activities as detailed throughout this HASP.

2.3 WESTON PROJECT MANAGER

The WESTON Project Manager, Mr. Jaisimha Kesari, P.E., DEE, is the primary contact for the WESTON Field Team Manager and the 3M Project Manager. The WESTON Project Manager is responsible for ensuring that all field personnel have the necessary qualifications and perform

their work in conformance with the HASP, reviewing field reports, and interfacing with the project team regarding resolution of health and safety problems or concerns.

2.4 FIELD TEAM MANAGER/PROJECT HEALTH AND SAFETY MANAGER

The WESTON Field Team Manager/Health and Safety Manager, Mr. Timothy Frinak, P.G., CHMM, has the highest level of contractor authority on-site. The Field Team Manager/Health and Safety Manager is responsible for reporting to the WESTON Project Manager, directing response operations, controlling site activities, and acting as the authority behind implementation of the site health and safety program. Mr. Frinak will participate in the 3M Decatur facility-required 4-hour on-site safety course (and yearly review, if required).

Mr. Frinak will be responsible for review and approval of the provisions of the HASP and any amendments that may become necessary. The Project Health and Safety Manager will also be responsible for the following tasks:

- Conduct project safety audits on a routine basis (at least quarterly).
- Review monitoring results and accident reports, as necessary.
- Report problems or concerns regarding project safety.
- Interpret the monitoring/sampling data required to upgrade or downgrade personal protective measures.
- Provide health and safety consultation as needed.

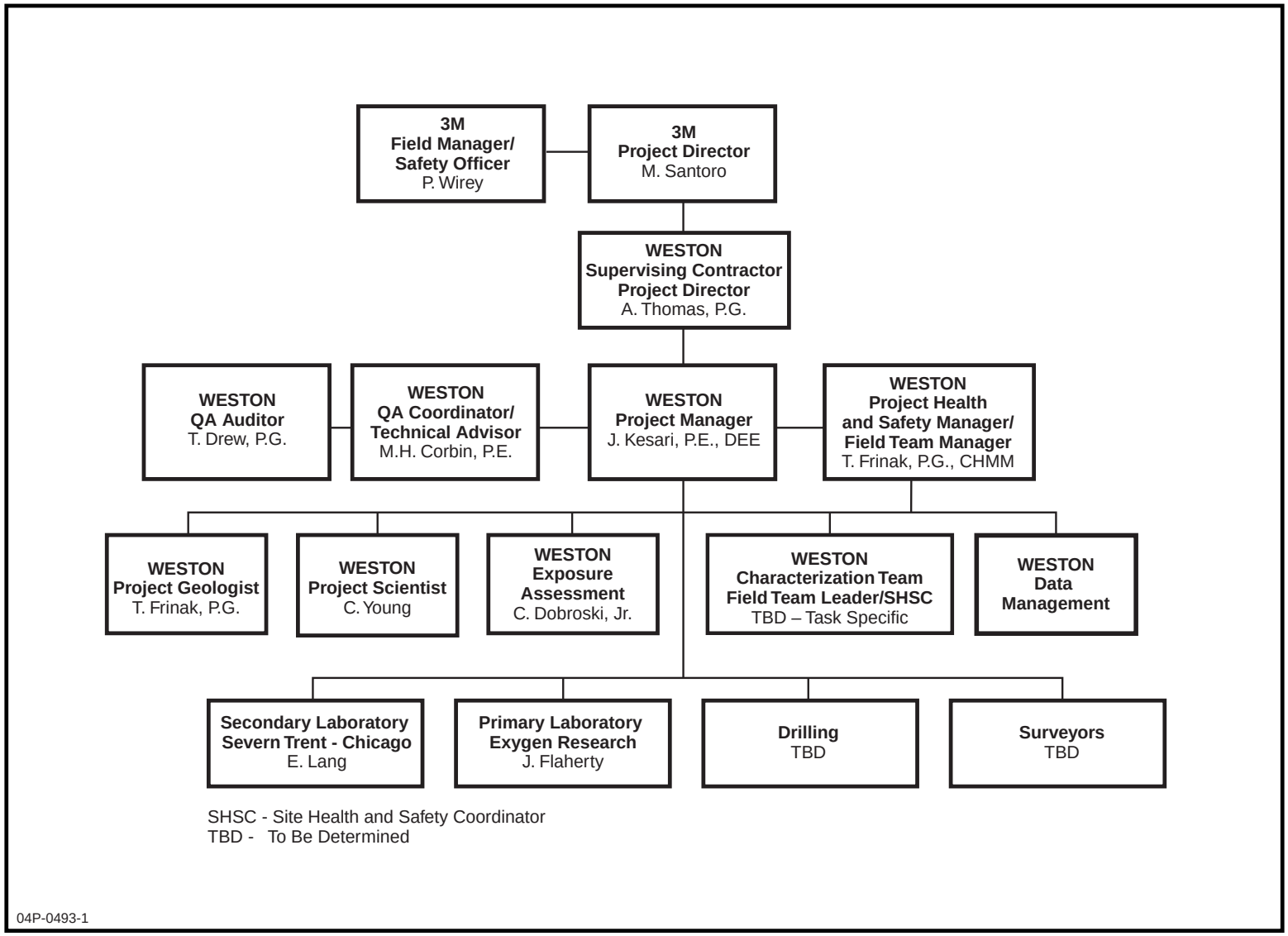
2.5 FIELD TEAM LEADER/SITE HEALTH AND SAFETY COORDINATOR

The Field Team Leader/Site Health and Safety Coordinator (SHSC) reports directly to the Field Team Manager and is responsible for implementing the health and safety program in the field. The SHSC will be determined on a task-specific basis. The SHSC directly advises the Field Team Manager on all aspects of health and safety on-site and advises the Field Team Manager to cease or change operations in the event that worker or public health or safety is threatened.

2.6 WESTON FIELD CHARACTERIZATION TEAM

The WESTON field characterization team is responsible for completing on-site tasks and for complying with all aspects of the site health and safety program.

Figure 2-1 Project Organization Chart



SECTION 3

HAZARD ASSESSMENT AND RISK ANALYSIS

Personnel will be made aware of any chemical, physical, and biological hazards of concern associated with each task as provided in Table 5-1 of the Phase 2 Work Plan. The potential hazards of each task are discussed in the following subsections. Protective measures and proper personal protective equipment (PPE) are discussed in later sections of this HASP. WESTON's Field Operating Procedures (FLDs) are presented in Attachment 2 to provide greater detail. Specific FLDs related to specific tasks are referenced in the following subsections where applicable. The complete HASP will be maintained on-site at all times for reference. A summary health and safety checklist is included in Attachment 3.

The principal chemicals of concern were initially presented in Section 1. Table 3-1 presents their chemical and toxicological properties, as well as known concentrations detected during previous activities conducted at the Decatur facility. Protection from these substances will be accomplished by following the health and safety procedures outlined herein.

The following subsections address the specific hazards and risks associated with each task to be performed as part of the Phase 2 characterization program at the 3M Decatur facility.

3.1 SITE PREPARATION/MOBILIZATION

Prior to initiating Phase 2 characterization program activities, the following site preparations will be completed:

- "3M Daily Work Permit" will be obtained in accordance with 3M's Contractor Safety Requirements (Attachment 4).
- Work areas will be cleared of brush, if necessary.
- Traffic control patterns to work areas will be developed, if necessary.
- Site control zones will be established.
- Utility clearances will be obtained.

Potential hazards associated with the PFOA Characterization Program site preparation activities (such as clearing and grubbing and establishment of temporary roadways) include physical hazards such as:

- FLD 01 Noise Protection
- FLD 02 Inclement Weather
- FLD 05 Heat Stress Prevention and Monitoring
- FLD 06 Cold Stress
- FLD 07 Wet Feet
- FLD 09 Hot Work
- FLD 10 Manual Lifting and Handling of Heavy Objects
- FLD 11 Rough Terrain
- FLD 12 Housekeeping
- FLD 14 Site Security
- FLD 15 Remote Areas
- FLD 19 Working Over or Near Water
- FLD 20 Traffic
- FLD 22 Heavy Equipment Operation
- FLD 29 Materials Handling
- FLD 30 Hazardous Materials Use and Storage
- FLD 31 Fire Prevention/ Protection/Response Plans
- FLD 32 Fire Extinguishers Required and Requirements
- FLD 34 Utilities
- FLD 35 Electrical Safety
- FLD 38 Hand and Power Hand Tools
- FLD 41 Hand and Emergency Signals
- FLD 43 Biological Hazards
- FLD 47 Clearing, Grubbing and Logging Operations

To ensure that underground and overhead utilities are not disturbed or are protected from PFOA characterization task-related activities, utilities clearance will be conducted at each site prior to intrusive activities according to 3M's Contractor Safety Requirements (Attachment 4) as well as state requirements and FLD 34. All personnel will practice proper electrical safety according to FLD 35.

The 3M plant staff will verify utility locations and ensure compliance with facility-specific procedures. Sample locations will be moved from any potential utilities identified by 3M during the utility clearance procedure. Extreme caution will be taken if piping, utility lines, or other

subsurface structures are exposed during intrusive activities. If necessary, cribbing or other measures will be used to support utilities if exposed during test pit excavations/soil sampling.

Equipment that will be mobilized to the site to complete the sampling tasks includes the following:

- Heavy equipment (drill rig, backhoe, trackhoe, etc.).
- Pumps and hoses.
- Pressure-washing equipment.
- Field monitoring and sampling instruments.
- Small power and handtools.

Potential hazards associated with the PFOA characterization activities, as identified in Table 5-1 of the Phase 2 Work Plan, include physical hazards such as:

- FLD 01 Occupational Noise and Hearing Conservation
- FLD 02 Inclement Weather
- FLD 05 Heat Stress Prevention and Monitoring
- FLD 06 Cold Stress
- FLD 07 Wet Feet
- FLD 10 Manual Lifting and Handling of Heavy Objects
- FLD 11 Rough Terrain
- FLD 12 Housekeeping
- FLD 13 Structural Integrity
- FLD 14 Site Security
- FLD 15 Remote Areas
- FLD 18 Operation and Use of Boats
- FLD 19 Working Over or Near Water
- FLD 20 Traffic
- FLD 22 Heavy Equipment Operator
- FLD 28 Excavating/Trenching
- FLD 29 Materials Handling
- FLD 30 Hazardous Materials Use and Storage
- FLD 31 Fire Prevention/ Protection/Response Plans
- FLD 32 Fire Extinguishers Required and Requirements
- FLD 34 Utilities
- FLD 35 Electrical Safety
- FLD 37 Pressure Washers
- FLD 38 Hand and Power Hand Tools
- FLD 41 Hand and Emergency Signals
- FLD 42 Lockout/Tagout
- FLD 43 Biological Hazards
- FLD 44 Biological Hazards - Bloodborne Pathogens Exposure Control Plan - First Aid Providers
- FLD 46 Control of Exposure to Lead

- FLD 47 Clearing, Grubbing and Logging Operation
- FLD 48 OSHA Inspections
- FLD 49 Safe Storage of Samples

Traffic presents a primary hazard during the mobilization of equipment and investigation activities in two ways:

1. When site workers are working close to roadways, the potential exists to be struck by oncoming traffic.
2. Driving to, from, and on the site.

Site-specific motor vehicle and equipment requirements are presented in the 3M contractor safety requirements contained in Attachment 4. In addition, WESTON's traffic safety guidelines are provided in FLD 20. The following procedures will be implemented for investigation activities near busy roadways:

- Workers in the proximity of active roadways will be reminded each day to be aware of their location in reference to roadways and to avoid working close to traffic.
- Workers near active roadways must wear reflective vests.
- 3M plant security personnel must be consulted in order to comply with applicable requirements.
- Workers must be aware of the danger related to the vehicles that are routinely on active roadways at the facility.
- Flag persons may be required to control the speed of nearby traffic. Barricading is extended to the point where it is visible to approaching traffic. If needed, flag persons will be WESTON personnel who are familiar with 3M Decatur traffic patterns.
- Drivers are required to inspect their vehicles daily. The check will include steering, brakes, mirrors, lights, horn, tires, and windshield wipers. Any special safety items, such as backup alarms and kill switches, will also be checked to ensure safe operation. Drivers will be required to report all defects, and repairs will be made promptly.

Extra precautions will be taken when driving vehicles under off-highway conditions to prevent shifting of loads when crossing rough terrain (FLD 11). In addition:

- Trucks must be reversed under the direction of a signal person, if the operator cannot clearly view the area to the rear.

- Windshields, rear-view mirrors, and lights will be kept clean.

- The Site Health and Safety Coordinator (SHSC) will ensure that seatbelts are installed and functional on all vehicles used by WESTON personnel and WESTON subcontractors, and that all passengers use them.

- Personnel are not allowed to ride on the outside or back (i.e., pickup trucks) of vehicles. The number of passengers will be limited to the number of seatbelts in the vehicle.

- Operators will immediately report any damage or failure of parts and accessories to the Site Health and Safety Coordinator. It is advantageous to have a fire extinguisher, first-aid kit, and road flares on the vehicle at all times.

- Control areas will be established where noise levels may exceed 85 decibels (dB). Based on past experience, this may apply to operators of backhoes and personnel at drilling operations. Individuals entering the control areas will be required to wear hearing protection with a sufficient noise reduction rating. Based on past experience, a minimum protection of earplugs will be sufficient for WESTON's field activities at the Decatur facility.

Hazardous and nonhazardous materials brought on-site will be controlled and stored in accordance with 3M and OSHA requirements. This includes the following:

- Materials must be stacked and stored to prevent sliding or collapse.

- Flammables and oxidizers must be stored in separate nonsmoking areas and flammable gases must be stored away from combustible materials.

- Personnel are prohibited from riding on the outside of material-handling equipment.

- Flammable liquids must be stored in approved containers in flammable storage cabinets or storerooms, or 25 feet from any other storage or office area or any ignition source.

- As a minimum, a 20-pound fire extinguisher, appropriate for the type of fire that could occur, must be within 50 feet of any accumulation of 5 gallons or more of flammable liquids or gases.

Material Safety Data Sheets (MSDSs) will be maintained on-site for each of the substances used during the Phase 2 characterization program. Additional hazardous material handling and storage

measures are provided in FLD 30. Because work area preparation may include the use of power tools such as drills or saws, FLD 38 (Hand and Power Handtools) and FLD 35 (Electrical Safety) are included in Attachment 2 for guidance. All extension cords will be grounded with internal ground fault circuit interrupters (GFCIs), if not provided at the panel. Safety guidelines provided in the manufacturer's specifications will be implemented for each power tool.

3.2 SOIL SAMPLING AND MONITOR WELL DRILLING/INSTALLATION

Soil sampling activities will consist of surface soil sampling, sediment/drainageway soil sampling, and/or soil boring, as outlined in Table 5-1 of the Phase 2 Work Plan.

To ensure that the project team is protected from exposure to area contaminants (chemical stressors), the proper PPE will be worn by each individual, and air monitoring (dependent on the type of contaminants of concern for the area) will be conducted for this and all tasks as directed in Table 3-2. As indicated, protocols for upgrading PPE and air monitoring strategies are discussed in Sections 6 and 8, respectively.

Typically, upgrades in PPE are based on airborne concentrations of work area contaminants as compared to background conditions. Several investigatory and characterization activities have been conducted in the north portion of the facility in the vicinity of the LOI wells (as shown on Figure 1-2), during which extensive air monitoring and soil and groundwater sampling have been performed. These activities included soil boring and well installations (intrusive activities) similar to those to be conducted during the Phase 2 characterization program. Based upon air monitoring and sample results from these previous activities conducted in the vicinity of the LOI wells, as provide in Table 3-1, modified Level D will be the level of protection required for the intrusive Phase 2 characterization activities.

Intrusive activities to be performed in the southern, or upgradient, portion of the site associated with the Phase 2 characterization program are not expected to encounter VOC contaminated soils. Therefore, these activities will be initiated without air monitoring. Upon indication (visual or olfactory) that a VOC may exist in the area, activities will be suspended until proper air monitoring equipment is obtained and the area is screened and assessed. If necessary, air

monitoring will continue to be conducted during intrusive activities performed in the southern portion of the site.

Potential hazards associated with soil sampling include the following:

- Toxicity hazards associated with inhalation, dermal, ocular, and ingestion exposure to contaminants, and to potentially contaminated decontamination washwater during decontamination activities. Personal protective measures and air monitoring will be implemented (see Sections 6 and 8).

- Physical and safety hazards such as noise, impact, crushing, laceration, and abrasion associated with excavation, inclement weather, heat/cold stress, wet feet, falling materials, improper lifting, slip/fall hazards, rough terrain, remote areas, vehicular traffic, heavy equipment operation, structural integrity of excavation, boring and drilling operations, inadvertent contact with underground utilities, and pressure washing during decontamination (FLDs 01, 02, 05, 06, 07, 10, 11, 13, 15, 20, 22, 28, 34, 37, 41, and 47).

- Biological hazards such as disease-vectoring insects, animals (i.e., poisonous snakes), and poisonous plants (FLD 43).

Prior to initiating boring, or drilling operations, health and safety guidance procedures will be obtained from the subcontractor(s). Based on the information obtained from the subcontractor, task-specific training will be provided to each individual by the Project Health and Safety Manager and the Site Health and Safety Coordinator. The training will include the following:

- Anticipated and potential hazards.
- Inspection procedures.
- Operating procedures.
- Health and safety protection protocols.
- Shutdown procedures.

To ensure underground and overhead utilities are not disturbed or are protected from soil boring or monitoring well installation, a utilities search will be conducted (FLD 34). The 3M Field Manager will be contacted to verify utility locations and ensure compliance with facility-specific procedures. Soil boring or monitoring well locations will be moved if utilities are identified during the utility clearance. A distance of at least 20 feet, or the height of the boom, whichever is greater, will be maintained from any overhead power line. In the event that an overhead or underground utility is contacted or ruptured, personnel will leave the work area and proceed to a

predetermined gathering point. No attempt will be made to shut down or remove equipment from the work area. After everyone has been evacuated to a safe distance, the 3M Field Manager, the 3M Project Director, and the WESTON Project Manager will be contacted to mitigate the situation.

Soil boring sampling will be completed using a Geoprobe or drill rig. Monitor well installation and drill rig activities will be completed while collecting continuous split-spoon soil samples. All soil borings will be properly abandoned upon completion of the soil sampling. During well installation, a diverter will be used to keep the breathing zone/immediate work area clear of mud, liquids, and vapors, which could contain VOCs. Based on past experience at the site, this method has allowed work to continue in Level D/Modified Level D PPE for monitor well installations performed by WESTON to date.

The Site Health and Safety Coordinator or a member of the drilling crew will inspect the drill rig at least daily for structural damage, loose nuts and bolts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, and/or damaged pressure gauges and pressure relief valves. The drill rig inspection checklist provided in WESTON's drill rig operating practice (included in Attachment 2) can be used to ensure an adequate inspection has been completed. The Site Health and Safety Coordinator will ensure that the drill rig supervisor checks and tests all safety devices, such as emergency shutdown switches, at least daily at the start of a drilling shift. Drilling will not be permitted until all emergency shutdown and warning systems are working correctly.

The Site Health and Safety Coordinator or drill rig supervisor will ensure that all new drill rig workers are informed of safe operating practices on and around the drill rig. The drilling company's supervisor will ensure that each new employee reads and understands the safety manual. The drilling company's supervisor will also carefully instruct a crew worker in drilling safety and observe the new worker's progress toward understanding safe operating practices. The Site Health and Safety Coordinator will ensure that all personnel working around the drill rig are informed of the location of the kill switches.

Prior to drilling, adequate site clearing and leveling will be performed to provide a safe working area for the drill rig and supplies. Drilling will not be commenced when tree limbs, unstable ground, or site obstructions can cause unsafe conditions.

It is especially important that precautions be taken when using drill rigs in the vicinity of electrical power lines and other utilities. The following procedures will be implemented prior to the start of drilling activities:

- Locate, note, and emphasize all overhead and buried utilities on all boring location plans and boring assignment sheets.
- When overhead electrical power lines exist at or near a drilling site or project, consider all wires to be live and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the 3M Field Manager and ask him to lift or raise the lines or deenergize (turn off) the power.
- Before raising the drill rig mast in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance will be from any point on the drill rig to the nearest power line when the mast is raised and/or is being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 feet (6 meters) or, if known, the minimum clearance stipulated by federal, state, and local regulations.
- Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.
- Move the drill rig with the mast down to avoid contact with power lines.
- If there are any questions concerning the safety of drilling on sites in the vicinity of overhead power lines, call the WESTON Field Manager.
- If a sign warning of underground utilities is located on a site boundary, do not assume that underground utilities are located on or near the boundary or property line under the sign. Call the 3M Field Manager to investigate. The underground utilities may be a considerable distance from the warning sign.
- Determine jointly with the 3M plant personnel the precise location of underground utility lines, mark and flag the locations, and determine jointly with utility personnel what specific precautions must be taken to ensure safety.

Drilling operations will be terminated if an electrical storm approaches. The drill rig mast will be lowered, and the entire crew will move away from the drill rig. For additional guidance, the WESTON drill rig operating practice (1.6) is included in Attachment 2.

3.3 WATER SAMPLING

Water sampling activities will consist of surface water and groundwater sampling activities. Potential hazards associated with water sampling include the following:

- Toxicity hazards associated with inhalation, dermal, ocular, and ingestion exposure to free, residual, or spilled hazardous wastes; VOCs present in the groundwater; and to potentially contaminated washwater during decontamination activities. Personal protective measures and air monitoring will be implemented (see Sections 6 and 8).

- Physical and safety hazards such as abrasion associated with sampling, inclement weather, heat/cold stress, wet feet, falling materials, improper lifting, slip/fall hazards, working on or near water, boating hazards, remote areas, and vehicular traffic (FLDs 02, 05, 06, 07, 10, 15, 18, 19, 20, and 41).

- Biological hazards such as disease-vectoring insects, animals (i.e., poisonous snakes), and poisonous plants (FLD 43).

An important potential hazard associated with water sampling involves the potential for exposure to the contaminants of concern in the water or groundwater during sampling and decontamination activities. To ensure that the project team is protected from exposure to the area contaminants, the proper PPE will be worn by each individual and air monitoring will be conducted as specified in Table 3-2. Protocols for upgrading PPE and air monitoring strategies are discussed in Sections 6 and 8.

Physical hazards such as noise, working with manual sampling equipment and pumps, will be managed by implementing the FLDs included in Attachment 2. In general, the approaches outlined for soil sampling will be implemented for water sampling activities.

3.4 SEDIMENT SAMPLING

Sediment sampling activities will be performed as part of the Phase 2 characterization program in accordance with the details presented in the Phase 2 Work Plan. Potential hazards associated with sediment sampling include the following:

- Toxicity hazards associated with inhalation, dermal, ocular, and ingestion exposure; VOCs present in the sediments; and potentially contaminated washwater during decontamination activities. Personal protective measures and air monitoring will be implemented (see Sections 6 and 8).

- Physical and safety hazards such as noise, impact, laceration, and abrasion associated with sampling, inclement weather, heat/cold stress, wet feet, working near water, boating hazards, slip/fall hazards, and remote areas (FLDs 01, 02, 05, 06, 07, 10, 11, 15, 18, 19, 20, and 41).

- Biological hazards such as disease-vectoring insects, animals (i.e., poisonous snakes), and poisonous plants (FLD 43).

An important potential hazard associated with sediment sampling involves the potential for exposure to the contaminants of concern in the surface water or sediments during sampling and decontamination activities. To ensure that the project team is protected from exposure to the area contaminants, the proper PPE will be worn by each individual and air monitoring will be conducted as specified in Table 3-2. Protocols for upgrading PPE and air monitoring strategies are discussed in Sections 6 and 8.

Physical hazards such as noise and working with manual sampling equipment, will be managed by implementing the FLDs included in Attachment 2. These FLDs include health and safety precautions for working near water and operation and use of boats (FLDs 18, 19). The field team members will follow the safety procedures in FLDs 18 and 19 where applicable for sediment sampling in Baker's Creek and/or the Tennessee River. In general, the approaches outlined for soil sampling will be implemented for water and sediment sampling activities.

3.5 SMALL MAMMAL SAMPLING

Small mammal sampling will be performed as part of the Phase 2 characterization program in accordance with the details presented in the *Phase 2 Work Plan* and will consist of an initial survey of small mammal populations by a limited trapping effort followed by more intensive

trapping and the collection of blood and liver samples from small mammals in and around the former sludge incorporation area. Potential hazards associated with small mammal trapping and the collection of tissue samples includes the following:

- Toxicity hazards associated with inhalation, dermal, ocular, and ingestion exposure to contaminants in site soils, and to potentially contaminated decontamination washwater during decontamination activities. Personal protective measures and air monitoring will be implemented (see Section 6 and 8).

- Physical and safety hazards such as inclement weather, heat/cold stress, wet feet, improper lifting, slip/fall hazards, rough terrain, and remote areas. (FLDs 01, 02, 05, 06, 07, 10, 11, and 15).

- Biological hazards such as disease-vectoring insects, animals (i.e. poisonous snakes), and poisonous plants (FLD 43). Additional biological hazards associated with small mammal sampling are described below.

An important potential hazard associated with small mammal trapping, handling, and tissue collection involves the potential for exposure to hantavirus. There are numerous viral strains within the hantavirus assemblage and exposure to some of these hantaviruses may result in hantavirus pulmonary syndrome (HPS) in humans (CDC, 1995). The hantavirus responsible for the initial detections of HPS in the southwestern U.S., Sin Nombre Virus (SNV), is primarily associated with the deer mouse (*Peromyscus maculatus*). Inhalation of aerosolized virus from the small mammal host's urine or feces is the primary mode of infection in humans (CDC, 1995).

Other small mammal species may also serve as competent hosts for SNV and related hantavirus strains that have been shown to cause HPS. These include the cotton rate (*Sigmadon hispidus*) which is host to the Black Creek Canal virus, the white-footed mouse (*P. leucopus*) which is host to the New York virus, and the rice rate (*Oryzomys palustris*), which is host to the Bayou virus (CDC, 2004). These three rodents species have distributions which include northern Alabama.

The southern portion of the range of the distribution of the meadow vole (*Microtus pennsylvanicus*), a prospective target species for the small mammal sampling effort, is also located in northern Alabama. However, the meadow vole is host to the Prospect Hill virus (PHV) which has not been determined to cause human disease (CDC, 1995 and CDC, 2004).

While risk associated with aerosolization of viruses is highest in confined spaces with rodent infestations, personnel handling rodents from small traps and preparing blood and/or tissue samples are also at risk unless safety precautions are implemented (CDC, 1995). Because of the potential risk for infection from small mammals hosting hantaviruses and other zoonotic agents and the high case fatality ratio associated with HPS, personal protective measures will be implemented to mitigate the risk to sampling team members. These measures are based on the safety guidelines established in the *Methods for Trapping and Sampling Small Mammals for Virologic Testing* (CDC, 1995) and included as Attachment 5 to this HASP. Protective equipment will include the use of full face respirators with N-100 high efficiency particulate air (HEPA) filter cartridges during trap retrieval and sample processing. Thick rubber or nitrile gloves will be used when handling rodents or traps that either contain rodents or are potentially contaminated by rodents. Gloves will be washed with a disinfectant solution of 5% hospital-grade Lysol® prior to removal. Traps and sample preparation surfaces will also be disinfected with 5% Lysol. All sample processing will be performed at an outside sample processing station. Additional information on safe handling procedures associated with collection and transport of small mammals, the collection of blood samples and performing necropsies to remove the liver samples, and related activities is contained in Attachment 5.

The Exygen Research, Inc. laboratory will be performing chemical analyses of blood and liver tissue samples and has been informed of the potential for hantavirus with the small mammal samples.

References:

CDC. 1995. *Methods for Trapping and Sampling Small Mammals for Virologic Testing*. U.S. Department of Health and Human Services. Public Health Service. Centers for Disease Control and Prevention (CDC). National Center for Infectious Diseases. Atlanta GA. Available at:

http://www.cdc.gov/ncidod/dvrd/spb/mnpages/rodentmanual.htm

CDC. 2002. *Hantavirus Pulmonary Syndrome – United States: Updated Recommendations for Risk Reduction*. Morbidity and Mortality Weekly Reports (MMWR) Recommendations and Reports 51(RR09); 1-12. July 26, 2002. available at:

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5109a1.htm

CDC. 2004. *All about Hantaviruses* web page prepared by the CDC National Center for Infectious Diseases Special Pathogens Branch. Atlanta GA. Available at: http://www.cdc.gov/ncidod/diseases/hanta/hps/index.htm accessed 2 July 2004.

3.6 FISH SAMPLING

Methods which may be used during this project to capture fish may include one or more of the following gear types: hand seines, gill nets, trotlines, and electrofishers. The primary hazards associated with these collection methods include: working near or over water, rough or uneven terrain, and electrical shock.

Hand seines will be operated by two or more individuals, and consist of a long, wall-like collecting net with a float line at the top and a lead line at the bottom. Seine nets will be used in shallow water where fish can be captured by surrounding an area and pulling the seine ashore to enclose the catch.

Seines will not be used in water with snags or other obstructions, and tend to roll up when pulled over weeds. Nets are difficult to pull in areas of high flow because of water resistance. Therefore, prior to attempting to seine a collection area, the area will be investigated to determine the feasibility, the efficiency, and the safety of using this collection method. Because

of the hazards associated with collecting fish by this method, the following precautions should be taken:

- Because the water depth is variable, prior to starting wading activities, the depth in a particular area shall be determined to minimize the potential for submersion.

- Because chest waders and/or hip boots will be required, appropriate precautions shall be taken. When filled with water, even partially, waders become heavy and pose a serious threat to the individual wearing them. Therefore, no sampling team personnel will venture into areas where submersion is likely. A belt fitted snugly around the top of the waders may also be worn to limit the ability of water to enter the boots. Safety lines may also be required, depending on conditions.

- The type of bottom may affect the field crew's footing and its ability to work efficiently and safely. If necessary sure grip devices, such as creepers or carpeting may be added to the soles of boots to improve traction.

- The accessibility of field locations shall be considered in the field planning. Proximity of vehicle access will be determined beforehand for ease of equipment portage and to allow prompt access by response personnel in the event of an emergency. It is required that the team leader be familiar with access roads and trails available in each area.

- Obstructions such as submerged rocks, trees, and floating objects affect the safety of boat use on lakes and waterways. Awareness of their locations is also significant in use of nets, trotlines, and instruments with the potential for snagging. Visual reconnaissance of areas for possible obstructions shall be made and their positions noted.

Trotlines may be used to selectively harvest bottom feeding fish specimens. Trotlines consist of long, heavy cords with multiple baited hooks attached by sections of monofilament line. Trotlines may be anchored by means of anchors or other weights attached to the ends of the trotlines or by tying the ends to stakes, limbs, or other immovable objects along the shoreline. The ends of the trotline sets will be marked by buoys and/or flagging tape to identify their location. The principal hazards associated with the deployment of trotlines are entanglement with the cordage and punctures from the hooks. Because of these hazards, the following precautions shall be observed:

- Trotlines will be deployed only in area of low current velocities to minimize the potential for drifting (or loss) of the trotlines from their intended locations.

- Trotline sets will be identified by flagging or buoys to minimize the risk associated with entanglement by members of the sampling team.

- Facility personnel will restrict access to the stream to only members of the sampling team for the duration of the trotline sets.

- Sampling team members will use caution in baiting, setting, handling, and harvesting the trotlines to minimize the potential for puncture wounds.

- Because the trotline hooks will be baited with materials such as commercial tub bait or chicken livers, the potential for infection resulting from puncture wounds exists. First aid equipment will be available to allow any puncture wounds to be immediately cleaned and disinfected.

The primary method that will be used to capture fish will be electrofishing. It should be noted that all electrofishing gear can develop electrical currents that are potentially harmful or lethal to man. Operators must be familiar with proper usage, potential involved, and safety procedures. Because of these hazards the following precautions shall be observed:

- The operator of an electrofisher must understand that the chance of receiving an electrical shock is multiplied when dealing with electric currents in or near water more than any other place.

- The Coffelt electrofishers have a high voltage output and certain safety precautions must be observed to provide safe operation and prevent possible dangerous shock. When operating the electrofisher the operator should never contact the anode. This situation could complete a path through the body for the electric current and cause a possible lethal shock. To prevent shocks from occurring the following equipment shall be used:

  - Non-leaking chest high waders. Wet boots can conduct electricity. If the waders become wet inside,

  - Non-leaking rubber electricians gloves that reach the elbow or higher. Wet gloves can conduct electricity. If the gloves become wet inside, electrofishing activities will be halted until and the gloves are thoroughly dry or replacement gloves are donned.

- The following are some do's and don'ts for electrofishing:

  - Do always make sure that all personnel are clear of the area surrounding the anode before turning on the power.

  - Don't continue to electrofish if your boots or gloves become damp or wet.

- Do make sure that the anode and cathode electrodes make a good connection with the output cable and that both electrodes are in contact with the water.

- Don't operate an electrofisher if you have any prior heart condition/history or if you have been under abnormal strain which may weaken your heart.

- Do review and know how to administer first aid treatment for electrical shock.

Because of the relatively high potential for hazard, all electrofishing equipment will be examined and approved for use, for reliability of safety devices and proper performance of the unit by a qualified technician prior to use in the field. It is the responsibility of the Site Safety Officer and Project Team Leader to verify that such equipment has been examined and approved for use prior to use. All maintenance and safety checks shall be recorded and kept by the SSO. Periodic checks will be determined by frequency of use.

3.7 ADDITIONAL FIELD OPERATING PROCEDURES

During the course of these Phase 2 characterization program activities, it may become necessary to conduct activities not specified in the sampling procedure descriptions. In order to anticipate some of these activities, the following FLDs have also been included in Attachment 2:

- FLD 09 Hot Work
- FLD 36 Welding/Cutting/Burning
- FLD 39 Illumination
- FLD 48 WESTON Hazard Communications Program

Table 3-1

Properties of Potential Environmental Contaminants, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL

Contaminant	Concentrations Detected in Previous Investigations	OSHA PEL (TWA)	ACGIH TLV (TWA)	Carcinogen	Characteristics/ Physical Description	Route of Exposure	Human Exposure Symptoms	Target Organs
1,1 - Dichloroethylene (1,1-DCE)	55 µg/kg (327R soil)	NE	5 ppm	A4, Carc	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.	Inh Abs Ing Con	Irritation of eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney dysfunction; pneumonitis. Potential occupational carcinogen.	Eyes, skin, respiratory system, CNS, liver, kidneys
1,1 –Dichloroethane (1,1-DCA)	15 µg/kg (327R soil) 3.6 µg/L (310R gw)	100 ppm	100 ppm	A2, Carc	Colorless, oily liquid with a chloroform-like odor	Inh Ing Con	Irritation of skin, CNS depression, liver, kidney, lung damage	Skin, liver, kidneys, lungs, CNS
1,1,1 – Trichloroethane (1,1,1-TCA)	7 µg/kg (327R soil)	350 ppm	350 ppm	A2, Carc	Colorless liquid with a mild, chloroform-like odor.	Inh Ing Con	Irritation eyes, skin, headache, lassitude, CNS depression, poor equilibrium, dermatitis, cardiac arrhythmias, liver damage	Eyes, skin, CNS, cardiovascular system, liver
1,2-Dichloroethane (1,2-DCA)	12 µg/kg (327R soil)	50 ppm	10 ppm	A3, Carc	Colorless liquid with a pleasant, chloroform-like odor.	Inh Ing Abs Con	Irritation of eyes, corneal opacity, CNS depression, nausea, vomiting, dermatitis, liver, kidney, cardiovascular system damage, (potential occupational carcinogen)	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system

Table 3-1

Properties of Potential Environmental Contaminants, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL (Continued)

Contaminant	Concentrations Detected in Previous Investigations	OSHA PEL (TWA)	ACGIH TLV (TWA)	Carcinogen	Characteristics/ Physical Description	Route of Exposure	Human Exposure Symptoms	Target Organs
2-butanone (MEK)	12 µg/kg (327R soil)	200 ppm	200 ppm	No	Colorless liquid with a moderately sharp, fragrant, mint-or acetone-like odor.	Inh Ing Con	Irritation of eyes, skin, nose, headache, dizziness, vomiting, dermatitis	Eyes, skin, respiratory system, CNS.
4-methyl-2-pentanone (MIBK)	140 µg/kg (327R soil)	100 ppm	50 ppm	No	Colorless liquid with a pleasant odor	Inh Ing Con	Irritation of eyes, skin, mucous membrane; headache, coma, dermatitis; in animals: liver, kidney damage	Eyes, skin, respiratory system, CNS, liver, kidneys
Acetone	4,300 µg/kg (327R soil) 6.9 µg/L (317L gw)	1,000 ppm	500 ppm	A4	Colorless liquid with a fragrant, mint-like odor.	Inh Ing Con	Irritation of eyes, nose, throat; headache, dizziness; CNS depression; dermatitis.	Eyes, skin, respiratory system, CNS
Benzene	520 µg/kg (327R soil) 21 µg/L (310R gw)	1 ppm ST 5 ppm	0.5 ppm	A1, Carc	Colorless to light-yellow liquid with an aromatic odor. (Note: A solid below 42°F.)	Inh Abs Ing Con	Irritation of eyes, skin, nose, respiratory system; giddiness, headache; nausea; staggered gait; fatigue; anorexia; lassitude (weakness, exhaustion); dermatitis; bone marrow; depression.	Eyes, skin, respiratory system, blood, CNS, bone marrow (leukemia)

Table 3-1

Properties of Potential Environmental Contaminants, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL (Continued)

Contaminant	Concentrations Detected in Previous Investigations	OSHA PEL (TWA)	ACGIH TLV (TWA)	Carcinogen	Characteristics/ Physical Description	Route of Exposure	Human Exposure Symptoms	Target Organs
Chloroform	11 µg/kg (327R soil)	C 50 ppm	10 ppm	A3, Carc	Colorless liquid with a pleasant odor.	Inh Abs Ing Con	Irritation of eyes, skin; dizziness, mental dullness; nausea; confusion, headache, fatigue; anesthesia; enlarged liver.	Liver, kidneys, heart, eyes, skin, CNS
Ethylbenzene	44 µg/kg (327R soil)	100 ppm	100 ppm	A3	Colorless liquid with an aromatic odor.	Inh Ing Con	Irritation of eyes, skin, mucus membranes; headache; dermatitis; narcosis; coma.	Eyes, skin, respiratory system, CNS
Isopropyl ether	490 µg/kg (220R 4 soil) 780 µg/L (310R gw)	500 ppm	250 ppm	No	Colorless liquid with a sharp, sweet, ether-like odor.	Inh Ing Con	Irritation of eyes, skin, nose, respiratory discomfort; dermatitis; in animals: drowsiness, dizziness, unconsciousness, narcosis.	Eyes, skin, respiratory system, CNS
Methylene chloride	32 µg/kg (327R soil)	25 ppm ST 125 ppm	50 ppm	A3, Carc	Colorless liquid with a chloroform-like odor.	Inh Abs Ing Con	Irritation of eyes, skin; fatigue, weakness; somnolence (unnatural drowsiness), lightheadedness; numbness, tingling in limbs; nausea.	Eyes, skin, CVS, CNS

Table 3-1

Properties of Potential Environmental Contaminants, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL (Continued)

Contaminant	Concentrations Detected in Previous Investigations	OSHA PEL (TWA)	ACGIH TLV (TWA)	Carcinogen	Characteristics/ Physical Description	Route of Exposure	Human Exposure Symptoms	Target Organs
Toluene	30 µg/kg (327R soil) 3.3 µg/L (320L gw)	200 ppm C 300 ppm 500 ppm (10-min max. peak)	50 ppm	A4	Colorless liquid with a sweet pungent, benzene-like odor.	Inh Abs Ing Con	Irritation of eyes, nose; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); nervousness; muscle fatigue; insomnia; paresthesia; dermatitis; liver, kidney damage.	Eyes, skin, respiratory system, CNS, liver, kidneys
Vinyl chloride	7 µg/L (310R gw)	1 ppm C 5 ppm	1 ppm	A1, Carc	Colorless gas or liquid with a pleasant odor at high concentrations. (Note: Shipped as a liquefied compressed gas.)	Inh Con	Weakness; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid frostbite.	Liver, CNS, blood, respiratory system, lymphatic system
Xylene	160 µg/kg (327R soil)	100 ppm	100 ppm	A4	Colorless liquid with aromatic odor.	Inh Abs Ing Con	Dizziness, excitement, drowsiness; incoordination, staggered gait; irradiation of eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.	CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin

Sources: *Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices*, ACGIH (1998).
NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services (January, 2003).

Table 3-1

Properties of Potential Environmental Contaminants, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL (Continued)

Key:

Abs = Skin absorption.
ACGIH = American Conference of Government Industrial Hygienists
A1 = Confirmed human carcinogen by ACGIH.
A2 = Suspected human carcinogen by ACGIH.
A3 = Animal carcinogen by ACGIH.
A4 = Not classifiable as a human carcinogen by ACGIH.
A5 = Not suspected as a human carcinogen by ACGIH.
C = OSHA ceiling concentration; must not be exceeded during any part of the workday.
Carc = Potential occupational carcinogen by NIOSH.
CNS = Central nervous system.
Con = Skin and/or eye contact.
CVS = Cardiovascular system
gw = Groundwater.
Ing = Ingestion.
Inh = Inhalation.
NE = Not established.
PEL = Permissible exposure limit.
PNS = Peripheral nervous system.
ppm = Parts per million.
OSHA = Occupational Safety and Health Administration.
ST = OSHA short-term exposure limit; 15-minute TWA exposure that should not be exceeded at any time during the workday.
TLV = Threshold limit value.
TWA = Time weighted average.

Table 3-2

Level of Protection and Monitoring by Task and Contaminant Type

Phase 2 Characterization Program, 3M Decatur Facility
Decatur, AL

Potential Contaminants of Concern	Minimum Initial Level of Protection						
	Vegetation Survey & Sampling Geophysical Survey	Surface Soils Sampling	Aquatic Sampling	Small Mammal Sampling	Soil Borings/ Well Installation	Surface-Water/ Sediment Sampling	Groundwater Sampling
For any/all of the contaminants listed below use initial level of protection	Level D/ Modified Level D	Modified Level D	Modified Level D	Level C	Modified Level D	Level D	Modified Level D
Type of Monitoring							
Metals (lead, chromium, cadmium, nickel, etc.)	N	N	NA	NA	N	N	N
Solvents (acetone, 1,1-DCE, etc.)	N	N	NA	NA	N / OVM Detector tubes, as warranted	N	N
BTEX	N	NA	NA	NA	N / OVM Detector tubes, as warranted	NA	N
Hantavirus	NA	NA	NA	NA	NA	NA	NA

N = No monitoring necessary due to the nature of the activity/matrix and/or levels of contaminants are known to be of low concentrations for which Level D/Modified Level D protection is sufficient.
NA = Not applicable.
BTEX = Benzene, toluene, ethylbenzene, and xylene.
1,1-DCE = 1,1-Dichloroethylene.
OVM = Organic vapor monitor.

Table 3-3

LOI Monitoring Wells

Phase 2 PFOA Characterization Program
Decatur, AL

Monitoring Location	Description
Wells 226R & L	Located east of inactive landfill and south of wastewater treatment – monitor background conditions in residuum and shallow limestone groundwater
Well 220R and L	Located northeast of inactive landfill – monitors predominant flow path of plume in residuum and shallow limestone zones
Well 320L	Located north of inactive landfill – monitor secondary flow path of plume
Wells 327R	Located in the former incinerator area – monitors residuum groundwater near source area
Wells 310R & 317L	Located in the Chemical Plant – monitors dominant groundwater flow pathways in the Chemical Plant

SECTION 4

ACCIDENT PREVENTION PLAN

An important element of the site-specific health and safety program is the implementation of an accident prevention program. It is essential that the contents of this HASP, as well as the contents of the accident prevention program, are communicated to all personnel who work at the site. There are four approaches to preventing accidents considered in this HASP:

- **Educate personnel** as to the requirements of the HASP.
- **Eliminate unsafe conditions.** Efforts must be initiated to identify conditions that can contribute to an accident and to remove exposure to these conditions.
- **Reduce unsafe acts.** Personnel will make a conscious effort to work safely. A high degree of safety awareness must be maintained so that safety factors involved in a task become an integral part of that task.
- **Frequent inspections.** Regular safety inspections of the work site, material, equipment, and operations by qualified persons ensure early detection of unsafe conditions. Health and safety deficiencies will be corrected as soon as possible, or site activities will be suspended.

The following Accident Prevention Plan covers those specific measures personnel will take to minimize the occurrence of accidents on-site. It was prepared to complement the existing *3M Decatur RCRA Emergency/Contingency Plan* (3M, 1998 as updated and amended), included as Attachment 6 of this HASP.

4.1 RESPONSIBILITIES

Effective implementation of the Accident Prevention Plan for the Phase 2 characterization program activities is ultimately the responsibility of each individual working on-site. The Site Health and Safety Coordinator will be responsible for development of the plan, for its introduction to all site personnel, and for the day-to-day implementation and enforcement of the plan. The Field Team Manager and Site Health and Safety Coordinator will maintain a working knowledge of all aspects of this manual as they pertain to site activities.

Accidents resulting in any fatality, lost-time injury or illness, hospitalization of three or more personnel, or property damage to 3M or contractor property (which occurred during the performance of the contract) must be: (1) reported by telephone to the 3M Field Manager at (256) 552-6631 and to the WESTON Project Manager at (610) 701-3761 as soon as possible, but not later than 2 hours after occurrence; and (2) reported in writing within 5 days of occurrence on the Incident Reporting Form (provided as Attachment 6 of this HASP). All other accidents/incidents must be reported by telephone to the 3M Field Manager at (256) 552-6631 and to the WESTON Project Manager at (610) 701-3761 within 8 hours of occurrence. The WESTON Project Manager will immediately notify the 3M Project Director of any incident/accident. The WESTON Project Manager also will notify the appropriate WESTON corporate health and safety personnel.

4.2 LOCAL REQUIREMENTS

Site activities will be conducted in accordance with applicable 3M requirements. Contractors will obtain permits in accordance with 3M regulations related to temporary construction facilities, the placing of temporary mobile offices, and temporary utility connections. Contractors must also follow 3M specifications for installation and use of same. Specific contractor safety requirements for the 3M Decatur facility are provided in Attachment 4. These site-specific requirements include general safety, permitting, and equipment and vehicle use, as well as safety procedures covering contractor related tasks.

4.3 WESTON SUBCONTRACTOR CONTROL

All WESTON subcontracted work performed at the site will be conducted under the expressed direction of the Field Team Leader. In this manner, all subcontractor personnel will adhere to the same strict safety provisions enforced for all on-site personnel. In addition, all site personnel (including subcontractors) will receive a complete introduction to the safety procedures established for site activities. This training is further outlined in Section 5.

4.4 TEMPORARY FACILITIES

Existing temporary construction facilities (offices, sanitary, etc.) have been laid out in accordance with good housekeeping and construction practices (FLD 12). Subcontractor plans will be reviewed and approved by the Field Team Manager prior to implementation.

4.5 TRAINING

Initial health and safety indoctrination, visitor health and safety training, and any additional training will be the responsibility of the Site Health and Safety Coordinator. The Site Health and Safety Coordinator will maintain a record of training attendance in the Field Logbook. Specific training requirements are included in Section 5.

4.6 TRAFFIC CONTROL

Vehicular traffic will be directed when necessary to avoid entering operational areas or to avoid posing a danger to site personnel. Traffic-control items (i.e., signs, cones, and barricades) will be of standard design and placed in a manner that will not cause confusion. On-site personnel will obey all road signs and posted speed limits (FLDs 11, 20, and 22).

4.7 MAINTENANCE/SITE HOUSEKEEPING

Good housekeeping will be maintained on-site at all times to ensure safe access to all site areas, as well as safe egress from the site. The Site Health and Safety Coordinator will assign individuals to the task of housekeeping to ensure cleanup at the end of each work shift (FLD 12).

4.8 EMERGENCIES

Section 11 of this HASP details the procedure for handling all fires and emergencies that the Site Health and Safety Coordinator decides cannot be handled safely by site personnel. Emergency telephone numbers for assistance will be posted by each telephone and can also be found in Section 11 of this HASP.

4.9 JOB SITE INSPECTION

A job site inspection will be the responsibility of the Site Health and Safety Coordinator. The inspection will be conducted regularly and will ensure that site conditions are in compliance with the HASP. Appendix C contains the checklist to be used during an inspection. The Site Health and Safety Coordinator will maintain a record of the inspection and findings in the Field Logbook.

4.10 ACCIDENT INVESTIGATION

All minor accidents (i.e., small fires, injuries, and small spills), and especially near-misses, will be investigated by the Site Health and Safety Coordinator. Accidents requiring hospitalization will be investigated by the Field Team Manager/Project Health and Safety Manager.

An accident investigation will consist of reviewing the accident/incident report, questioning the employee(s) involved, as well as questioning all other personnel witnessing the occurrence, identifying all contributing acts and conditions, determining underlying reasons for their existence or occurrence, and implementing corrective actions. A report documenting the investigation will be written by the Site Health and Safety Coordinator and reviewed by the Field Team Manager/Project Health and Safety Manager and WESTON Project Manager. Recommendations for accident prevention also will be made in the report and communicated to all site personnel during the periodic training sessions. A copy of an Incident Reporting Form is contained in Attachment 7.

In addition, all accidents will be reported to 3M's Fire Protection Division and Safety Office, the 3M Project Director, and the 3M Decatur Safety Officer. Accidents involving spills will be reported to 3M's Field Manager.

4.11 TEMPORARY POWER SYSTEMS

All temporary wiring will be secured overhead with adequate clearance to prevent accidental contact by personnel or equipment.

Temporary electrical distribution systems and devices will be checked and accepted for polarity, ground continuity, and ground resistance prior to initial use and prior to use after modification in accordance with OSHA 1926 Subpart K. All electrical systems will be equipped with GFCIs.

Extension cord sets will be of a type listed by Underwriters Laboratories (UL). Flexible cord sets used on construction sites will contain the number of conductors required for the service, plus an equipment ground wire.

Portable electric lighting used in hazardous locations will be operated at a maximum of 12 volts (V). Exposed empty light sockets and broken bulbs will not be permitted. In addition, all power systems must be approved by the 3M Field Manager (FLDs 34 and 35).

4.12 SAFE CLEARANCE PROCEDURES (LOCK-OUT/TAG-OUT)

Procedures for safe clearance that will be followed are taken from WESTON FLD 42, and are as follows:

- The safe clearance procedure will be followed in securing electrical systems, machinery, pressure systems, and rotating equipment. Power will be turned off, tagged, and locked in the open position at the master switch or main breaker. Gears, agitators, or transmissions will be mechanically locked out or disconnected. Padlocks will be used wherever possible, with the person working on the equipment in possession of the key.

- A safe clearance procedure will be required on all systems and equipment if unauthorized removal or return to service could result in injury, damage, loss of content, loss of protection, or loss of operating capability.

In addition, the requirements of OSHA's lock-out/tag-out standard (29 CFR 1910.147) will be met. All persons performing or affected by lock-out/tag-out must be properly trained. Where the two documents are inconsistent, the requirements of the more stringent will be followed.

4.13 OFFICE TRAILER ANCHORING SYSTEM

All trailers or other temporary structures used as field offices or to house personnel will be anchored with rods and cables to provide a stable, safe working environment.

4.14 WEATHER-RELATED CONTINGENCY PLAN

Weather will be considered in safety planning. The Site Health and Safety Coordinator will decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, tornado warnings, extreme heat, ice storms, or strong winds are examples of conditions that would call for the discontinuance of work. A telephone will be available on-site to enable easy access to weather service information (FLD 02).

4.15 ACTIVITY HAZARDS ANALYSIS

Section 3 of this HASP presents an activity hazard analysis for each task of the Phase 2 characterization program activities.

4.16 HAZARD COMMUNICATION

The primary requirements of the project hazard communication program are the accumulation and availability of MSDSs, container labeling, and employee training.

MSDSs will be brought on-site for each hazardous material used during the completion of this project. The MSDSs will be provided in the site HASP under the custodianship of the Site Health and Safety Coordinator. MSDSs also will be provided to the 3M Field Manager.

This HASP for site operations serves the purpose of the MSDSs for contaminants present in each work area. The purpose of this procedure is to ensure that WESTON and subcontractor personnel working with hazardous materials are made aware of the hazards associated with the materials and to conform with the Hazard Communication Standard (29 CFR 1910.1200).

All containers of hazardous materials subject to 29 CFR 1910.1200 must be labeled in accordance with the standard. Manufacturer's, importer's, or distributor's existing labels may be used, provided the information is correct and sufficient.

Labels affixed to or close to containers of hazardous materials must accomplish the following:

- Identify the material using a name with which workers are familiar.

- Identify the hazards associated with the material, including toxicity information, which indicates symptoms and target organs.
- Contain the name, address, and telephone number of the manufacturer, importer, or distributor where more information may be obtained.

Labels must not conflict with Hazardous Materials Transportation Act (HMTA) labeling requirements and must meet the requirements of OSHA substance-specific health standards if such regulated substances are present.

Labels are not required on portable containers filled from a correctly labeled container if only the worker filling the container uses the material from that container immediately.

Required labels on containers must never be defaced or removed unless immediately replaced by an appropriate correctly prepared label.

Subcontractors will be formally notified of the presence of any hazardous substances used on this project site. Subcontractors must also provide proof of a Hazard Communication Program and must inform WESTON of any hazardous substances used in their work for WESTON, have appropriate MSDSs on-site, and have containers correctly labeled.

If necessary, the Field Team Leader/Site Health and Safety Coordinator will also be responsible for ensuring that 3M provides hazard communication information to WESTON and subcontractor employees when working where exposure to hazardous substances subject to this section are present.

Training requirements are discussed in Section 5.

SECTION 5

TRAINING

On-site personnel engaged in the Phase 2 characterization program activities will be trained in accordance with the requirements of 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response [HAZWOPER]) and 29 CFR 1910.1200 (Hazard Communication) because these requirements pertain to their role, function, and activities on-site. Personnel will provide written certification to the Project Health and Safety Manager that the required training has been received prior to engaging in on-site activities. Documentation of training (i.e., 40-hour, 8-hour, respiratory fit testing, cardiopulmonary resuscitation [CPR]/first aid, etc.) will be maintained on-site and managed by the Site Health and Safety Coordinator. Specific training requirements are discussed in the following subsections.

5.1 PREASSIGNMENT TRAINING

5.1.1 Off-Site Training

All personnel assigned to, or regularly entering, areas of the site other than the support zone for the purpose of performing or supervising work; for health, safety, security, or administrative purposes; for maintenance; or for any other site-related function, will be trained in compliance with the health and safety training requirements of 29 CFR 1910.120(e). Prior to beginning work on-site, the training will be consistent with their job functions and responsibilities.

Training will consist of a minimum of 40 hours of initial instruction covering the specific subjects outlined in 29 CFR 1910.120(e). All personnel will receive a minimum of 8 additional hours of off-site refresher training each year, which will include bloodborne pathogens training. In addition, supervisory personnel will have a minimum of 8 hours of additional specialized training on managing hazardous waste operations. The Site Health and Safety Coordinator will have a minimum of 8 hours of initial medical first aid training (first aid/CPR) and an additional 4 hours (minimum) of such training every 2 years.

5.1.2 Site-Specific Training

All personnel assigned to the site will complete one site-specific training session. The Site Health and Safety Coordinator will verify that they are capable of, and familiar with, the use and care of safety, respiratory, and protective equipment, and with site control, decontamination, emergency, safety, security procedures, and hazard communication required for this site. The HASP will be discussed during this training conducted by the Site Health and Safety Coordinator.

5.2 PERIODIC TRAINING

Daily safety briefings, including discussion of operational problems and compliance with the site-specific HASP, will be conducted by the Site Health and Safety Coordinator for all personnel assigned to work at the site. If an operational change affecting on-site field work is made a meeting prior to implementation of the change will be convened to explain health and safety procedures.

5.3 VISITORS

Visitors to the site will receive a briefing on site safety issues. These visitors will not be permitted in the exclusion zone unless they have been trained in accordance with Subsection 5.1.1 of this HASP, have been fit-tested (if required), have been medically approved, and can provide written certification to the Site Health and Safety Coordinator.

SECTION 6

PERSONAL PROTECTIVE EQUIPMENT

6.1 REQUIRED LEVELS OF PROTECTION AND ACTION LEVELS

Levels of protection (LOPs), as defined by EPA Standard Operating Safety Guides, have been designated on a task-by-task basis. The initial LOP for each task will be as specified in Table 3-2 or as specified by the Site Health and Safety Coordinator. The required PPE for each LOP is presented in Attachment 8. These LOPs may be downgraded or upgraded by the Site Health and Safety Coordinator after consulting with the Project Health and Safety Manager and will be based on the measurement of organic vapor levels with a portable photoionization detector (PID) (an organic vapor monitor [OVM], or HNu®) as specified for each task in Tables 4-1 (see Section 4 of the Phase 2 Work Plan) and 3-2 (see Section 3 of this plan). All air monitoring will be conducted in breathing zone locations. Because the PID devices are not compound-specific, action levels (ALs) for upgrading and downgrading protective equipment have been developed based on chemical contaminant exposure guidelines and instrument responses. The ALs are presented in Table 6-1. The general concepts of the air-monitoring program, including the determination of background levels, are provided in Section 8 of this HASP.

In addition to the use of PPE, site control measures designed to minimize contamination of personnel, including an exclusion zone (EZ) and support zone (SZ), will be utilized to protect personnel during performance of the Phase 2 characterization program. The site control measures are presented in Section 9 of this HASP.

Based on the trace concentrations of contaminants of concerns presented in Table 3-1 and the nature and location of the Phase 2 characterization field activities, Level D/Modified Level D protection can be worn during the initiation of each site activity as specified in Table 3-2. However, field observations (visual and/or olfactory indicators) assessed with an air monitoring instruments (discussed above) may indicate that an upgrade to a higher LOP is warranted.

In the LOI well locations where benzene has been found at low concentrations (maximum concentration of 0.52 ppb in soil at depth of 29 to 31 feet below ground surface (bgs) and 0.021

ppb in groundwater), the following guidelines will be used as a strategy for air monitoring and upgrading LOPs. Based on historical data, the source of benzene, if any is detected, is expected to be from gasoline or fuel oil. The ALs listed in Table 6-1 will be utilized to make the LOP decisions. Level D/Modified Level D protection is acceptable if OVM instrument levels do not exceed 5 units above the background level. Background level measurement guidance is provided in Section 8 of this HASP. If the OVM reading exceeds and sustains a level of 5 units over background, the field team will evacuate the EZ and allow the area to ventilate. The team will re-enter the EZ with a detector tube (e.g., Dräeger, MSA) to determine if benzene is present. The colorimetric detector tube must be sensitive to 0.5 ppm of benzene. The team will re-enter the EZ from the upwind direction, taking measurements in the breathing zone with the OVM and detector tube.

If benzene is not detected above 0.5 ppm with the detector tube, then work can proceed in Level D protection. However, if benzene is detected at a concentration exceeding 0.5 ppm, the sampling team will upgrade to Level C and begin to monitor the air with the colorimetric tubes on a regular schedule. Readings will be taken, and documented in the Field Logbook, at 30-minute intervals (or more frequently) during periods of employee exposure. Once levels decrease to consistent readings below 0.5 ppm, a downgrade back to Level D/Modified Level D can be made by the Site Health and Safety Coordinator, or his designee. For Level C operations, a full-face, air-purifying respirator will be used. Cartridges will be changed at the end of the service life (as designated by the manufacturer), not to exceed 4-hour periods. Based on historical data, Level C or B protection is not expected to be required for Phase 2 characterization program field work as a result of benzene exposure. Additionally, based on historical information, benzene is not a potential concern in the former sludge application area.

In areas where solvents are a potential contaminant of concern, the following guidelines will be used as a strategy for air monitoring and upgrading LOPs. The ALs listed in Table 6-1 will be utilized to make the LOP decisions. Similar to areas where benzene is a potential concern, Level D/Modified Level D protection is acceptable if OVM instrument levels do not exceed 5 units above the background level. If the OVM reading exceeds and sustains a level of 5 units over background, the field team will evacuate the EZ and allow the area to ventilate. The team will re-

enter the EZ with a detector tube (e.g., Dräeger, MSA) to determine if vinyl chloride or 1,1-DCE is present. The colorimetric detector tube must be sensitive to 0.5 ppm of vinyl chloride (this tube is sensitive to 1,1-DCE also). The team will re-enter the EZ from the upwind direction taking measurements in the breathing zone with the OVM and detector tube.

If the vinyl chloride detector tubes do not exceed 0.5 ppm, then work can proceed in Level D protection. However, if the detector measures a concentration exceeding 0.5 ppm, the sampling team will upgrade to Level C and begin to monitor the air with the colorimetric tubes on a regular schedule. Readings will be taken, and documented in the Field Logbook, at 30-minute intervals (or more frequently) during periods of employee exposure. Once levels decrease to consistent readings below 0.5 ppm, a downgrade back to Level D/Modified Level D can be made by the Site Health and Safety Coordinator, or his designee. Based on historical data, Level C or B protection is not expected to be required for Phase 2 characterization program field work as a result of solvent exposure. Additionally, based on historical information, benzene is not a potential concern in the former sludge application area.

The direct solvent OVM AL is based on 1,1-DCE, which has a permissible exposure limit (PEL) of 5 ppm. The AL listed in Table 6-1 (>5 units above background) will be used for upgrading to Level C based directly on the OVM readings and not through the use of detector tubes.

Determining the ALs by this method provides a conservative and protective approach to PPE LOP upgrades and downgrades. WESTON will implement a conservative approach to setting PPE requirements and ALs for PPE upgrades and downgrades based on breathing zone conditions. A worker's breathing zone for this project will be the lowest vertical space where personnel are breathing. This approach is in accordance with industry standards and will account for unanticipated compounds (stressors) that may be encountered during intrusive activities.

6.2 PROTECTIVE EQUIPMENT

The use of PPE will be in compliance with 29 CFR 1910 Subpart I. Personnel using respirators will have written certification of medical fitness and proof of training prior to initiating site operations.

Modified Level D or Level D protection is cited for the beginning of each task as specified in Table 3-2. Where airborne concentrations of contaminants indicate the need for an upgrade in the LOP to Level C, employees will use a NIOSH-approved, full-face, air-purifying respirator and other equipment cited in Attachment 1 of this HASP. The respirators will be supplied with NIOSH-approved combination cartridges for organic vapors, dusts, and fumes. For areas where vinyl chloride requires an upgrade in the LOP, NIOSH-approved cartridges for vinyl chloride will be used.

As indicated in Table 6-1, based on the conditions, the LOP may be upgraded to Level C or Level B. The criteria for the change from Level C to Level B will be the concentrations of contaminants and the type of respiratory protection required. Specifically, while the protective clothing (i.e., gloves and boots) is the same for Levels C and B, Level B requires the use of a self-contained breathing apparatus (SCBA).

6.3 WORK PRACTICES

As required by 29 CFR 1910 Subpart I, the use of a respirator by personnel with facial hair that obstructs the seal between the respirator and the face will not be permitted. Personnel who must use respirators will report to the site with clean-shaven faces.

Good hygiene will be practiced by all site personnel. This includes the following:

- Eating, drinking, and smoking in the EZ will not be permitted.
- Changing from work clothes into street clothes at the end of the workday.

In general, work practices will be in accordance with the EPA Standard Operating Safety Guides and all 3M health and safety contractor requirements as provided in Attachment 4.

6.4 SAFETY MEETINGS

The Site Health and Safety Coordinator will conduct a safety meeting prior to initiating the scheduled activities and at the beginning of each day. The safety meeting will, at a minimum, include topics such as the following:

- Evacuation routes.
- Warning signals.
- Maintaining line-of-sight and communications.
- Rehearsal of the scheduled activities.
- Hospital routes.
- Locations of safety equipment.
- Previous violations of the safety plan.
- Cold stress and heat stress provisions.
- Work zones.
- Site conditions.

All safety meetings will be documented in the Field Logbook. Meeting participants will be required to sign an attendance sheet.

In the event air quality readings indicate that upgraded respiratory protection is warranted, the Site Health and Safety Coordinator will conduct a safety briefing regarding the upgrade. The Site Health and Safety Coordinator also will conduct safety briefings daily if repeated violations of this plan are observed.

6.5 RESPIRATORY FIT TESTING

Site participants qualified for respirator use will demonstrate to the Site Health and Safety Coordinator that they have been fit-tested in the past year. Fit-testing will be performed in accordance with OSHA's Respiratory Protection Standard provided in 29 CFR 1910.134.

6.6 MODIFICATIONS TO LOPs

Designated LOPs will be upgraded as described in Subsection 6.1. Whenever the Site Health and Safety Coordinator implements an upgrade, the WESTON Field Team Manager/Project Health and Safety Manager, WESTON Project Manager, and 3M Field Manager/Safety Officer will be notified.

Modifications to the LOP will be recorded in the Field Logbook. A memorandum explaining the upgrade will be prepared by the Site Health and Safety Coordinator for inclusion in the project files and provided to the 3M Project Director for review.

Table 6-1

Action Levels, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL

Direct-Reading Instrument	Instrument Readings (Breathing Zone) (units)[a]	Action/Levels of PPE
PID/OVM (solvent/benzene areas specified in Tables 3-1 and 3-2	<5 units above background[b]	D
	>5 units above background	Use detector tubes
	>5 units above background	C
Detector tubes: Benzene (tasks specified in Tables 4-1 and 3-2)	< 0.5 ppm	D
	>0.5 ppm	C
Detector tubes: Vinyl chloride; 1,1-dichloroethylene (tasks specified in Tables 4-1 and 3-2)	<0.5 ppm	D
	>0.5 ppm	C

[a] Actual concentrations for the OVM are measured as "instrument response units." This instrument only measures in units of ppm if its response to a material's airborne concentration is 100%. The detector tube units are in ppm as noted.

[b] If the OVM levels exceed 5 units above background, detector tubes are to be used to measure for vinyl chloride, 1,1-DCE, and benzene. If these compounds are detected above 0.5 ppm in the breathing zone, Level C will be used.

SECTION 7

MEDICAL SURVEILLANCE

On-site personnel will participate in a medical surveillance program equivalent to the requirements specified in 29 CFR 1910.120(f) and American National Standards Institute (ANSI) Z-88.3. The examination will include the following:

- Complete medical and work histories.
- Physical examination.
- Pulmonary function tests (FVC and FEV1).
- Chest X-ray (every 2 years) with a "B" reading.
- Visual acuity.
- Audiometry.
- Urinalysis.
- Blood chemistry, including hematology and serum analyses.

The examination protocols and the evaluation of results will be overseen by a licensed physician certified in occupational medicine by the American Board of Preventive Medicine or a licensed physician who, by required training and experience, is board-eligible. Records of the examinations will be retained by the employer for at least 30 years after the end of the employment period.

Personnel and visitors entering the EZ will be required to provide written documentation to the Site Health and Safety Coordinator that the required medical examinations have been performed (baseline and annual). This documentation will be maintained in the project files in the field office trailer.

A medical examination will be given to any individual who experiences any illness or injury while on the job. Tests will be administered at the discretion of the attending physician. This examination will take place as soon as possible after the illness or injury, and in no case will personnel be allowed to start work at the site without first obtaining clearance to return to full work duties from the examining physician.

SECTION 8

AIR MONITORING

This section explains the general concepts of an air monitoring and sampling program and specifies the surveillance activities to be performed during the Phase 2 characterization program tasks.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine and verify the level of worker protection needed (Section 6), and to document the level of airborne contaminants at the site. Two principal approaches are available for identifying and quantifying concentrations of airborne contaminants:

- The use of direct-reading instruments ("monitoring").
- The collection of samples followed by laboratory analysis ("sampling").

The collection of samples for laboratory analysis is not warranted in support of the Phase 2 characterization activities.

8.1 DIRECT-READING INSTRUMENT MEASUREMENTS

Monitoring will be conducted using the following direct-reading instruments as specified for particular tasks/contaminants of concern specified in Tables 3-1 and 3-2:

- OVM with a 10.6-electron volt (eV) lamp for VOCs.

The OVM has been selected because of the instrument's ability to detect a wide range of VOCs with ionization potentials (IPs) equal to or less than the IP of the source lamp.

The results obtained with the OVM will be compared to the ALs described in Section 6 of this HASP and the appropriate measures will be taken. Personnel performing monitoring will be trained in the use of air-monitoring equipment as part of the off-site training.

The direct-reading instruments will be calibrated according to manufacturer's instructions prior to field use. Recalibration of the instruments will be performed pre- and post-sampling each day that the instrument is used. The initial calibration will be recorded in the instrument logbook. Daily calibration checks, areas where used, instrument settings, and readings obtained will be recorded in

the Field Logbook. The battery in each unit will be recharged after use to maintain a good charge. Specific calibration procedures are provided by the manufacturer with the instrument.

Because background VOC levels at the 3M Decatur, AL, facility can range from nondetectable to 5.0 ppm, background VOC data will be obtained with an OVM, as described in Section 3.

At a minimum, daily background readings will be made upwind from each sampling location/area of investigation and recorded in the project Field Logbook. However, more frequent monitoring for background levels may be required. Several independent and uncontrollable variables, most notably temperature and weather conditions, can affect the concentrations of airborne compounds. Other variables include wind speed, rainfall, moisture, vapor emissions, and work activities (mechanical disturbance of materials). These factors must be considered when measuring background levels. If changes in these variables are observed in the field, background readings will be retaken to ensure that the proper upgrades/downgrades in LOPs are made.

After valid background data are obtained, reliable decisions can be made regarding upgrades and downgrades in worker PPE.

During performance of applicable tasks, as discussed in Section 3, the levels of organic vapors will be measured in employees' breathing zones several times during the shift using the direct-reading instrument (OVM). The specific frequency of the monitoring will vary, with monitoring performed more frequently during operations having a greater potential for exposure.

The results of this air monitoring will be compared to the ALs in Table 6-1, and a decision on changing the LOP will be made by the Site Health and Safety Coordinator, or his designee. All changes in LOP will be made in accordance with the requirements presented in Section 6 of this HASP.

As indicated, measurements of airborne total dust concentrations will not be performed. As discussed in Section 3, dust generation is not expected to pose a health and safety concern, and can be readily addressed with conventional measures.

SECTION 9

SITE CONTROL

Personnel will be knowledgeable in site control measures designed to minimize contamination of personnel and the spread of contamination outside the EZ. These measures are designed to control contamination through defining the work zones and establishing decontamination procedures. The following discussion defines the different work zones in general and describes their purpose:

- Exclusion zone (EZ)—The area known or suspected of being contaminated or containing uncontrolled hazardous materials.
- Support zone (SZ)—The area outside the EZ used for project management and coordination, and for storage of equipment and vehicles.

The EZ will be established to include the field investigation location, including any areas where soil or sediment sampling may occur. Access to the EZ will be restricted to the authorized field team and support personnel. Equipment, sampling devices, and other field gear will be decontaminated prior to removal from the EZ.

The SZ will be located near, but upwind of, the work site to minimize potential exposures to site-associated contaminants. It will be positioned and sized to provide adequate space for the staging and support activities.

Communications will be established and maintained during site activities. A telephone or cellular telephone will be easily accessible to site personnel.

3M provides normal security 24 hours/day for the plant, including access roads and active plant areas. During working hours, WESTON will control access to the work locations to restrict unauthorized access. If unauthorized (i.e., untrained and not medically qualified) individuals enter a work area, operations will be halted until the person has been escorted from the work area and informed of the work area hazards.

SECTION 10

PERSONNEL AND EQUIPMENT DECONTAMINATION

Personnel will be aware of the procedures used to decontaminate EZ personnel, equipment, and sampling containers. Disposable PPE and other items will be placed in heavy-duty plastic bags and properly disposed of. Specific decontamination procedures are presented in the following subsections.

10.1 PERSONNEL PROCEDURES

10.1.1 Level C Personnel Decontamination

- Step 1: Equipment drop (if any is used).
- Step 2: Remove boot covers; place in disposables container.
- Step 3: Remove outer gloves; place in disposables container.
- Step 4: Remove protective clothing; place in disposables container.
- Step 5: Wash inner surgical gloves.
- Step 6: Remove respirator; sanitize prior to reuse.
- Step 7: Remove inner gloves; place in disposables container.
- Step 8: Wash and rinse hands.

10.1.2 Level D and Modified Level D Personnel Decontamination

- Step 1: Equipment drop (if any is used).
- Step 2: Remove boot covers (if worn); place in disposables container.
- Step 3: Remove outer gloves; place in disposables container.
- Step 4: Remove coverall (if worn); place in disposables container.
- Step 5: Remove inner gloves (if worn); place in disposables container.
- Step 6: Wash and rinse hands.

10.2 EQUIPMENT DECONTAMINATION

Because equipment and vehicle (i.e., drilling) decontamination is difficult, unnecessary equipment and vehicles will not be brought into the EZ and dedicated and disposable sampling equipment will be used to the extent practicable.

A standard operating procedure which will be employed at the site regarding decontamination of equipment potential exposed to PFOA is provided in Appendix C of the *Phase 2 Work Plan.*

10.3 SAMPLE CONTAINER DECONTAMINATION

Sample containers will be laboratory-prepared, precleaned containers. Following sample collection and closure of the container, the outside of the container will be wiped clean. The sample containers will then be placed into shipping containers and sealed for shipment. A notation to laboratory personnel of potential container contents will be included with the chain-of-custody (COC) sheets.

SECTION 11

FIRST AID AND EMERGENCY RESPONSE EQUIPMENT AND PROCEDURES

Although accidents can be minimized through safe work practices, there is always the potential for their occurrence. Site personnel will be familiar with the various contingency measures should an accident occur. At least one person will be CPR/first-aid trained and on-site at all times for activities covered by this HASP. This section presents a list of emergency telephone numbers, directions to the local hospital, and Emergency Response Plan (ERP) conforming to the requirements of 29 CFR 1910.120. The provisions of the Emergency Response Plan are primarily applicable to large-scale emergencies that cannot be handled safely by the contractor procedures and work practices discussed in previous sections of this HASP. This section has been prepared using the 3M Decatur RCRA Emergency/Contingency Plan (3M, 1998), which is included in its entirety as Attachment 6.

11.1 EMERGENCY TELEPHONE NUMBERS

Table 11-1 lists important emergency telephone numbers. These numbers will be posted near telephones close to the site.

11.2 ROUTE TO HOSPITAL

Injured personnel will be taken to Parkway Medical Center located at 1874 Beltline Road, Decatur, AL. The hospital is approximately 7 miles away with a travel time of 15 minutes. Directions to the hospital are as follows:

- Exit facility to Joe Wheeler Highway (Highway 20/Alternate 72).
- Head east, make left onto Beltline Road (Highway 67).
- Go south approximately 3.5 miles.
- The hospital is on the left near McDonald's.

A map showing the route to the hospital can be found in Attachment 9 of this HASP.

11.3 EMERGENCY RESPONSE PLAN

11.3.1 Pre-Emergency Planning and Coordination with Outside Parties

Prior to beginning the site investigation activities, the following individuals/groups will be made aware of site activities:

- 3M Field Manager/Safety Officer: Phillip Wirey, (256) 552-6631.
- 3M Security (24 hours): (612) 733-6100.
- 3M Emergency Response Personnel: 6111.

The 3M Field Manager will be provided with a copy of the HASP and a schedule of activities, and 3M security and emergency response personnel will be briefed on the work scope. This action will ensure that 3M Decatur emergency response mechanisms are aware of the investigation activities and are ready to respond if conditions warrant.

Site personnel will be made fully aware of the provisions of the Emergency Response Plan. This awareness training will be conducted by the Site Health and Safety Coordinator prior to the commencement of site activities during the site-specific training. Emergency telephone numbers will be posted at all of the telephone locations surrounding the areas of investigation. A list of emergency telephone numbers is included in Table 11-1, and will be included with all project cellular phones.

11.3.2 Personnel Roles, Lines of Authority, and Communication

Personnel witnessing an accident become the first step in the emergency response cascade. These individuals will find the nearest telephone, and dial 6111 (dial 911 if off-site). Once contact is made, witnessing personnel will remain on the telephone line to provide the responding 3M Decatur elements with additional data. In no case will witnessing personnel attempt to fight a major fire, conduct a rescue in an unsafe environment, or conduct a cleanup of a major spill.

11.3.3 Emergency Recognition and Prevention

Recognition and prevention of emergency conditions are duties of every individual on-site. While the objective of the HASP is to provide site personnel with the necessary information to prevent emergencies from arising, the basic principles of emergency recognition will be initially covered during the 40-hour training required by 29 CFR 1910.120 and reviewed during the off-site training, site-specific training, and follow-up training.

11.3.4 Safe Distances and Places of Refuge

Prior to the commencement of each site activity, the Site Health and Safety Coordinator will select a location, at an appropriate distance from the activity, where personnel can gather in the event of an emergency evacuation of a site. This location will be pointed out to site personnel during the site-specific training. This refuge may change depending on weather and the job activity. The Site Health and Safety Coordinator will ensure that all personnel are made aware of any changes.

During accidents involving a fire or spill of potentially explosive materials, site personnel will turn off any operating equipment and evacuate a site by the nearest means of egress. Because in emergency situations speed is often of the greatest importance, personnel in the EZ need not go through a formal decontamination. Once they arrive at a safe location, a formal decontamination can be undertaken. The Site Health and Safety Coordinator also is responsible for notifying other contractors in the event of an accident or spill that may impact them.

11.3.5 Site Security and Control

In the event of a fire, explosion, or major chemical spill, site security and control functions will be assumed by 3M Decatur's responding elements, and assisted by WESTON, as necessary.

11.3.6 Evacuation Routes and Procedures

As discussed in Subsection 11.1, personnel will exit a site by the nearest means of egress during accidents requiring evacuation. Once off-site, personnel will assemble at a location designated by the Site Health and Safety Coordinator and be counted. Any missing personnel will be brought to the attention of the responding 3M Decatur entities.

11.3.7 Decontamination Procedures

During accidents involving injury to personnel inside the EZ, a decision will be made by the Site Health and Safety Coordinator as to whether or not an individual's injury allows for formal decontamination, as outlined in Section 10. If the injury is minor, the individual will undergo formal decontamination. If the injury is major or life-threatening, the individual will be transported to the hospital. Hospital and ambulance personnel will be informed that the individual may be potentially contaminated so that appropriate measures can be taken to prevent cross-contamination.

11.3.8 Emergency Medical Treatment and First Aid

During site activities, at least one individual certified in first aid/CPR will be present at all times. During an accident involving an injury to site personnel, this individual will not attempt emergency medical procedures other than first aid/CPR unless specifically directed by a licensed physician.

11.3.9 Emergency Alerting and Response Procedures

As discussed in Subsection 11.1, emergency telephone numbers will be located at a telephone near the investigation areas. In the event of an emergency, witnessing personnel will contact the appropriate 3M Decatur responding element. 3M Decatur responding elements will then assume control of the incident and institute response procedures. In no case will site personnel attempt to assist in the response by fighting a major fire, conducting a rescue in an unsafe environment, or conducting a cleanup of a major spill. Site personnel will provide assistance to responding entities as necessary.

11.3.10 Critique of Response and Followup

Following an accident involving an injury to site personnel, the Site Health and Safety Coordinator will prepare an incident report using the Notification of Incident Form included in Attachment 7. The report will be submitted to the WESTON Project Manager, WESTON Regional Safety Officer, 3M Project Director, 3M Field Manager/Safety Officer, and the WESTON Field Team Manager/Project Health and Safety Manager for review. A copy will be kept in the project file.

Table 11-1

Emergency Telephone Numbers, Phase 2 Characterization Program, 3M Decatur Facility, Decatur, AL

Incident	Contact	Telephone Number
All Emergencies:	Plant Emergency Number (on-site)	6111
	Emergency System Activation (off-site)	911
	3M Corporate Security (24 hours)	(612) 733-6100

Additional Phone Numbers		
Organization/Position	**Contact**	**Telephone Number**
3M:		
On-site Field Manager/Safety Officer	Primary: Phillip Wirey Secondary: Don Swanner	Plant: (256) 552-6631 Home: (256) 351-0629 Plant: (256) 552-6060 Home: (256) 773-5512
Project Director	Michael Santoro	(651) 733-6374
WESTON:		
Project Manager	Jaisimha Kesari	(610) 701-3761
Field Team Manager/Project Health and Safety Manager (PHSM)	Timothy Frinak	(334) 887-0653
Site Health and Safety Coordinator (SHSC)	Charles T. Young	(610) 701-3787
MISCELLANEOUS:		
Decatur Fire Department	NA	(256) 353-4141
Decatur General Hospital	NA	(256) 340-5140
Decatur Police Department	NA	(256) 353-2515
Morgan County Sheriff	NA	(256) 778-6100
Morgan County EMA	NA	(256) 351-4620
Poison Control	NA	(800) 292-6678
Suburban Ambulance	NA	(256) 355-3844
Alabama Emergency Response Commission	NA	(800) 843-0699
U.S. Coast Guard, National Response Center	NA	(800) 424-8802

Notes:
Plant Name: 3M Decatur Plant
Plant Address: State Docks Road
P.O. Box 2206
Decatur, AL 35609-2206
EPA ID No. ALDOO4023164

*All fires, spills, and other emergencies will be reported to the Decatur Plant emergency phone number, 6111, and then to 3M Corporate Security for assistance (if needed). 3M personnel will then notify appropriate staff groups (Environmental Technologies [ET&S], Safety, Transportation, Industrial Hygiene, Toxicology, etc.) for assistance. ET&S or site personnel will notify state and federal agencies and contact outside contractors for cleanup, if needed, according to 3M procedures.

SECTION 12

STANDARD OPERATING PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

Personnel will be aware of the proper procedures and work practices to follow in order to protect themselves from the specific chemical, safety, and biological hazards associated with the site activities. Specific "safe-work" procedures are discussed in the following subsections.

12.1 BUDDY SYSTEM

The "buddy system" ensures that no individual may enter the EZ without another individual being present. The logic behind the buddy system is that should one individual have an accident, another individual is always present to render assistance or obtain emergency assistance. During Level C and D activities, the minimum number of personnel in the EZ will be two. One of these individuals will be the Site Health and Safety Coordinator.

12.2 EATING, DRINKING, AND SMOKING PRECAUTIONS

Because ingestion is a potential contaminant exposure pathway, eating, drinking, and smoking will be prohibited in the EZ. Site personnel working in the EZ will complete the required personnel decontamination upon exiting and prior to eating, drinking, or smoking. Smoking is permitted only in designated areas at the site, as established by 3M.

12.3 IGNITION SOURCES

Fires and explosions require fuel, air (oxygen), and an ignition source (heat). The first two are not easily controlled. Consequently, while working on-site where a fire hazard may be present, potential ignition sources must be kept out of the area.

Open flames, lit cigarettes, hot surfaces, or other potential ignition sources will be excluded from the EZ. Equipment used to handle waste containers and to clean up spills will be constructed of nonsparking materials. Portable fire extinguishers (20 lb ABC-type) will be readily accessible to extinguish small fires and will be placed on each vehicle. For fires, 3M Decatur emergency response personnel will be contacted (FLDs 31 and 32).

Prior to initiating activities involving potential ignition sources (i.e., welding or operating a forklift, etc.), personnel will request a "hot-work" permit from the Site Health and Safety Coordinator and the 3M Field Manager. The Site Health and Safety Coordinator will issue such a permit only after it has been verified that conditions are safe for such activities to commence (i.e., no explosive or flammable conditions exist). All work will be done in accordance with WESTON FLD 09.

12.4 EXPLOSIVE ATMOSPHERES

Potentially explosive atmospheres are not expected to be encountered at the site because all work is in the open air, which will provide adequate dilution ventilation. CGI measurements also will be taken prior to initiating any "hot work" (i.e., welding, forklift operation, etc.) as part of the hot-work permit, and at any time potentially explosive atmospheres or conditions are identified.

12.5 EYEWASH

Existing eyewash stations meeting the requirements of ANSI Z358.1 will be readily accessible to site personnel. Personnel will be made aware of the locations of these stations and will be instructed by the Site Health and Safety Coordinator on how to properly use the eyewash.

12.6 FIRE EXTINGUISHERS

Portable fire extinguishers (20 lb ABC-type), which will be given an initial inspection and approval by the 3M Decatur Field Manager, will be placed on each vehicle and will be readily accessible to site personnel. The Site Health and Safety Coordinator will train the site personnel in their proper use. Daily inspections of the fire extinguishers will be conducted by the Site Health and Safety Coordinator to ensure that they are adequately charged. A record of the inspection will be kept in the site Field Logbook.

12.7 WATER AND SANITATION

An adequate supply of potable water will be provided on-site in the SZ through the existing facility water supply system. Any portable container used to dispense drinking water will be capable of being tightly capped, clearly marked as to its contents, and will not be used for any other purpose. Single-service cups will be supplied with a receptacle for disposing of used cups.

12.8 ROUTINE SAFETY INSPECTIONS

The Site Health and Safety Coordinator will conduct routine safety inspections of the site. Hazardous conditions will be noted, the information transmitted to all site personnel, and mitigated, if possible. A record of the safety inspection will be documented in the site Field Logbook.

12.9 CONTROL OF MINOR SPILLS

Minor spills will be controlled by initially surveying the scene to ensure that it is safe to act, using the appropriate PPE to stop the leak, and cleaning up the spilled material. Minor leaks can often be stopped by positioning the container with the leak at the highest elevation. Spilled material may then be absorbed and disposed of using an inert, commercially available absorbent (i.e., kitty litter). Care will be exercised to prevent transit of spilled material to sewer or stormwater drains.

Cleanup of large spills will not be conducted by site personnel. Where site personnel can safely contain the spill, initial measures to isolate and contain the material will be attempted. The Site Health and Safety Coordinator will be consulted immediately to determine whether or not cleanup of a spill will be attempted. Refer to Section 11 for large spill procedures. Regardless of the size of the spill, however, the contractor will be responsible for proper containerization, storage, labeling, removal, treatment, and disposal of the spill residue.

In addition, all spills (except minor leaks) will be reported to the 3M Decatur Field Manager.

SECTION 13

LOGS, REPORTS, AND RECORDKEEPING

Recordkeeping is an important part of maintaining an accurate account of site activities. Recordkeeping will be a regular and orderly process. The types of recordkeeping to be maintained during closure activities are discussed in the following subsections. Documentation will be maintained on-site during field activities for 29 CFR 1910.120 requirements, medical surveillance program, CPR/first aid, and respirator fit testing.

13.1 HEALTH AND SAFETY LOGBOOK

The Site Health and Safety Coordinator will maintain a Field Logbook into which health and safety notations will be made. All monitoring data collected for health and safety purposes also will be included. At the completion of the site investigation (SI) activities, the Field Logbook and health and safety monitoring records will be placed into the project file to become part of the project record.

13.2 MEDICAL MONITORING

Copies of personnel medical fitness certifications will be retained in the project files. Any injury reports, monthly personal exposure records, and results of job-termination physicals will be retained in the project file and the personnel file.

13.3 VISITOR LOG

All visitors to the site will be required to sign an attendance sheet maintained by the Site Health and Safety Coordinator in the front of the HASP (field copy). The attendance sheets will be retained in the project file.

13.4 INCIDENT REPORTS

Incident reports will be prepared by the Site Health and Safety Coordinator using the WESTON Incident Reporting Forms contained in Attachment 7. Additional pages of supporting information may be submitted along with the standard forms. The originals will be submitted to the WESTON

Project Manager and Field Team Manager for review and/or action. Copies also will be included in the project file.

13.5 3M ACCESS

3M will have access to the project records, including those pertaining to site health and safety, during normal working hours.

ATTACHMENT 1 – CHEMICAL HAZARD DATA SHEETS

To Be Provided In Field Copy

ATTACHMENT 2 – OPERATING PROCEDURES (WESTON FIELD OPERATING PROCEDURES

LIST OF FIELD OPERATING PROCEDURES

Number	Title
FLD 01	NOISE PROTECTION
FLD 02	INCLEMENT WEATHER
FLD 05	HEAT STRESS PREVENTION AND MONITORING
FLD 06	COLD STRESS
FLD 07	WET FEET
FLD 09	HOT WORK
FLD 10	MANUAL LIFTING AND HANDLING OF HEAVY OBJECTS
FLD 11	ROUGH TERRAIN
FLD 12	HOUSEKEEPING
FLD 13	STRUCTURAL INTEGRITY
FLD 14	SITE SECURITY
FLD 15	REMOTE AREAS
FLD 18	OPERATION AND USE OF BOATS
FLD 19	WORKING OVER OR NEAR WATER
FLD 20	TRAFFIC
FLD 22	HEAVY EQUIPMENT OPERATION
FLD 28	EXCAVATING/TRENCHING
FLD 29	MATERIALS HANDLING
FLD 30	HAZARDOUS MATERIALS USE AND STORAGE
FLD 31	FIRE PREVENTION/PROTECTION/RESPONSE PLANS
FLD 32	FIRE EXTINGUISHERS REQUIRED AND REQUIREMENTS
FLD 34	UTILITIESCGENERAL
FLD 35	ELECTRICAL SAFETY
FLD 36	WELDING/CUTTING/BURNING

LIST OF FIELD OPERATING PROCEDURES
(Continued)

Number	Title
FLD 37	PRESSURE WASHING
FLD 38	HAND AND POWER HAND TOOLS
FLD 39	ILLUMINATION
FLD 41	STANDARD HAND AND EMERGENCY SIGNALS
FLD 43	BIOLOGICAL HAZARDS
FLD 44	BLOODBORNE PATHOGENS
FLD 45	HAZARDOUS WASTES BLOODBORNE PATHOGENS PLAN
FLD 46	CONTROL OF EXPOSURE TO LEAD
FLD 47	DRILLING SAFETY GUIDE
FLD 48	WESTON HAZARD COMMUNICATIONS PROGRAM

FLD 01 OCCUPATIONAL NOISE AND HEARING CONSERVATION

(Final revision 11/8/1999)

GENERAL

Noise is defined as unwanted sound. Noise can cause sudden traumatic temporary or permanent hearing loss, long term slowly occurring sensory-neural and irreversible hearing loss, disruption of communication, and masking of warning devices and alarms. Increased stress levels and effects on the cardiovascular and nervous systems have been documented as additional concerns.

The goal of this operating practice is to reduce and potentially eliminate hazardous levels of noise exposure.

REFERENCES

29 CFR 1910.95

RESPONSIBILITIES

Project Manager or Supervisor: The Project Manager or employee's supervisor shall ensure that WESTON and subcontract personnel under their control comply with the requirements of this procedure and have the necessary resources to assure compliance. The Project Manager or Supervisor will ensure that hazard assessment, monitoring and control procedures have been implemented.

Safety Officer: The safety officer (site, project or region) shall assist the Project Manager or Supervisor in understanding the technical requirements of this practice.

The Corporate Health and Safety (CHS) Director: The CHS Director or his designees (e.g., safety professionals, safety officers, division safety managers, or operations health and safety group) will provide assistance with interpretations of this practice. The CHS Director will ensure periodic evaluation of this operating practice through practice review and inspections.

Occupational Medical Provider (OMP): WESTON's OMP will assist in compliance with this practice through evaluation of clinics, verification of baseline exams and annual employee audiogram evaluation. The OMP will advise the Safety Officer and, if necessary, the CHS Director of any problems associated with medical compliance or occupationally related hearing loss in workers.

Employees: All affected employees are responsible for complying with the requirements of this practice. Any concerns or questions regarding compliance is to be brought the attention of the Safety Officer, the Project Manager, or the Supervisor.

Recognition and Risk Assessment

Employee noise exposure is expressed as an eight-hour time-weighted average (full shift exposure) in decibels (dB) on the "A-scale" (dBA). This number is to be compared to the Occupational Safety and Health Administration's Permissible Exposure Limit (PEL) which is an 8-hour time-weighted average (TWA) of 90 dBA, and the OSHA Action Level (AL) which is 85 dBA. Table G-16 in 29 CFR 1910.95 provides information regarding time-equivalent PELs.

The PEL is a limit which should not be exceeded, and the AL is a noise level threshold which when exceeded obligates the employer to establish a Hearing Conservation Program (HCP). The HCP includes baseline and annual hearing tests, and hearing conservation training. Whenever there is a reasonable possibility of employee noise exposure over 85 decibels, the affected employee is enrolled in the HCP.

The need for noise monitoring equipment, noise dosimeters or hearing protection devices must be addressed in the planning stages of a project. WESTON personnel and WESTON subcontractors are to wear hearing protection devices when required and where signs are posted requiring their use.

Some of the sources of noise at hazardous materials sites, demolition operations, construction and industrial sites which can cause hearing damage are: compressor motors, drill rig engines, hammer blows (such as from a split spoon), compressor motors, compressed air, and heavy equipment. Examples of approximate noise levels from various activities are as follows:

- Rock Drilling: up to 115 dBA
- Chain Saws: up to 125 dBA
- Abrasive Blasting: up to 110 dBA
- Heavy Equipment: 95 to 110 dBA
- Demolition: up to 117 dBA
- Needle Guns: up to 112 dBA
- Riveter/Chipper: up to 120 dBA
- Noisy Factory: up to 90 dBA
- Noisy Office: 70 to 80 dBA
- Conversational Speech: 60 dBA

Noise Evaluation and Surveillance Procedures

Noise exposure assessment is performed only by qualified personnel with properly calibrated and functional noise measuring equipment. If the HASP or the Safety Officer indicate that the site, or activity, requires an instrumentation survey then the area will be screened with an A-weighted sound level meter (Area Monitoring). If deemed necessary a more in depth evaluation utilizing a noise dosimeter may be performed (Personnel Monitoring). Both types of monitoring, if needed, will be accomplished in accordance with requirements established in 29 CFR 1910.95(d).

Long-term work efforts at fixed locations (e.g., water treatment plants, incinerators, etc.) will require an evaluation of noise levels utilizing instrumentation. Re-monitoring may be necessary when changes in equipment, processes or activities result in modification of the noise level.

If impact noise is present, the peak noise levels and the frequency of the impacts should be determined. Both OSHA and the American Conference of Governmental Industrial Hygienists (AGCIH) recommend certain limits to impact noise which depend on the noise intensity and frequency of the impacts. These resources and/or qualified personnel should be consulted if questions arise regarding impact or impulse noise.

Noise Control Methods

Engineering Controls

The primary means of reducing or eliminating personnel exposure to hazardous noise is through engineering controls. Engineering controls are defined as any modification or replacement of equipment, or related physical change at the noise source or along the sound transmission path that will reduce the noise level to the employees ear. Engineering controls include items such as; mufflers on heavy equipment or motors, sound baffles, and enclosures.

Administrative Controls

Administrative controls are defined as changes in the work schedule or operations which reduce noise exposure. These controls include increasing worker distance from the noise source and rotation of jobs so that time limits of exposure are reduced.

Administrative time control is not a preferable method for preventing noise exposure since extreme noise for a short duration can cause severe, permanent hearing loss. Administrative controls may be utilized in accordance with the TWA Tables (see 29 CFR 1910.95, Table G-16). Administrative controls may not be utilized for exposures greater than 115 dBA, regardless of the exposure time.

Hearing Protection

Hearing protection devices are utilized whenever engineering controls prove to be infeasible or cost prohibitive. Various types of ear muffs and ear plugs are available. Hearing protector attenuation is intended to reduce employee exposures below 85 dBA for employees with standard threshold shifts and below 90 dBA for all other employees.

Hearing protection devices are strongly recommended in any noisy environment, but are mandatory in the following situations:

- The eight hour average may equal or exceed 90 decibels.
- Any employee exposed to greater than or equal to 85 decibels and who have experienced a standard threshold shift (STS) in their hearing.
- Any noise equal to greater than 115 decibels impact, continuous or intermittent.
- Anywhere a “HEARING PROTECTION REQUIRED” sign is posted. These signs are to be posted in all mandatory situations listed above.

In the absence of sound level measuring instrumentation, any noise preventing normal vocal discussion between two individuals at arms length distance ("arms-length rule") will dictate the need for hearing protection. WESTON guidelines require the use of hearing protection on an immediate basis under the "arms-length rule". Exceptions may be granted based upon task and duration.

Not all hearing protection devices have the same noise reduction rating (NRR). Verification of all NNR values must be made by referring to the manufacturers' specifications.

The proper hearing protection is selected using results from a properly calibrated sound level meter in the following manner. The NRR of the device chosen is reduced by subtracting. Then this resulting number is subtracted from the noise level in dBA (for example: if the noise reading is 100 dBA, and the ear plugs selected have a NRR of 27. Subtracting 7 from 27 equals 20. Subtracting 20 from 100 equals 80. The attenuated sound level to the wearer is 80). Appendix B of 29 CFR 1910.95 provides information on attenuation adequacy using other monitoring devices or scales.

Hearing protection must attenuate employee exposure to an 8-hour TWA of 90 dBA or less. WESTON will strive to accomplish an attenuation of 85 dBA or less. For any employee diagnosed with a standard threshold shift, the attenuation must be 85 dBA or less.

Additional information regarding the selection, use, maintenance, and control of hearing protection devices is provided in the WESTON Personnel Protective Equipment Program.

Medical Surveillance

Compliance with the Hearing Conservation Program (HCP) component of 29 CFR 1910.95 is required whenever an employee's exposure to noise in excess of 85 dBA occurs. As such, field employees whose job descriptions require work with drill rigs, heavy construction equipment or noisy client operations would be candidates for the HCP and medical surveillance requirements thereof. Supervisors of any employees not meeting the categories above (e.g., treatment plant operations, print shop, maintenance personnel) are required to determine the need for those employees to participate in the HCP by performing noise surveys, and advise their safety officer who will in turn notify the Occupational Medical Provider.

WESTON's Occupational Medical Provider will make the final determination of employee involvement in the medical surveillance component of the HCP.

Audiometric testing is performed annually to evaluate the hearing of all individuals who are routinely exposed to 8 hour TWA exposures of 85 dBA or greater (including compliance with the "arms-length rule"). By evaluating the hearing of these individuals, the overall effectiveness of the Occupational Noise and Hearing Conservation Program can be systematically monitored. WESTON's Occupational Medical Provider is responsible for assuring local clinic compliance with the audiometric testing component of the standard.

Training

Initial and annual training shall be given to each employee included in the Hearing Conservation Program. Training will address the following:

The effects of noise on hearing.

- The purpose of hearing protection, advantages, disadvantages, attenuation of various types, and the selection, fitting, use, and care of protectors.

- The purpose of audiometric tests and explanation of test procedures.

- Recognition of hazardous noise.

WESTON's initial and refresher courses under 29 CFR 1910.120 (Hazwoper) are utilized to deliver these training obligations. Alternative training will be given to employees who are included in the HCP but who are not trained in accordance with Hazwoper requirements,.

Program Evaluation

Periodic program evaluations will be conducted to assess compliance with 29 CFR 1910.95 and this operating practice. The CHS Director (or his designee) is responsible for reviewing this practice on an annual basis. WESTON's Occupational Medical Provider is responsible for assisting in this evaluation by providing information relative to employee exposure and medical surveillance data.

Recordkeeping

Employee exposure measurements are retained for a minimum of two years and audiometric test records are retained for the duration of the employee's employment, plus thirty years.

FLD 02 INCLEMENT WEATHER
GENERAL

REFERENCES

Related FLD OPS:

FLD05 – Heat Stress Prevention and Monitoring
FLD06 – Cold Stress
FLD25 – Working at Elevations
FLD26 – Ladders
FLD27 – Scaffolds

PROCEDURE

Hot weather (ambient temperatures over 70°F), cold weather (ambient temperatures below 40°F), rain, snow, ice, and lightning are examples of inclement weather that may be hazardous or add risk to work activities. Heat stress and cold stress are covered under separate operating procedures.

Extremes of heat, cold, and humidity, as well as rain, snow, and ice, can adversely affect monitoring instrument response and reliability, respiratory protection performance, and chemical protective clothing materials.

Heat

Additional examples and protection from heat stress are addressed in WESTON Safety Procedure FLD05. Hot, dry weather increases risk of soil drying, erosion, and dust dispersion, which may present or increase risk of exposure and environmental impact from toxic hazards. Hot weather will increase pressure on closed containers and the rate of volatilization, thereby potentially increasing the risk of exposure to toxic, flammable, or explosive atmospheres.

Rain, Wet Weather, and High Humidity

Rain and wet conditions increase slipping and tripping hazards, braking distances of vehicles, and the potential for slippage or handling difficulties for devices such as augers and drills. Rain fills holes, obscures trip and fall hazards, and increases risk of electrical shock when working with electrical equipment. Changes in soil conditions caused by rain can impact trenching and excavating activities, creating the potential for quicksand formation, wall collapse, and cave-in. Vehicles become stuck in mud, and tools and personnel can slip on wet surfaces.

Rain and wet conditions may decrease visibility (especially for personnel wearing respiratory protection) and limit the effectiveness of certain direct-reading instruments (e.g., photoionization detectors [PIDs]).

Cold, Snow, and Ice

In addition to cold stress, which is covered in WESTON field procedure FLD06, cold weather affects vehicle operation by increasing difficulty in starting and braking. Ice, frost, and snow can accumulate on windows and reduce vision.

Cold, wet weather can cause icing of roadways, driveways, parking areas, general work places, ladders, stairs, and platforms. Ice is not always as obvious to see as snow or rain, and requires special attention, especially when driving or walking.

Snow and ice increase the risk of accidents such as slipping when walking, climbing steps and ladders, or working at elevation, and the risk of accidents when driving vehicles or operating heavy equipment. Heavy snow and ice storms may cause electric lines to sag or break, and the use of electrical equipment in snow increases the risk of electric shock. Snow can hide potholes and mud, which can result in vehicles getting stuck or persons falling when stepping into hidden holes. Snow also may cover water, drums or other containers, sharp metal objects, debris, or other objects that can cause falls or punctures.

Personnel performing activities that require working over ice should be aware of minimal ice thickness safety guidelines as follows:

- 4-inch minimum: activities such as walking or skating.
- 6-inch minimum: activities such as snowmobiling or the use of equipment with the same weight and cross-sectional area as a snowmobile.

Personnel should always be aware that these measurements are under ideal conditions and that snow cover, conditions on rivers, ponds, or lakes with active currents, and other environmental factor impact the safety of working on ice. Clear ice typically is the strongest, while ice that appears cloudy or honeycombed is not as structurally strong. Measurements made by drilling or cutting through the ice should be made every few feet to verify safe conditions. Under no circumstances should WESTON personnel operate motor vehicles such as cars or trucks on ice.

Provisions for rescue (e.g., ladders or long poles and effective communications) must be available at the work site.

Lightning

Lightning represents a hazard of electrical shock that is increased when working in flat open spaces, elevated work places, or near tall structures or equipment such as stacks, radio towers, and drill rigs. Lightning has caused chemical storage tank fires and grass or forest fires. Static charges associated with nearby electrical storms can increase risk of fire or explosion when working around flammable materials, and can adversely affect monitoring instruments.

Recognition and Risk Assessment

Few Occupational Safety and Health Administration (OSHA) regulations apply to the conditions covered in this procedure; however, under specific standards (e.g., Construction Industry, Subpart P, Excavations) and the OSHA General Duty Clause, inclement weather hazards must be addressed in safety programs.

Heat, rain, cold, snow, ice, and lightning are natural phenomena that complicate work activities, and add or increase risk. The potential for physical hazards must be considered for tasks that expose personnel to inclement weather. Risk assessment can be accomplished during the planning stages of a project by developing a task risk analysis for the most likely inclement weather conditions that may be encountered, i.e., rain and lightning in late spring, summer, and early fall, or lightning prone areas; cold, snow, and ice in winter. The SHSC must make decisions on the proper safety procedure and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

A pre-site activity risk assessment must be completed when inclement weather occurs. Weather conditions that affect instruments and PPE function must be conveyed to site workers. All personnel should monitor function and integrity of PPE and be alert to changing weather conditions. A decision must be made on the proper safety procedures to use if work must continue, or to stop work if the risk is too great. The Appropriate Safety Professional **must be notified of all instances of the need to stop work for safety reasons, including inclement weather**.

Prevention and Protection Programs

Procedures applicable to inclement weather include the following:

Monitoring equipment and PPE must be maintained in proper working order and used according to manufacturers' instructions.

Walkways, stairs, ladders, elevated workplaces, and scaffold platforms must be kept free of mud, ice, and snow.

Vehicles used in rain or cold weather must have windshield wipers and defrosters, and windows must be kept clear of obstruction.

Employees must be protected from airborne contaminants using engineering controls such as wetting dry soil to prevent particle dispersion, and providing local ventilation to reduce volatile air contaminants to safe levels, or if engineering controls are infeasible, using prescribed personal protective equipment (PPE).

Required conformance with traffic laws, including maintaining speed within limits safe for weather conditions, and wearing seat belts at all times.

Using a walking stick or probe to test footing ahead of persons walking where there is standing water, snow, or ice to protect the walker against stepping into potholes or onto puncture hazards, buried containers, or other potential structurally unsound surfaces.

Prior to using vehicles or equipment in off-road work, walking the work area or intended travelway when puddles or snow may obscure potholes, puncture hazards, or buried containers, or other potential structurally unsound surfaces.

Arranging to have winches, come-alongs, or other mechanical assistance available when vehicles are used in areas where there is increased risk of getting stuck. Cable or rope and mechanical equipment used for pulling stuck vehicles must be designed for the purpose, of sufficient capacity for the load, and be inspected regularly and before use to ensure safety. **Manually pushing stuck vehicles is to be avoided**.

Monitoring wind shifts and velocity where change may result in dispersion of airborne contaminants into work area.

Prior to working in areas or beginning projects during times when there is an increased likelihood of lightning or the potential for lightning striking personnel, steps must be taken to predict the occurrence of lightning strikes, including:

a) Checking with client management to determine if there is any pattern or noted conditions that predict lightning or if there are structures that are prone to lightning strikes. Arrange for client notification when there is increased potential for lightning activities. Ensure that clients include WESTON workers in lightning contingency plans.

b) Monitoring weather reports.

c) Noting weather changes and conditions that produce lightning.

d) Stopping work in open areas, around drill rigs or other structures that may attract lightning, on or in water and in elevated work places when lightning strikes are sighted or thunder is heard near a work site.

e) Ensuring all personnel are provided with safe areas of refuge. Keep personnel from standing in open areas, under lone trees, or under drill rigs.

FLD 05 HEAT STRESS PREVENTION AND MONITORING

Return to top

GENERAL

Heat stress may occur at any time work is performed at elevated temperatures. Wearing chemical protective clothing often decreases natural body heat loss and increases the risk of heat stress.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur, with symptoms ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration or dexterity) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventive measures are vital to ensure worker safety.

Employees who are taking prescription or over-the-counter medications should consult with their personal physician prior to working in high-temperature environments.

REFERENCES

OSHA 29 CFR 1910 and 1926

Related FLD OPS:

FLD02 – Inclement Weather
FLD03 – Hot Processes – Steam
FLD08 – Confined Space Entry
FLD36 – Welding, Cutting and Burning
FLD37 – Pressure Washing

APPENDICES

A Common Heat Stress Disorders and Their Prevention and Treatment

PROCEDURE

Recognition and Risk Assessment

In the planning stages of a project, the potential for heat stress disorders must be considered as a physical hazard in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely heat stress disorders that may occur.

The SHSC must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great. In addition, all site personnel must be aware of these symptoms in both themselves and their co-workers.

Four common heat stress disorders and their associated prevention and treatment methods are provided in Appendix A.

Prevention and Protection Programs

Heat stress is affected by several interacting factors including, but not limited to, age, obesity, physical condition, substance abuse, level of personal protective equipment worn, and environmental conditions (temperature, shade, and humidity). Site workers must learn to recognize and treat the various forms of heat stress. The best approach is preventive heat stress management such as the examples given below.

Have workers drink 16 ounces of water before beginning work, at established breaks, and in the morning or after lunch. The body's normal thirst mechanism is not sensitive enough to ensure body fluid replacement, therefore, pre- and post-work fluid intake is necessary. Under heavy work and heat conditions, the body may lose up to 2 gallons of fluids per day. In order to prevent heat stress symptoms, the individual must ensure replacement of this moisture.

Provide disposable cups that hold about 4 ounces, and water that is maintained at 50 to 60°F. Have workers drink 16 ounces of water before beginning work, and a cup or two at each break period. Provide a shaded area for rest breaks. Discourage the intake of caffeinated drinks during working hours. Monitor for signs of heat stress.

Encourage workers to maintain a good diet during these periods. In most cases, a balanced diet and lightly salted foods should help maintain the body's electrolyte balance. Bananas are especially good for maintaining the body's potassium level. The most important measure to prevent heat-related illness is adequate fluid intake. Workers should drink 1/2 to 1 quarts of liquids per hour in high heat conditions. Most of this liquid should be water.

If utilizing commercial electrolyte mixes, double the amount of water called for in the package directions. Indications are that "full-strength" preparations taken under high heat stress conditions may actually decrease the body's electrolytes.

Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin work activities with extremely demanding tasks. Rotate shifts of workers who are required to wear impervious clothing in hot weather. In extremely hot weather, conduct field activities in the early morning and evening.

Provide cooling devices to aid natural body heat regulation. These devices, however, add weight and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear, which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.

Ensure that adequate shelter is available to protect personnel against heat and direct sunlight, which can decrease physical efficiency and increase the probability of heat stress. If possible, set up the command post in the shade.

Good hygienic standards must be maintained by frequent showering and changes of clothing. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

Heat Stress Monitoring and Work Cycle Management

When strenuous field activities are part of on-going site work conducted in hot weather, the following guidelines should be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures should be instituted when the temperature exceeds 70°F and the tasks/risk analysis indicates an increased risk of heat stress problems. Consult the HASP and a safety professional (e.g., Division safety manager, safety officer) if questions arise as to the need for specific heat stress monitoring. In all cases, the site personnel must be aware of the signs and symptoms of heat stress and provide adequate rest breaks and proper aid as necessary.

Measure Heart Rate – Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the rest period. The heart rate at the beginning of the rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats per minute.

Measure Body Temperature – When ambient temperatures are over 90°F, body temperatures should be measured with a clinical thermometer as early as possible in the rest period. If the oral temperature exceeds 99.6°F (or 1 degree change from baseline) at the beginning of the rest period, the following work cycle should be shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6°F (or 1 degree change from baseline). Under no circumstances should a worker be allowed to work if their oral temperature exceeds 100.6°F.

Measure Body Water Loss – Body water loss greater than 1.5% of total body weight is indicative of a heat stress condition. Body weight is measured before personal protective equipment (PPE) is donned and after the PPE is removed following a work cycle. Body water loss can be measured with an ordinary bathroom scale, however, the scale must be sensitive to one-half pounds increments. A worker is required to drink additional fluids and rest if their body water loss is greater than 1.5%.

Note: For purposes of this operating practice, a break is defined as a 15-minute period and/or until an individual's vital signs are within prescribed guidelines.

A physiological monitoring schedule is determined by following the steps below:

Measure the air temperature with a standard thermometer.

Estimate the fraction of sunshine by judging what percent the sun is out (refer to Table 1).

Calculate the adjusted temperature based on the following formula:

Adjusted Temperature = Actual Temperature + 13 X
(fraction of the percent sunshine factor)

Using Table 2, determine the physiological monitoring schedule for fit and acclimated workers.

The length of work period is governed by frequency of physiological monitoring (Table 2). The length of the rest period is governed by physiological parameters (heart rate and oral temperature). For example, site personnel anticipate wearing level C (impermeable clothing) during site activities.

The air temperature is 80°F and there are no clouds in the sky (100% sunshine). The adjusted temperature is calculated in the following manner:

Adjusted Temperature (Adj T °F) = Actual Temperature (Amb T °F) + (13 x fraction of the percent sunshine factor).
Adj T °F = 80°F + (13 x 1.0)
Adj T °F = 93°F

Using Table 2, the pulse rate, oral temperature and body water loss monitoring would be conducted after each 60 minutes of work. The adjusted temperature may need to be redetermined if the percent sunshine and ambient temperature changes drastically during site work.

If an individual's heart rate exceeds 110 beats per minute at the beginning of the rest period, that individual will continue to rest until his or her heart rate drops to baseline; the next work period is then decreased by 33%.

PERCENT SUNSHINE FACTORS
HEAT STRESS PREVENTION AND MONITORING

Percent Sunshine (%)	Cloud Cover	Sunshine fraction
100	No cloud cover	1.0
50	50% cloud cover	0.5
0	Full cloud cover	0.0

TABLE 2

PHYSIOLOGICAL MONITORING SCHEDULE
HEAT STRESS PREVENTION AND MONITORING

Adjusted Temperature	Level D (Permeable clothing)	Level C, B, or A (Nonpermeable clothing)
90^{o}F (32.2^{o}C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5^{o}F (30.8^{o}-32.2^{o}C)	After each 60 minutes of work	After each 30 minutes of work
82.5^{o}-87.5^{o}F (28.1^{o}-32.2^{o}C)	After each 90 minutes of work	After each 60 minutes of work
77.5^{o}-82.5^{o}F (25.3^{o}-28.1^{o}C)	After each 120 minutes of work	After each 90 minutes of work
72.5^{o}-77.5^{o}F (22.5^{o}-25.3^{o}C)	After each 150 minutes of work	After each 120 minutes of work

Revised 11/1999

APPENDIX A

COMMON HEAT STRESS DISORDERS AND THEIR PREVENTION AND TREATMENT

Heat Rash

Heat rash is caused by continuous exposure to heat and humidity, and is aggravated by chafing clothes. The condition decreases an individual's ability to tolerate heat and can be extremely uncomfortable.

Symptoms – Mild red rash, especially in areas of the body that come into contact with protective gear.

Treatment – Decrease amount of time spent working in protective gear and provide body powder to help absorb moisture and decrease chafing.

Heat Cramps

Heat cramps are caused by inadequate electrolyte intake. The individual may be receiving adequate water, however, if not combined with an adequate supply of electrolytes, the blood can thin to the point where it seeps into the active muscle tissue, causing cramping.

Symptoms – Acute painful spasms of voluntary muscles, most notably the abdomen and extremities.

Treatment – Move the victim to a cool area and loosen clothing. Have the victim drink 1 to 2 cups of lightly salted water or diluted commercial electrolyte solution immediately, and then every 20 minutes thereafter until symptoms subside. Electrolyte supplements can enhance recovery (e.g., Gatorade, Quench) however, it is best to double the amount of water required by the dry mix package directions or add water to the liquid form.

Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.
Symptoms – Pale, clammy, and moist skin, profuse perspiration, and extreme weakness. Body temperature is normal, pulse is weak and rapid, and breathing is shallow. The person may have a headache, may vomit, and may feel dizzy.

Treatment – Move the victim to a cool, air-conditioned or temperature-controlled area, loosen clothing, place in a position with the head lower than the feet (shock prevention), and allow the victim to rest. Consult a physician, especially in severe cases. Have the victim drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside.

Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the body's heat regulating mechanisms, i.e., the individual's temperature control system (sweating) stops working correctly. Body temperature rises so high that brain damage and death may result if the person is not cooled quickly.

Symptoms – Red, hot, dry skin (although the person may have been sweating earlier); nausea, dizziness, confusion, extremely high body temperature, rapid respiratory and pulse rate, unconsciousness or coma.

Treatment – Remove the victim from the source of heat and cool the victim quickly. If the body temperature is not brought down quickly, permanent brain damage or death may result. Soak the victim in cool (not cold) water, sponge the body with cool water, or pour water on the body to reduce the temperature to a safe level (less than 102°F). Monitor the victim's vital signs and obtain immediate medical help. Do not give the victim coffee, tea, or alcoholic beverages.

FLD 06 COLD STRESS

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GENERAL

REFERENCES

Related FLD OPS:

FLD02 – Inclement Weather
FLD07 – Wet Feet
FLD15 – Remote Areas
FLD17 – Diving
FLD18 – Using Boats
FLD19 – Working Over Water
FLD25 – Working at Elevations

PROCEDURE

Persons working outdoors in low temperatures (below 40°F), and especially at or below freezing, are subject to cold stress. Exposure to extreme cold for a short time can cause severe injury to the surface of the body, or result in profound generalized cooling which, unchecked, could ultimately cause death. Areas of the body that have high surface-area-to-volume ratios, such as fingers, toes, and ears, are the most susceptible.

Chemical protective clothing generally does not afford protection against cold stress. In many instances, it increases susceptibility. Chemical hazard site workers must learn to dress carefully to provide both chemical protection and thermal insulation while not dressing so warmly that exercise or strenuous activity will result in cold stress.

Body heat is conserved through the constriction of surface blood vessels. This constriction reduces circulation at the skin layers and keeps blood nearer the body core.

Loss of body heat can occur through:

1. Respiration – In extreme cold, cover the mouth and nose with wool or fur to "pre-warm" the air you breath.

2. Evaporation – Wear layered clothing, and remove outer layers prior to overheating to avoid soaking clothing with perspiration. Replace layers prior to becoming chilled. Wear clothing that will "breath" or allow water vapor to escape to reduce the cooling effect of evaporation.

3. Conduction – Sitting on snow, touching cold equipment, and working in the rain are examples of how heat can be lost by conduction. A great deal of body heat is lost rapidly when a person becomes wet. Hypothermia from immersion in water has resulted in death at temperatures of 40°F or lower. Perspiration or rain should never be allowed to saturate clothing; such soaking will seriously reduce the insulative properties of the clothing, in addition to increasing heat loss. Most clothing loses approximately 90 percent of its insulating properties when wet.

4. Radiation – The greatest amount of body heat is lost from uncovered surfaces of the body, especially the head, neck, and hands. Covering these areas is, therefore, extremely important.

5. Convection – The body continually heats a thin layer of air next to the skin. As long as this warm air is retained next to the body, it will remain warm. If this warm air is removed by air currents (wind), the body will be cooled attempting to rewarm the surface air. The primary function of clothing is to retain this warm surface layer of air while allowing water vapor to pass through. Ensure that clothing remains secure around the body, especially at the neck and waist. Wind chill or equivalent chill temperature indices describe the chilling effect of moving air in combination with low temperature.

Two major factors that influence the potential of cold injury are ambient temperature and wind velocity. The term wind chill is used to describe the chilling effect of moving air in combination with low temperature. Additionally, water conducts heat 240 times faster than air; thus, the body cools suddenly when protective equipment is removed if the clothing underneath is perspiration-soaked.

Tables 1 and 2 should be consulted to adjust working schedules for wind chill conditions. These tables are meant as guides only; ambient temperatures and wind conditions should be monitored frequently and work schedules adjusted as required. Workers' physical symptoms or condition will also be an indicator of the need to modify work schedule.

Recognition and Risk Assessment

In the planning stages of a project and safety plan, the potential for cold stress disorders must be considered as physical hazards in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely cold stress disorders which may occur. The SHSC must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great. Two common cold stress disorders and treatment methods are identified below.

Frostbite

Local injury resulting from cold is included in the generic term frostbite. By definition, frostbite is the freezing of tissue, however, several stages are recognized, based on the degree of injury.

Frostbite most commonly affects the toes, fingers, and face, and occurs when an extremity loses heat faster than it can be replaced by the circulating blood. Frostbite may also result from direct exposure to extreme cold or high wind, as happens with the nose, ears, and hands. Feet may freeze because of the conduction of heat away from the skin's surface caused by damp socks and shoes.

Frostbite of the extremities can occur in three forms:

- Frost nip or incipient frostbite is characterized by sudden blanching or whitening of skin.
- Superficial frostbite is characterized by skin with a waxy or white appearance that is firm to the touch, but the tissue beneath is resilient.
- Deep frostbite is characterized by tissues that are cold, pale or darkened, and solid.

Treatment for frostbite:

- Move the victim indoors and/or away from additional exposure to cold, wet, and wind.
- Superficially frostbitten areas are best warmed by placing them next to warm skin. The basic tenant to rewarming frostbitten areas is to not raise the temperature much above that of the body. The abdomen and the armpit are body areas that can be used to rewarm frostbitten areas. Water at 99° to 104°F can be used. Avoid the use of fires, hot water, or external heaters to warm frostbitten areas.
- Give a warm drink (water or juices, **not** coffee, tea or alcohol). Do not allow the victim to smoke.
- If using water to rewarm the affected areas, keep the frozen parts in warm water until all paleness has turned to pink or burgundy red, but no longer. Remember, the tissue will be very painful as it thaws.
- After rewarming, elevate the area and protect it from further injury.
- Do not break blisters.
- Use sterile, soft, dry material to cover the injured areas.
- Keep victim warm and obtain medical care as necessary.
- Do **not** rub the frostbitten part (this may cause gangrene).
- Do **not** use ice, snow, gasoline or anything cold on the frostbitten area.
- Do **not** use heat lamps or hot water bottles to rewarm the frostbitten area.
- Do **not** place the frostbitten area near a hot stove.

Hypothermia

Systemic hypothermia occurs when body heat loss exceeds body heat gain and the body core temperature falls below the normal 99°F. While many hypothermia cases are caused by extremely cold temperatures, most cases develop in air temperatures between 30° and 50°F, especially when compounded with water immersion or soaking, and windy conditions.

Remember that the victim of hypothermia may not know, or refuse to admit, that he or she is experiencing hypothermia. All personnel must be observant for these signs for themselves and for other team members. Hypothermia can include one or more of the following symptoms.

- Uncontrollable shivering.
- Vague, slow, slurred speech.
- Irrational actions.
- Memory lapses.
- Incoherence.
- Fumbling hands, frequent stumbling, lurching gait.
- Apathy, listlessness, and sleepiness' inability to get up after resting.
- Unconsciousness, glassy stare, slow pulse and slow respiration.
- Death.

Below the critical body core temperature of 95°F, the body cannot produce enough heat by itself to recover. At this point, emergency measures must be taken to reverse the drop in core temperature. The victim may slip into hypothermia in a matter of minutes and can die in less than 2 hours after the first signs of hypothermia are detected. Treatment and medical assistance are critical.

Treatment for hypothermia:

- Prevent further heat loss by moving the person to a warmer location out of the wind, wet, and cold.

- Remove cold, wet clothing. If necessary, based upon the victim's condition, external sources of heat (e.g., warm blankets, warm water baths, or body contact) may be necessary to rewarm the victim.

- If the victim is conscious, provide warm liquids, candy, or sweetened foods. Carbohydrates are the food most quickly transformed into heat and energy. Do not give alcohol or caffeine.

- Keep the victim awake, monitor ABCs, perform first aid as appropriate, and obtain medical assistance soon as possible.

Prevention and Protection Programs

Site workers must learn to recognize and treat the various forms of cold stress. The best approach is preventive cold stress management, such as the following:

- Wear loose, layered clothing, masks, woolen scarves, and hats in extreme cold weather.

- Keep clothes dry by wearing water and wind resistant clothing and footwear.

- Eat well-balanced meals, ensure adequate intake of liquids and avoid alcoholic beverages. Dehydration increases risk of cold stress.

- Have warm shelter available and implement work-rest schedules.

- Monitor yourself and others for changes in physical and mental condition.

- If wearing a face protector, remove it periodically to check for frostbite.

- Never touch cold metal with bare hands.

The following guidelines should be used when working in air temperatures below 40°F.

- When cold surfaces below –7°C (19.4°F) are within reach, a warning should be given to each worker by the SHSC to prevent inadvertent contact by bare skin.

- If the air temperature is –17.5°C (0°F) or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.

Provisions for additional total body protection are required if work is performed in an environment at or below 4°C (39.2°F). Workers should wear cold-protective clothing appropriate for the level of cold and physical activity:

- If the air velocity at the job site is increased by wind, draft, or artificial ventilation, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

- If only light work is involved and if the worker's clothing may become wet on the job site, the outer layer of the clothing in use may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outerwear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, the employee should make sure that clothing is not wet as a consequence of sweating. If clothing is wet, the employee should change into dry clothes before entering the cold. Workers should change socks and any removable felt insoles at regular daily intervals, or use vapor barrier boots. The optimal frequency of change should be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

- Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 4°C (39.2°F) should take special precautions to avoid soaking clothing or gloves with the liquid because of the added danger of cold injury due to evaporative cooling.

Work/Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below –7°C (19.4°F), heated warming shelters, tents, cabins, and break rooms should be made available nearby. Workers should be encouraged to use these shelters at regular intervals, frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When

entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation, or the worker should change into dry clothing to avoid returning to work in wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in a cold environment and may increase the susceptibility of workers to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid replacement. The intake of caffeinated drinks should be limited because of the diuretic and circulatory effects.

For work practices at or below –12°C (10.4°F) ECT, the following should apply:

- The worker should be under constant protective observation (buddy system or supervision).

- The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work must be done, rest periods must be taken in heated shelters and opportunities to change into dry clothing should be provided.

- New employees should not be required to work full-time in the cold during the first days of employment until they become accustomed to the working conditions and the use of required protective clothing.

- The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.

- The work should be arranged in such a way that sitting or standing still for long periods is minimized. The worker should be protected from drafts to the greatest extent possible.

- The workers should be instructed in safety and health procedures. The training program should include, as a minimum, instruction in:

  - Proper rewarming procedures and appropriate first aid treatment.

  - Proper use of clothing.

  - Proper eating and drinking habits.

  - Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body, even when shivering does not occur.

  - Safe work practices.

Table 1

Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature*

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

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

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Table 2

Cold Work/Warmup Schedule for 4-Hour Shifts,

EQUIVALENT CHILL TEMPERATURE	MAXIMUM WORK PERIOD	NO. OF BREAKS
≥-24°F	Normal	1
-25° to –30°F	75 minutes	2
-31° to –35°F	55 minutes	3
-36° to –40°F	40 minutes	4
-41° to –45°F	30 minutes	5
≤-46°F	Stop work	Stop work

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GENERAL

REFERENCES

Related FLD OPS:

FLD05 – Heat Stress Prevention and Monitoring
FLD06 – Cold Stress

PROCEDURE

Under both hot and cold stress conditions, feet that become wet and are allowed to remain wet can lead to serious problems. Trench foot, paddy foot, and immersion foot are terms associated with foot ailments resulting from feet being wet for long periods of time. All have similar symptoms and effects. Initial symptoms include edema (swelling), tingling, itching, and severe pain. These may be followed by more severe symptoms including blistering, death of skin tissue, and ulceration.

Recognition and Risk Assessment

In the planning stages of a project and safety plan, the potential for wet feet must be considered as a physical hazard. Risk assessment can be accomplished in part in the development stages of a project by listing in the Health and Safety Plan (HASP), the most likely task where wet feet may occur. These tasks could include extended work in chemical protective clothing and wading during biological assessments. The SHSC must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

Prevention and Protection Program

Prevention methods are required when work is performed in wet conditions or when conditions result in sweating, causing the feet to become and remain wet. Proper hygiene is critical. Workers must dry their feet and change socks regularly to avoid conditions associated with wet feet. Use of foot talc or powder can additionally assist in prevention of this type of condition.

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GENERAL

REFERENCES

Related FLD OPS:

FLD05 – Heat Stress Prevention and Monitoring
FLD06 – Cold Stress

PROCEDURE

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FLD 09 HOT WORK

GENERAL

Tasks that produce heat, sparks, or energy sufficient to serve as an ignition source (i.e., hot work) may not begin in any work location that could potentially have ignitable atmospheres until a Hot Work Protection Procedure has been instituted and a Hot Work Permit has been issued. Examples of hot work include welding, cutting, burning, soldering, grinding, use of power tools, and use of internal combustion engines.

PROCEDURE

Many operating facilities or clients will have their own internal hot work permitting practices. WESTON will use whichever is more conservative. The Site Manager and the Site Health and Safety Coordinator (SHSC) must approve the use of a client's hot work permitting procedures.

The Site Health and Safety Coordinator is responsible for issuing hot work permits. Permits must be reissued at the beginning of each day, or each work shift. Expired hot work permits must be submitted to the Site Manager for his review prior to being retained as part of the site or project file. The Site Manager will note any incidents or near-incidents involving hot work during his review of the expired permits, and contact the corporate Health and Safety Director with recommendations for modifications of this procedure, if necessary.

The Site Manager is responsible for inspecting the site, determining the need for a Hot Work Permit Procedure, and ensuring that workers at the site are notified and instructed of the requirement for, need for, and procedures for obtaining hot work permits.

A fire-watch is required for every activity where hot work could result in other than a minor fire due to ignition of combustibles. Fire extinguishing equipment commensurate with the ignitable material and training level of the fire-watch must be immediately available at the hot work location.

A combustible gas meter must be used to survey the hot work location and then must be left to constantly monitor the air between the flammable material and the immediate vicinity of the hot work. A survey of the area to identify any atmospheric conditions that may be toxic or that could be decomposed by the hot work.

Welding or cutting on closed systems such as tanks and pipelines must be specifically approved by the appropriate safety professional.

HOT WORK PERMIT

The Site Manager and the Site Health and Safety Coordinator have surveyed the site and found the following Hot Work conditions exist and will require permitting at _____

CONDITION	YES	NO	CONDITION	YES	NO
Welding			Electrical equipment, fixed		
Cutting			Electrical equipment, portable		
Use of power tools			Electrical equipment, hand-held		
Space heaters			Others		

PRE-WORK CHECKLIST All items must be completed for Permit to be valid	YES	NO	N/A
Work area inspected by SSO prior to hot work beginning?			
Fire-watch established? Name: _____			
Fire extinguisher appropriate for media/readily accessible?			
Work area clear of all trash and combustible debris/equipment properly grounded?			
Area in which hot work is to be performed has been monitored for combustible atmosphere?			
Will combustible gas indicator(s) be used constantly during hot work?			
If no, why?:			
List additional personal protective equipment worn:			
Welding or cutting on closed systems prohibited?			
Closed system cutting procedures?			

Date ____/____/____ Time ____:____ Permit Expiration Time ____:

Certification of SHSC that hot work may commence **Yes** ☐ No ☐ N/A ☐

Signature: _____

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HOT WORK TEAM SIGN-OFF		
I/we have read and understand the terms of the above **Hot Work Permit**.		
NAME (PLEASE PRINT CLEARLY)	SIGNATURE	DATE/TIME (24 HR.)

CERTIFICATION OF SHSC THAT THE HOT WORK AREA HAS BEEN SHUT DOWN AND THAT NO IGNITION POTENTIAL EXISTS: _____

Time: _____. Must be reinspected and signed **no earlier** than 30 minutes **after** all hot work has been completed.

FLD 10 MANUAL LIFTING AND HANDLING OF HEAVY OBJECTS

GENERAL

PROCEDURE

Improper lifting can result in cuts, pinches, crushing, and serious injury to back, abdomen, arm and leg muscles, and joints. Even relatively light objects, lifted improperly, can contribute to injury.

Cuts, Pinching, and Crushing

Splinters, slivers, and sharp edges on objects to be lifted can result in cuts. Heavy objects can pinch or crush fingers, toes, arms, and legs between the object and nearby objects (e.g., walls, tables, counters, or railings).

Muscle and Joint Injuries

Muscle and joint injuries occur when objects to be lifted are too heavy or awkward, are lifted improperly, or in areas where access is restricted.

Lifting tasks which are awkward and repetitive, even if involving only light objects, can lead to nerve and joint damage.

~~Recognition and Hazard Assessment~~

The need for manual lifting must be identified as a physical hazard when project tasks specifically require manual handling or use of heavy equipment, and the following safe lifting techniques must be instituted:

- Plan any lifting task, noting:
  - **Contact hazards**. Check each object before lifting for presence of splinters, slivers, sharp edges or parts, cracks and loose joints, signs of biological hazards, and chemical or radioactive material contamination.
  - **Weight of object**. Unless involved in weight training, recommended safe lifting weights for an average man or woman are 50 and 35 pounds, respectively.
  - **Size and shape of object**. Large and oddly shaped objects are more difficult to lift, even within safe weight limits, due to imbalanced center of gravity.
  - **Area in which lifting is to be done.** Check for pinch points such as other objects close by and ensure there is room for safe lifting.
  - **Conditions under which lifting is to be accomplished.** Check for wet or slippery surfaces. Also consider level of protection to be used. Level B or A protection may add up to 40 lbs. To be lifted, as well as restricting range of motion and adding to area restriction by increasing bulk.

- **Route to be traveled, if lifting includes carrying.** Check walking and working surfaces for slip and trip hazards, note ramps, changes in level of elevation, and ladders or stairways that need to be negotiated.

Prevention and Protection Programs

- Before lifting, identify the potential for contact hazards on objects to be lifted. Check each object before lifting, remove any noted hazards as feasible, and wear gloves (cotton, at a minimum, or leather, kevlar, or chemical resistant material, depending on the nature of the hazard).

- Avoid contact with, or cover cracks or loose joints to reduce hazards of pinching.

- Workers must know their lifting limitations, plan before lifting, keep themselves in good physical condition, and get help if uncertain that they can lift safely. Managers must plan and allow for safe lifting.

- When lifting an object from the floor:

  - Determine that the object is within the safe weight limit.

  - Check for contact hazards.

  - Walk the intended route of travel to identify and remove slip and fall hazards.

  - Identify changes in elevation, steps, ramps, stairs and ladders that must be negotiated.

- To lift square or rectangular objects:

  - Avoid reaching as you lift.

  - Set feet firmly, placing one foot alongside the load and the other slightly behind the load.

  - Keep objects close to the body.

  - Squat in front of the load.

  - Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.

  - Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight and tuck in the chin.

  - Straighten the legs, keeping the spine straight, pull the object into the body and stand up slowly and evenly without jerking or twisting.

  - If turning or change of direction is required, turn with feet without twisting the torso and step in the direction of travel

- To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.

Workers must be trained and have the opportunity to use the above steps with lighter objects before performing heavy lifting. **For odd-shaped objects, the only modification needed should be hand-hold position**. When two or more persons are lifting, have a plan and a set of signals so lifting occurs simultaneously.

Do not carry objects in a manner which obstructs vision in the line of travel.
Carry objects so one hand is free to hold the handrail on stairs and that there is an unobstructed view of footing. Carry objects in a manner to permit use of both hands while climbing a ladder.

Manual Handling of Heavy Objects

Hazard

Manual maneuvering or handling of heavy objects without actually lifting is often required for hazardous materials and on Resource Conservation and Recovery Act (RCRA) facilities and construction sites. Manual handling of heavy objects, even when not actually lifting, can pose the same hazards as lifting including cuts, pinches, bruises, crushing, muscle and joint strain, and contact with hazardous materials and biological hazards.

Recognition and Risk Assessment

The need for manual handling of heavy objects must be addressed in the planning stages of a project Health and Safety Plan (HASP). Drums and other containers which must be maneuvered for access to information or sampling locations, that are inaccessible to mechanical handling equipment, require manual handling and special precautions. When handling of heavy objects does not actually involve lifting, workers can handle heavier objects, even those weighing several hundred pounds, safely if proper techniques are used. In many instances, the procedures involve balancing and taking advantage of the shape of the object.

Prevention and Protection Programs

Prior to performing manual handling, it must be determined that it can be done safely and that mechanical assistance is infeasible.

Mechanical equipment or assistance such as dollies, carts, come-alongs or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The minimum protection for manual handling is heavy cotton or leather gloves, safety boots, and coveralls. Metatarsal guards, chemical protective clothing, and metal mesh or kevlar gloves must be used as risk increases of heavy items falling, hazardous materials contact and sharp edges, splinters or slivers.

Workers must be aware of and work within their weight-handling capabilities.

Objects to be manually handled must be checked for contact hazards prior to beginning movement, and to ensure handling will not trap hands, arms, legs, or feet between the object and other objects, walls, or railings.

Properly trained personnel may roll heavy objects with a round base such as 55 gallon drums or compressed gas cylinders, if rolling will not damage the structural integrity. Rolling must be controlled by chutes, tag-lines, or other means of limiting acceleration. Use of the legs for pushing and tag-line control of rolled objects must be stressed.

Only properly trained personnel may move cylindrical objects which must remain upright by hand. Cylindrical objects, such as drums that must remain upright, are handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks beside the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus maintaining balance and a steady controlled forward motion.

Prior to moving cylindrical objects in this way, the route of travel must be walked to identify any changes of elevation, pot holes, or other obstructions that could cause the object to snag, tip, or get out of control.

Flat, square, or rectangular objects are most easily handled using make-shift rollers or skids to break the friction with the resting surface and pushing, using the legs.

FLD 11 ROUGH TERRAIN

GENERAL

REFERENCES

Related FLD OPS:

FLD02 – Inclement Weather
FLD05-Heat Stress
FLD06-Cold Stress
FLD15 – Remote Areas
FLD22-Heavy Equipment Operation
FLD47-Clearing and Grubbing

Hazard

Physical hazards associated with rough terrain include vehicle accidents, heavy equipment incidents, falling, slipping, and tripping. Driving vehicles on uneven surfaces creates a possibility of the vehicle rolling, getting stuck in mud or ditches, or of an accident due to flat tires or striking obstacles and other vehicles. Heavy or downed vegetation can hide holes or breaks in the terrain, which increase risk of slips, trips, and falls or vehicle accidents.

Recognition and Risk Assessment

Rough terrain complicates work activities and adds or increases risk. In the planning stages of a project, rough terrain must be considered as a physical hazard. Risk assessment is usually accomplished from site history information (i.e., site topography) and onsite by the Site Health and Safety Coordinator (SHSC).

Hazard Prevention and Protection Programs

Hazard prevention can be achieved by ensuring regular maintenance is performed on vehicles. In order to minimize accidents, site surveillance on foot may be required to ensure clear driving paths. The site crew should be alert and observe terrain while walking to minimize slips, trips, and falls. Boots that are ankle high or higher should be worn to provide additional support and stability. Vehicle drivers and passengers should wear seatbelts at all times. 4 wheel drive vehicles should be used if terrain conditions are wet, frozen, broken, or otherwise deemed unsafe for 2 wheel drive vehicles by the SHSC.

When clearing and grubbing activities are being conducted, the equipment operator is to protected by a fully enclosed cab. Chainsaw operators are to wear chaps, hardhat, face/ear and eye protection. Ground personnel should always be alert for snakes and wild animals.

Personnel should maintain a high level of physical conditioning due to increased body stress and exertion. Emergency communications such as a cell phone or two-way radio should be carried at all times. Personnel should be aware of potential hazards and ensure the availability of first aid supplies and knowledge of the location of the nearest medical assistance.

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FLD 12 HOUSEKEEPING

GENERAL

Hazards associated with poor housekeeping include slips, trips, falls, punctures, cuts, and fires.

REFERENCES

Related FLD OPS:

FLD29 – Material Handling
FLD33 – Demolition
FLD39 – Illumination

PROCEDURE

Recognition and Risk Assessment

Good housekeeping is an important element of accident prevention. Good housekeeping should be planned at the beginning of the job and carefully supervised and monitored through to the final clean-up.

Housekeeping requirements must be addressed in the planning stages of a project and safety plan. Risk assessment can be accomplished in the development stages of a project by listing in the site-specific Health and Safety Plan (HASP), good housekeeping requirements and the hazards associated with poor housekeeping (e.g., slips, trips and falls). The SHSC must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

Prevention and Protection Programs

Poor housekeeping can be prevented by following the three steps described below:

1. Plan ahead. A materials storage area which has been planned is more orderly than one which has developed haphazardly.

2. Assign responsibilities. If the size of the job and work force merit, a person should be assigned specific responsibility for clean up. Ideally, each individual should pick up his or her work area and help keep the site neat.

3. Implement the program. Housekeeping must be part of the daily routine, with clean-up being a continuous procedure.

Accidents caused by poor housekeeping can be prevented by adherence to the following rules.

Lunch areas should be kept clear of empty bottles, containers, and papers. Trash disposal cans should be provided. An effective means of preventing litter is the provision of suitable receptacles for hazardous waste, as well as nonhazardous waste.

Accumulation of flammable and combustible liquids on floors, walls, and other areas, is prohibited. All spills of flammable and combustible liquids must be cleaned up immediately. Combustible waste such as soiled rags and paper is to be stored in a safe place (such as a covered metal container) and disposed of regularly.

WESTON project managers and WESTON subcontractors should provide sufficient personnel and equipment to ensure compliance with all housekeeping requirements.

Work will not be allowed in areas that do not comply with the requirements of this section.

The SHSC and WESTON subcontractors will inspect the work area daily for adequate housekeeping and record unsatisfactory findings on the daily inspection report.

If applicable, the decontamination line must be keep neat and free of debris.

Adequate lighting should be provided in or around all work areas, passageways, stairs, ladders, and other areas used by personnel.

All stairways, passageways, gangways, and accessways shall be kept free of materials, supplies, and obstructions at all times.

Loose or light material should not be stored or left on roofs or floors that are not enclosed, unless it is safely secured.

Tools, materials, extension cords, hoses, or debris are to be used, disposed of, and stored so as not to cause a tripping or other hazard.

Tools, materials, and equipment subject to displacement or falling should be adequately secured.

Empty bags that contained lime, cement, and other dust-producing materials should be removed periodically, as specified by the designated authority.

Protruding nails in scrap boards, planks, and timbers should be removed, hammered in, or bent over flush with the wood, unless placed in containers or trucks for removal.

Walkways, runways, and sidewalks should be kept clear of excavated material or other obstructions and no sidewalls should be undermined unless shored to carry a minimum live load of 125 pounds per square foot.

Containers should be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.

When rivet heads are knocked off or backed out, they should be prevented from falling.

Form and scrap lumber and debris should be cleared from work areas, passageways, and stairs in and around building storage yards and other structures.

All storage and construction sites should be kept free of the accumulation of combustible materials.

All materials should be maintained in neat stockpiles for ease of access. Aisles and walkways should be kept clear of loose materials and tools.

Areas prone to weeds and grass should be kept mowed. A standard procedure should be established for cleanup of such areas, as specified by the SHSC.

Rubbish, brush, long grass, or other combustible material must be kept from areas where flammable and combustible liquids are stored, handled, or processed.

FLD 13 STRUCTURAL INTEGRITY

GENERAL

REFERENCES

Related FLD OPS:

FLD02 – Inclement Weather
FLD23 – Cranes/Lifting Equipment
FLD24 – Aerial Lifts/Manlifts
FLD26 – Ladders
FLD27 – Scaffolding
FLD28 – Excavating/Trenching

Related Programs:

PPE Program (See Section 1 – General Requirements):

Section 1.4, page 23 – Eye and Face Protection
Section 1.4, page 24 – Head Protection
Section 1.4, page 24 – Foot Protection

PROCEDURE

Structural integrity hazards include those hazards associated with deteriorated conditions of containers (such as drums or tanks) and buildings (including appliances such as both fixed and portable ladders), scaffolding, and excavations or trenches. The failure of structures can cause significant injury or death to personnel.

Recognition and Risk Assessment

In the planning stages of a project and safety plan, the potential for injury due to structural integrity must be considered as a physical hazard in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely hazards which may occur associated with structural integrity. The SHSC must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

Prior to entering any building, an assessment of structural integrity must be made. Buildings on inactive sites or facilities, unused buildings, and buildings which are to be demolished require special attention. This assessment must ensure, through observation and experience, that entering and/or task activities will not expose personnel to unusual risk of falling debris, loose materials that could be dislodged by touching or walking nearby, or walking on surfaces that cannot bear the weight of personnel.

Prior to demolition operations, Occupational Safety and Health Administration (OSHA) 29 CFR 1926 Subpart T requires that an engineering survey be made by a competent person. The engineering survey must be in writing.

The structure must be assessed to determine the condition of the framing, floors, and walls, and the possibility of any unplanned collapse of any portion of the structure. Any adjacent structures where employees may be exposed must also be inspected.

In buildings with several levels, floors, stairs, and fixed ladders must be similarly assessed.

Signs indicating the lack of structural integrity include loose, hanging, or sagging materials, water stains on floors where there is uncertainty as to the underlying support, loose handrails, protruding nails and fasteners, cracked concrete, masonry, or plaster, and evidence of structural failure, such as debris.

Prevention and Protection Programs

Personnel should wear appropriate personal protective equipment (PPE) such as hard hats, safety shoes, safety glasses, and gloves in all structures to minimize hazards. If there is doubt of the structural integrity of buildings, entry should be delayed until a competent person can make assessment.

FLD 14 SITE SECURITY

GENERAL

REFERENCES

Related FLD OPS:

FLD15 – Remote Areas
FLD39 – Illumination

PROCEDURE

When WESTON's responsibilities include site control or security as in WESTON Office locations, one aspect of the Site Health and Safety Plans and Business Continuity Plan Emergency Action Plans to be addressed is security, or maintaining control of access to the site. Contingency plans are required to deal with unauthorized entry. Inquisitive and/or hostile persons may interfere with the site activities or work effort, jeopardizing their safety, as well as the safety of the field team.

Recognition and Risk Assessment

In the planning stages of a project and safety plan, the potential for security problems must be considered as physical hazards in the site-specific Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the HASP the most likely security problems that may be encountered. The Site Health and Safety Coordinator (SHSC) must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

Entry to a site by unauthorized persons presents risks to the persons entering and to WESTON personnel who may have to interact with such individuals. In many cases, the unauthorized entry is accidental or unintentional; however, contingency plans must also include procedures for instances when unauthorized entry is deliberate or for purposes which could pose a threat to site personnel.

During the assessment of risk for each site, security problems must be identified. The contingency plan should identify ways to prevent and respond to security problems.

Security problems may arise from the site neighborhood due to:

- Socio-economic factors
- Client/neighbor relations
- Client/labor relations
- Poor lighting
- Remoteness and size of site
- Value of equipment and materials
- Sampling equipment tampering

Prevention and Protection Program

Prevention programs are an integral portion of a Security Plan for Business Continuity and Emergency Action Plans or Contingency Plans for Site Health and Safety Plans. An effective preventative measure is to inform all interested parties of the site activities. An attempt should be made to notify state and local police, the fire department, and any local/state government officials of the project's purpose and scope. This will allow those authorities to answer questions posed to them by local residents and the media by preparing statements on the project's purpose or by informing the public where to call for further information. This will alleviate the problem of work stoppage due to field personnel answering questions.

One must ensure that the client understands and approves of any information released. In most cases, the liaison should be between the client and the public.

The Security Contingency Plan must:

- Identify the person responsible for implementing the Contingency Plan
- State as the first priority the safety of WESTON personnel
- Be designed to minimize the potential for confrontation and to obtain security assistance as quickly as possible
- Assign the enforcement of security functions to properly trained and authorized or bonded agencies
- Establish a communication procedure for obtaining assistance
- Be communicated to site personnel

Security Problem Prevention measures include:

- Community relations programs
- Visible security precautions (e.g., fences, "keep out" signs)
- Locking doors that are unattended during working hours and all doors during non-working hours
- Carefully defined rules/requirements for authorizing site access
- Clearly delineated access points and barriers around work area
- Vigilance by all site personnel
- Adequate lighting
- Working in pairs or teams in sensitive areas
- Locking and storing equipment securely
- Using discretion in discussions and conversations when off-site
- Working to avoid confrontation

In short, security prevention includes not advertising activities or inviting intrusion. Telephone numbers and instructions for obtaining security assistance must be clearly posted onsite.

Personnel onsite must always have access to communications. These communications may be to additional onsite personnel or, in certain situations, communications by team members to outside response agencies may be necessary.

Workplace Violence

Workplace violence has become an unfortunate concern for any employer and employee. Workplace violence has proven to have little regard for location or status of the workplace. The information provided in Appendix A is considered guidance for developing awareness and violence prevention programs. The key to preventing workplace violence is to develop an objective awareness of all aspects of our work environment including the people within it.

Terrorism

Terrorist events in recent years have added the need to ensure Emergency Action Plans.address Bomb threats and precautions to reduce the potential for terrorist activities.

Bomb Threats

WESTON's association with environmental issues have led to past experiences where local elements have identified WESTON with regulators and have threatened violence against WESTON personnel or property.

Precautions to be taken include those listed above under general site security and the following:

- Ensure that site and office personnel are made aware when WESTON activities increase the potential for work place violence,

- Use care in discussing involvement in Department of Defense, Department of Energy or other politically or socially sensitive issues out side of work,

- Train persons receiving and handling mail and deliveries in what to look for as potential for inflicting violence on a WESTON person or workplace. Examples include:

    - Misspelled words
    - Hand written addresses
    - Mail from foreign countries
    - Excessive tape or postage
    - Restrictive markings (e.g., Confidential)
    - No return address

Emergency Action Plans must identify procedures to be taken if suspicious packages are received.

APPENDIX A

WESTON SOLUTIONS, INC.

VIOLENCE-FREE WORKPLACE GUIDANCE

WESTON SOLUTIONS, INC.

VIOLENCE-FREE WORKPLACE GUIDANCE

1. PURPOSE

Weston Solutions, Inc. (WESTON) is committed to providing a safe workplace and high standards of health and safety for employees. Consistent with this commitment, the Company establishes this Violence-Free Workplace Guidance Document to define its zero-tolerance policy regarding workplace violence and to describe the programs that will support that policy.

2. POLICY

It is WESTON's policy that violence will not be tolerated from any WESTON employee whether at or away from any work area, activity, or function. All reasonable and legal steps will be taken by WESTON staff and managers in the performance of their daily work activities to ensure that harassing, intimidating, threatening, or assaulting behaviors are avoided or prevented, and if observed are appropriately addressed. Any such behavior by a WESTON employee will be investigated and disciplinary action will be swift and severe if violent behavior is verified.

This policy applies also to threats or acts of violence perpetrated on WESTON work sites by non-WESTON personnel. WESTON employees will report instances of such behavior to their supervisors, and supervisors will take appropriate actions to protect potential victims and report improper behavior to the authorities.

3. TRAINING

There are no regulatory requirements for training on the topic of preventing workplace violence, and this Guidance Document does not impose strict requirements for training employees on the topic. However, information regarding prevention of workplace violence will be disseminated as part of standard employee training sessions such as new employee indoctrination, management skills training, and refresher training for field staff. In addition, short training sessions ("brown-bag" courses) will occasionally include the information in this GUIDANCE and related topics such as protection against violent acts such as robbery, car jacking, and road rage, identifying situations that increase the likelihood of violence, and recognizing warning signs that predict violent behavior.

Indicators that may signal the risk potential of violent episodes

The risk of workplace violence can be minimized by the careful observation of behavior. Specific stress factors, behaviors, and personality traits have been associated, after the fact, with almost every incident of workplace violence. The presence of several of these indicators greatly increases the likelihood of violent actions. Most people will not just "snap". An escalating series of clues usually precedes an act of workplace violence. The risk of a violent outburst is greatly increased when a combination of the following warning signs are ignored.

- **Boundary crossing** includes pushing the limits of acceptable workplace behavior and continual testing of established rules. **Chemical dependence** upon alcohol and/or drugs may agitate or create paranoia and aggressive behavior.
- **Concentration problems** such as difficulty recalling instructions, forgetfulness, repetition of errors, and staring into space indicate a troubled employee.
- **Depression** causes nearly one in seven sufferers to commit a violent act either upon themselves or others. Symptoms of depression include; despair, ambivalence, slowed work pace, continual sad or blank facial expressions, withdrawal, self-condemnation and self-destructive behavior, hopelessness, helplessness, inappropriate guilt/shame, and poor personal hygiene.
- **History of violence**, including domestic abuse, is the best predictor of violent behavior.
- **Inconsistent work patterns and attendance problems** include periods of very high and very low productivity as well as unexplained or improbable excuses for absences.
- **Obsessive interest in weapons and violent incidents** may be revealed in casual conversations.. An obsession with an impending apocalypse, or destruction of the world, is also common among unstable individuals.
- **Obsession with job** may cause a deeper sense of loss in the case of a poor performance review or termination. These individuals may be loners, having little else of importance in their lives.
- **Pathological "blamers"** cannot take responsibility for their own actions. They will not admit wrongdoing, even for minor mistakes, always blaming other people, the organization, or the system.
- **Personality disorders** can result in antisocial behavior such as repeated fighting and domestic violence. These individuals have little remorse about wrongdoing and will find ways to justify their violent behavior. Mood shifts, inappropriate anger, skillful manipulation of others, and preoccupation with self are indicators of personality disorder.
- **Personal stress** can result in excessive personal phone calls, desk pounding or throwing of objects, crying, lapses in attention, and general frustration with the surrounding environment. Debt, separation, divorce, or the death of a relative can all cause excessive stress.
- A pattern of **Poor interpersonal relationships** may result in belligerence, overreaction to criticism, and verbal harassment.
- **Psychosis** is a loss of contact with reality which may be manifested as paranoia, loss of association during conversations, flat facial expressions, extreme ambivalence, hallucinations, poor insight, talking to self, or bizarre delusions.
- **Romantic obsession** is a fixation upon and idealized romantic love for another person. Behavioral signs may include stalking, numerous phone calls, spying, and unwanted visits and gifts.
- **Safety issues** like recklessness and a sudden increase in accident rate reveal lapses in concentration and disregard for personal/coworker safety.

- **Unusual/changed behavior** includes verbal outbursts, inappropriate remarks, and threats such as "they'll regret this". A series of escalating threats is a particularly important indicator of the potential violent actions.
- **Paranoia -** irrational thoughts of being "Set-up

If an employee begins demonstrating any or a combination of the above indicators, it is important that management is informed and consults with the Manager of Human Resources to refer him or her to the Employee Assistance Program (EAP) or other counseling services as appropriate. It is imperative to respond in an empathic, caring and non-shaming manner, remembering that time is of the essence.

Oftentimes, violence in the workplace is committed by someone from outside a company. Therefore, when possible, it is important to have surveillance at the entrance of the office location or control using secured access. The following situations indicate a potential threat:

- The spouse or partner of an employee who is in an abusive relationship
- Rejected suitors, partners involved in divorce or separation procedures
- Ex-employees who have been fired or laid off
- Disgruntled customers
- Person committing armed robbery
- Persons involved in gang activities

Types of workplace violence and their characteristics

Workplace violence occurs in a variety of forms. These "types" are violence by strangers, violence by customers or clients, violence by co-workers, and violence by personal relationships. These types of workplace violence and their specific characteristics are described below:

Type 1: Violence by strangers -- involves verbal threats, threatening behavior or physical assaults by an assailant who has no legitimate business relationship to the workplace. The person enters the affected workplace to commit a robbery or criminal act. Violence by strangers is responsible for the majority of fatal injuries related to workplace violence nationally. Workplaces at risk of violence by strangers commonly include late-night retail establishments and taxi cabs.

Type 2: Violence by presumably affected parties -- involves verbal threats, threatening behavior or physical assaults by an assailant who either receives services from or is under the custodial supervision of the affected workplace or the victim. Assailants may have known or perceived claims against a client or stakeholder in a project or in the case of a labor dispute with WESTON or a subcontractor. .

Type 3: Violence by co-workers -- involves verbal threats, threatening behavior or physical assaults by an assailant who has some employment related involvement with the workplace—a current or former employee, supervisor or manager, for example. Any workplace can be at risk of violence by a co-worker. In committing a threat or assault, the individual may be seeking revenge for what is perceived as unfair treatment. This type of violence accounts for a much smaller proportion of the fatal workplace injuries than violence by strangers.

Type 4: Violence by personal relations -- involves verbal threats, threatening behavior or physical assaults by an assailant who, in the workplace, confronts an individual with whom he or she has or had a personal relationship outside of work. Personal relations include a current or former spouse, lover,

relative, friend or acquaintance. The assailant's actions are motivated by perceived difficulties in the relationship or by psycho-social factors that are specific to the assailant.

4. REQUIREMENTS

Violent behavior is considered indicative of personality characteristics that WESTON chooses to avoid in new hires and employees. As a result, WESTON may not hire individuals who have been convicted of violent activities. WESTON managers will verify the result of any background checks, references, or referrals and will carefully weigh any evidence of past violent actions in their consideration of candidates for hire.

WESTON will train its managers to recognize violent actions and tendencies, and requires that they investigate and respond in a timely and appropriate manner to any reported acts of violence by an employee. Managers shall consult with the Headquarters Managers of Human Resources and Environmental Health and Safety as necessary to determine an appropriate course of action. In addition, managers will be trained to recognize potentially inflammatory situations and handle them in ways that will not encourage violent behavior.

Employees are prohibited from bringing weapons that are clearly not required for the performance of work duties, such as firearms, onto work premises, including parking lots. WESTON reserves the right to inspect and search any item on the company's premises, including personal vehicles that are present in parking lots at any company work site. Employees may not consider any personal item brought to the workplace as exempt from search and inspection procedures.

Former employees and off-duty employees are prohibited from entering WESTON work areas unless required in the course of normal business activities and approved by a WESTON manager.

Disciplinary actions for workplace violence may range from counseling an employee to immediate termination of employment with WESTON. The latter may be enacted in cases of flagrant acts of physical violence and other cases warranting such action as determined by the Managers of Human Resources and Corporate Environmental Health and Safety.

Employees are encouraged to report any concerns or observations including threats, harassment, physical attacks, and domestic problems that may affect work performance to their supervisors. Supervisors will take appropriate measures to address violent acts by workers and to prepare for potential consequences at work that may result from domestic problems reported by employees.

Emergency action plans as part of each office's business continuity must address workplace security and actions to avoid and react to workplace violence

FLD 15 REMOTE AREAS

GENERAL

REFERENCES

Related FLD OPS:

FLD05 – Heat Stress Prevention and Monitoring
FLD06 – Cold Stress
FLD10 – Manual Lifting of Heavy Objects
FLD11 – Rough Terrain
FLD13 – Structural Integrity
FLD34 – Utilities

PROCEDURE

Hazards associated with remote areas include the following.

- Exposure to irritant and toxic plants such as poison ivy and thorny plants may cause allergic reactions.
- Surfaces covered with heavy vegetation and undergrowth present tripping and falling hazards due to holes or depressions that are not easily visible.
- Back strain due to carrying instruments or equipment.
- Native wildlife such as rodents, ticks, and snakes present the possibility of bites and associated diseases, such as Lyme disease.
- Driving vehicles on uneven or unsafe surfaces can result in accidents such as overturned vehicles or flat tires.
- Structurally unsound buildings pose overhead hazards.
- Limited access to medical assistance.
- Heat stress/cold stress exposure.

Recognition and Risk Assessment

Remote areas complicate work activities and add or increase risks. In the planning stages of a project, physical hazards associated with remote areas must be considered. Risk assessment is usually accomplished onsite by the Site Health and Safety Coordinator (SHSC) and by evaluating site history information.

Prevention and Protection Program

The following protective protocols reduce accidents at remote areas.

- Wear long-sleeved clothing and slacks to minimize contact with irritant and toxic plants and to protect against insect bites. Provide appropriate first aid for personnel with known allergic reactions.

- Be alert and observe terrain while walking to minimize slips and falls. Wear ankle-high (or higher) boots for increased traction, support, and stability.

- Use proper lifting techniques to prevent back strain.

- Avoid wildlife when possible. In case of an animal bite, perform first aid and capture the animal, if possible, for rabies testing. Perform a tick check after leaving a wooded or vegetated area.

- Ensure all maintenance is performed on vehicles before going to the field. Proper vehicle maintenance will prevent avoidable vehicle breakdown in the field. In order to minimize accidents from uneven terrain, a site surveillance should be performed on foot to select a clear driving path. Seat belts should be worn at all times.

- Inform office personnel of location and estimated return time.

- Maintain an adequate and fully stocked first aid kit.

- Maintain communications capability.

- Maintain adequate supplies of drinking water and food.

- Keep a current map of the work area.

- Avoid buildings that are not structurally sound.

- Implement heat and/or cold stress management techniques such as shifting work hours, fluid intake, and monitoring employees, especially high-risk workers.

FLD 18 OPERATION AND USE OF BOATS

GENERAL

WESTON acknowledges the significant hazard that operating watercraft creates for our personnel, vendors and clients. This procedure describes the minimum requirements for WESTON personnel to be involved in activities or tasks that require the use of boats (watercraft). The following is an outline of the combinations of personnel that are possible in a boating related job:

1. Only WESTON Personnel
2. WESTON personnel and client and/or vendor personnel
3. Vendor personnel only

WESTON requires that a Pilot, Helmsman, or Captain of the vessel be identified and approved for all three of these personnel combinations involving watercraft. For tasks that require non-WESTON personnel to be present on a WESTON boat, the boat or other watercraft may need to be operated by an individual with a current U.S. Coast Guard (USCG) Captain's license and rating for the type of vessel being operated.

NOTE: *The local Coast Guard Regional Marine Safety Office (MSO) should be contacted to determine the need for a Captains license. Criteria to be assessed would include; location, type craft, tasks to be conducted, personnel involved and the basis for passengers to be onboard.*

APPROVALS

Use of watercraft requires the written approval of the Division Safety Manager (DSM) **and** a Boating Safety Review Committee Member. The DSM and Boating Safety Review Committee Member shall review and approve Health and Safety Plan tasks associated with the use of watercraft. Approved Boating Safety Review Committee Members are:

- James Davis
- Conrad Lehr
- Michael McCarley
- Shel McGee
- Paul Potvin
- Theodore Blackburn

A Pilot, Helmsman, or Captain shall be identified by name and approved by the DSM and a member of the Boating Safety Review Committee. The Pilot, Helmsman, or Captain shall prepare a float plan and file the float plan with the DSM, Safety Officer, and the Project Manager. The Float Plan may also be filed with the appropriate authority (U.S. Coast Guard). Pilot, Helmsman, or Captain qualifications and experience shall be defined at a minimum as follows:

- License and rating (Coast Guard and State or other) if required,
- Experience with type/size of boat being used
- Experience on body of water where the boat will be operating

REFERENCES

Related FLD OPS:

FLD02 - Inclement Weather
FLD05 - Heat Stress Prevention and Monitoring
FLD06 - Cold Stress
FLD07 - Wet Feet
FLD10 - Manual Lifting of Heavy Objects
FLD15 - Remote Areas
FLD19 - Working Over or Near Water
FLD32 - Fire Extinguisher Required and Requirements

Reference Guide to State Boating Laws (fifth edition)-USCG

PROCEDURE

This field operating procedure is intended as an overview and guide for boating operation and safety. This field operating procedure is much too brief to adequately prepare personnel to operate watercraft or work on the water. At a minimum, WESTON requires that WESTON personnel and Vendors who plan to operate watercraft take a course on Boating Skills and Seamanship offered by the Coast Guard Auxiliary, as well as any State-required training. Topics covered usually include sailing, marine engines, navigation, ropes and knots, locks and dams, and safe boat handling and operation.

Introduction

Watercraft are frequently used in WESTON field activities to gather environmental information and samples. The use of boats without adequate preparation and training can lead to accidents, injuries, and death.

Whether a passenger or Pilot, Helmsman, or Captain of the Boat used for environmental monitoring, all personnel have responsibilities for safety. All personnel working on boats need some basic information about boat safety equipment and preparation, and about routine boating procedures and emergency procedures. Even if an individual does not plan to pilot a boat, an accident may unexpectedly put him or her in command or in the water alone.

Three major areas of boating safety will be discussed in this field operating procedure:

1. Selection and preparation of the vessel and its equipment.

Coast Guard Notes:
A Coast Guard study of boating accidents shows that the main cause of fatalities to be boats capsizing due to someone standing up in the boat, improper loading of the boat, or ignoring weather warnings. Most boating fatalities resulted from boats capsizing. The second and third largest number of fatalities resulted from falls overboard, vessels sinking, and collisions.

Every person operating a boat is legally responsible for inspecting, equipping, and operating the boat in compliance with federal and state regulations and for any damage that may be caused by operation of the boat. The person in command of a boat is required to know the requirements for operation and navigation of the boat, the regulations that apply locally, and the mandatory rules of the road.

The rules of the road are the codes governing the lights to be carried by boats, the signals to be made, and the actions of one boat with respect to another when the risk of collision exists. International Rules of the Road for preventing collision at sea were first formalized in 1889 for navigation in international waters. The United States has adopted similar rules that must be followed in all United States waters. (The separate rules that have existed for the Great Lakes, the Mississippi River and its tributaries, and the intracoastal waterway and other inland waters are in the process of

2. Preparation of information and other items needed for the field trip.
3. Operation of the vessel under routine and emergency conditions.

Much of the information in this field operating procedure has been drawn from publications of the U.S. Coast Guard and the U.S. Coast Guard Auxiliary. Many other references are available, such as "Chapman Piloting – Seamanship & Small Boat Handling" by Elbert S. Maloney. Please refer to these sources for additional information.

Hazard Recognition

The hazards associated with the operation and use of watercraft include but are not limited to:

- drowning,
- heat stress,
- cold stress,
- hypothermia, and
- injuries from slips, trips, and falls.

The potential for back injuries due to improper lifting techniques also exists when working on boats. Carelessness, horseplay, or other unsafe acts that could cause injury to personnel when operating or using boats are prohibited.

There are also serious hazards associated with untrained, inexperienced personnel operating boats and/or boating equipment, lack of USCG-approved Personal Floatation Devices (PFD), and misuse of appropriate PPE , which could result in injury or death.

Some of the most serious and often neglected hazards associated with boating safety include:

- Weather – weather and weather forecasts need to be reviewed prior to departure and while boating. Changes in weather conditions can happen quickly and can create serious problems if caught unaware.
- Operating in unfamiliar waters – currents, subsurface obstructions, and navigation need to be included in float plan development
- Operating an unfamiliar vessel – different types of boats have different characteristics in handling and performance. The type of vessel must be both appropriate for the type of waters where the vessel will operate and for the type of work expected to be performed.

Documentation Requirements

Health and Safety Plan

A WESTON HASP is required for any work involving a boat or other watercraft. This HASP shall include specific descriptions of :

- Work to be performed from the watercraft,
- Body of water that will be involved,
- Type of boat to be used,
- Identity and qualifications & experience of the Pilot, Helmsman, or Captain and the crew.
- Definition of conditions such as weather and hours of operation where the boat will be prohibited from operating or will be required to stop work and return to port.

- Communication methods and frequency.
- Methods of navigation, charts and maps

Pre-Trip Hazard Assessment and Boating Checklist

The Pilot, Helmsman or Captain shall be responsible for completing a Daily Boating Pre-Trip Inspection Checklist (Refer to attachment "A") prior to each days operations. Any deficiencies noted shall be resolved prior to leaving the dock.

Registration

All boats must be registered and their numbers and validation stickers displayed. The certificate of registration must be onboard at all times when the boat is being operated.

NOTE: Livery boats under 26 feet in length, hired for less than seven days, need not carry the certificate, but must have copy of the lease or rental agreement on board, signed by the owner/representative and by the person renting the boat. The agreement must show the registration number and the period of time for which the boat is rented.

Navigation Charts

Up-to-date navigation charts, a GPS, and a compass should be taken and information should be obtained about any unusual navigation hazards that may be likely in the are, such as shoals, sandbars, rocks, or rapids.

Float Plans

The Pilot, Helmsman, or Captain shall prepare a float plan for each trip and file it with the DSM, Safety Officer and the Project PM who will be responsible to request a search if necessary. At a minimum, the Float Plan should include destination, time of return, who is on board, and a description of the boat (refer to Attachment E—Sample Float Plan).

The Coast Guard's recommended format for a Float Plan provides space for recording:

1. Description of boat in detail, so the boat can be identified and its position can be estimated

2. Number of persons aboard and who they are

3. Radio type and frequencies available

4. Trip expectations, destination, and latest expected return time

5. Name and telephone numbers of Coast Guard or other agency to be notified if return is delayed beyond the latest expected return time.

Selection and Preparation of the Vessel

This section describes requirements for the selection and preparation of a vessel, compliance with WESTON operating procedures, boating safety regulations, and recommendations for achieving more than the minimum protection required.

Only watercraft that are considered to be stable in the environment of use should be used for environmental monitoring and sampling projects. Canoes and kayaks, due to their tipable nature, are not considered to be stable and should not be used unless specific approval is obtained from the responsible DSM. and a Boating Safety Review Committee member.

One convenient way to see if a watercraft is in compliance with the minimum safety requirements is to request a complimentary inspection from the local Coast Guard Auxiliary. A member of the Coast Guard Auxiliary will examine the watercraft for compliance with the federal regulations and additional recommendations that the Auxiliary considers desirable for safety. If the watercraft passes the inspection, a current Courtesy Examination decal will be placed on the watercraft. If the watercraft does not pass, a confidential report of deficiencies will be given to the watercraft owner.

All powered watercraft are required to be registered, usually with a number assigned by the state.

Equipment Needed or Required

Equipment needed or required on all motorboats includes a fire extinguisher, a signaling device, means of preventing accumulation of flammable fuel vapors, an approved PFD for each person onboard, visual distress signals, and lights if the vessel will be operated at any time before sunrise or after sunset. Refer to Attachment "B" for additional equipment discussion and Attachment "A" for an Daily Pre-trip Inspection/Equipment Checklist

Recommended Inspections

Before a boat is taken out on a field trip, it should be inspected carefully to see that the engine has an adequate fuel supply and is in good working order, that all navigation and communication equipment is working, and that all safety equipment is on board and accessible. In addition, all watercraft equipment is expected to be in good operating condition.

The Coast Guard Auxiliary publishes information that can be used to develop a pre-trip checklist for each specific type of boat. They also provide information that can be used to prepare guidelines for engine troubleshooting and for routine engine maintenance. The watercraft should not be operated unless a complete pre-trip watercraft inspection is conducted and there are no deficiencies detected.

Refueling Precautions

Gasoline is flammable and watercraft are very susceptible to damage from fire that special safety precautions must be taken. Four basic precautions are:

- keep all sources of ignition away from flammable vapors
- keep the nozzle of the fueling source in contact with the fill opening to prevent static sparks
- avoid overfilling tanks

- never fill portable fuel tanks in the boat. (Portable tanks should be filled on the dock or at another location.)

The precautions for fueling boats with inboard engines are usually more elaborate than for outboard motors because inboard engine fuel tanks cannot be filled remote from the boat and special ventilation equipment is needed.

Equipment

All boats to be used on WESTON projects will be require to have, at a minimum, the equipment indicated below. Additional information on equipment, loading and boat handling is contained in Attachment B.

Minimum Required Safety Equipment for Boats to 26 Feet

Equipment	*Class A* *Less Than 16 Feet (4.9m)*	*Class 1* *16 Feet to Less Than 26 Feet (4.9–7.9m)*
Personal flotation devices	One Type I, II, III, or IV for each person.	One Type I, II, or III for each person on board or being towed on water skiis, etc., plus one Type IV available to be thrown.
Fire extinguishers		
When no fixed fire extinguishing system is installed in machinery space(s)	At least one B-I type approved hand portable fire extinguisher. Not require on outboard motorboats less than 26 feet (7.9 m) in length and not carrying passengers for hire if the construction of such motorboats will not permit the entrapment of flammable gases or vapors.*	
When fixed fire extinguishing system is installed in machinery space(s)	None	
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110°F. (43°C). Boats built after 31 July 1981 must have operable power blowers.	
Whistle	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal" audible 1/2 mile.	
Bell	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal."	
Backfire flame arrester	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, expect outboard motors.	
Visual distress signals	Required only when operating at night or carrying six or fewer passengers for hire. Same equipment as for larger boats.	Orange flag with black square-and-disc (D); and an S-O-S electric light (N); or three orange smoke signals, hand held or floating (D); or three red flares of handheld, meteor, or parachute type (D/N).

*Dry chemical and carbon dioxide (CO_2) or the most widely used types, in that order. Other approved types are acceptable. Toxic vaporizing-liquid type fire extinguishers, such as those containing tetrachloride or chlorobromomethane, are not acceptable.

Minimum Required Safety Equipment for Boats 26 to 65 Feet

Equipment	*Class 2* *26 Feet to Less Than 40 Feet (7.9–12.2m)*	*Class 3* *40 Feet to Not More Than 65 Feet (12.2–19.8m)*
Personal flotation devices	One Type I, II, or III for each person on board devices or being towed on water skiis, etc., plus one Type IV available to be thrown.	
Fire extinguishers		
When no fixed fire extinguishing system is installed in machinery space(s)	At least two B-I type approved hand portable fire extinguishers, or at least one B-II type approved hand portable fire extinguisher.	At least three B-I type approved hand protable fire extinguishers, or at least one B-I type plus one B-II type approved hand portable fire extinguisher.
When fixed fire estinguishing system is installed in machinery space(s)	At least one B-I type approved hand portable fire extinguisher.	At least two B-I type approved hand portable fire extinguishers, or at least one B-II approved unit.
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110°F. (43°C). Boats built after 31 July 1981 must have operable power blowers.	
Whistle	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal" audible 1/2 mile.	Boats 39.4 to 65.7 feet (12–20 m)—device meeting technical specifications of Inland Rules Annex III, audible 1/2 mile.
Bell	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal."	Boats 39.4 to 65.7 feet (12–20 m)—bell meeting technical specifications of Inalnd Rules Annex II; mouth diameter of at leàst 7.9 inches (200 m).
Backfire flame arrester	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, expect outboard motors.	
Visual distress signals	Orange flag with black square-and-disc (D); and an S-O-S electric light (N); or three orange smoke signals, hand held or floating (D); or three red flares of handheld, meteor, or parachute type (D/N).	

Accidents

Various studies have shown the following to be the major causes of boating accidents:

- Overloading, overpowering, and improper trim.
- High speed turns, especially in rough water.
- Failure to keep a sharp lookout for obstructions.
- Going out in bad weather (or not starting for home soon enough when good weather turns bad).
- Standing in a moving boat.
- Having too much weight too high in the boat, as when someone sits on the deck of a small outboard.
- Leaks in the fuel system.
- Going too far offshore.

Each of these factors, and others not listed here, should be avoided. A carefully matched boat, motor, and propeller, operated in accordance with the law and with courtesy, will go a long way toward

eliminating accidents. Always remember that the possibility of trouble always exists; be prepared to act in an emergency.

Man Overboard

If someone falls overboard, maneuver the boat's stern away from him. Shift into neutral immediately (kill the motor if you do not have a gearshift) and throw a buoyant cushion or life jacket near the victim (try to get it close, but do not aim directly at the victim). Make sure you are well clear of the person in the water before shifting into gear again.

Circle around quickly, selecting a course that will allow you to approach the person with the boat headed into the wind or waves. Approach him slowly, taking care to come alongside and not over him. Stop the motor before attempting to get the victim aboard.

When alongside, extend a paddle or boathook to him, or one end of a line. With the motor stopped, lead him around to the stern, where the freeboard is the lowest, if there is enough space at the transom for him to get aboard without contacting the motor. If this is not feasible, help the victim aboard over the side as far aft as possible. In either case, the use of a boarding ladder will be of help. To avoid a capsize while the victim is coming aboard, other passengers should shift their weight to the opposite side to maintain trim as much as possible. When helping a person aboard, hold him under the armpits and lift gently.

In Case of an Accident

Personnel involved in a boating accident are required to stop and give as much help as possible without seriously endangering their boat or passengers. Personnel must identify themselves and their boat to any person injured or to the owner of any property damaged.

Personnel witnessing an accident may now render assistance with reasonable assurance of freedom from liability. The Federal Boat Safety Act of 1971 contains a "good samaritan" section which provides that any person who renders assistance at the scene of a vessel accident will not be liable for civil damages from such action if he acts as a reasonably prudent man would have acted under the same circumstances.

When giving first aid, proceed slowly. More damage may be done by the well-meaning amateur than was caused by the actual injury. Remember, there are only three instances when speed in giving first aid is required:

1. when the victim has stopped breathing and has no pulse.
2. when there is arterial bleeding.
3. when the victim has been subjected to other injuries that may be life threatening.

The measures required in these instances are taught in standard first aid courses. An NOI is to be completed and submitted, as appropriate. If the incident results in the sinking of the vessel, or damage to the vessel, a Coast Guard report and NOI is to be submitted as soon as possible.

ATTACHMENT A

PRE-BOAT TRIP INSPECTION CHECKLIST

Boat Pre-trip Inspection Checklist

Date: / /	
Name of inspector:	
Type of vessel:	
Type of engine(s):	
Rated boat weight capacity:	
Captain of the boat:	
List of personnel who will be part of the trip:	

BASICS			
Is there a fire extinguisher on board (Type ABC)?	☐ YES	☐ NO*	
Is the fire extinguisher inspected?	☐ YES Date of inspection ___/___/_____	☐ NO*	☐ Not Applicable
Are lifejackets available for each person on board?	☐ YES Specify Type: _____	☐ NO*	
Has the first aid kit been inspected?	☐ YES Date of inspection ___/___/_____	☐ NO	
Is the first aid kit in a waterproof container?	☐ YES	☐ NO	
Indicate the emergency signaling devices on board (e.g., flares, mirrors, flags, etc.).	List:		
What electronics/navigational devices are you planning to use (e.g., radar, GPS, depth finder, compass, communications [e.g., 2-way radio, _____, marine radio, etc.], etc.)?	List:		
What body of water will the boat be operating in?	☐ river ☐ stream ☐ lake ☐ ocean ☐ pond	Name: _____ Location: _____	
Are there any special conditions present (barge traffic, dam, adverse weather, operation near shipping lanes, near sand bars, etc…)	☐ YES	☐ NO	List:

BOAT

Is the boat registration inspection updated for the current year?	☐ YES	☐ NO*	
Are the fuel levels adequate?	☐ YES Fuel levels_____	☐ NO*	
Are bail plugs (upper and lower) present on boat?	☐ YES	☐ NO*	
Is the motor size adequate for the boat (see boat specifications)?	☐ YES	☐ NO*	
Are there holes or cracks in the hull?	☐ YES*	☐ NO	
Is the bilge pump operational?	☐ YES	☐ NO*	
Do all engine(s) operate properly?	☐ YES	☐ NO*	
Are spare fuses available on board? (if req'd)	☐ YES	☐ NO	
Does the boat need to have an anchor?	☐ YES	☐ NO	
Is an anchor present?	☐ YES	☐ NO	
Is there enough rope on the anchor for the location, depth, and scope?	☐ YES Length of rope_____	☐ NO	
If operating at night, are the navigational lights working?	☐ YES	☐ NO*	☐ Not Applicable
If operating at night, does the pilot, helmsman, or captain have prior experience operating in such conditions?	☐ YES	☐ NO*	
Overall, is the vessel sea-worthy? (If possible this determination should be made by Coast Guard personnel, prior to the trip.)	☐ YES	☐ NO*	
Will the dead weight (people + equipment) exceed the maximum weight requirements for the boat?	☐ YES*	☐ NO	

TRAILER

Is trailer in good condition?	☐ YES	☐ NO	☐ Not Applicable
Are the trailer lights working properly?	☐ YES	☐ NO	
Is the winch operating properly?	☐ YES	☐ NO	
Is the winch strap in good condition?	☐ YES	☐ NO	
Are the trailer rollers cracked?	☐ YES	☐ NO	
Are the trailer boat guides straight and in good condition?	☐ YES	☐ NO	
Do the tires have appropriate air pressure?	☐ YES	☐ NO	
Are the tires in good condition?	☐ YES	☐ NO	
Are the engines secured to or removed from the transom during transportation?	☐ YES	☐ NO	

SUPPLEMENTAL INFORMATION

WEATHER FORECAST

How will the pilot, helmsman, or captain and crew keep track of changing weather conditions?			
Will someone onshore track weather conditions also?	☐ YES	☐ NO	
How will that person remain in contact with the boat?			
For a small boat (under 21'), are the waves equal or greater than 2 feet (1' wave)?	☐ YES*	☐ NO	☐ Not Applicable
For a larger boat, are the waves equal or greater to 4 feet (2' wave)?	☐ YES*	☐ NO	☐ Not Applicable
For any boat, is the wind speed equal or greater than 15 knots?	☐ YES*	☐ NO	☐ Not Applicable

OTHER

Has a float plan been filed with the Project PM?	☐ YES Plan filed with _____	☐ NO	
Is the operator licensed (with the State or with Coast Guard)?	☐ YES	☐ NO*	
Are any members of the crew capable of operating the boat if the pilot, helmsman, or captain is incapacitated?	☐ YES	☐ NO*	
Does the HASP describe the task(s) involved with the operation of boats?	☐ YES	☐ NO*	

*If any answer followed by an asterisk is checked, justify task continuation if a "No" is checked.

I certify that I have inspected all the items on this checklist and that the information is accurate to the best of my knowledge.

Reviewer's Signature: _____ Date: _____

NOTE: Copy of checklist to be placed in Project file.

ATTACHMENT B

HANDLING AND EQUIPMENT DISCUSSION

Handling

Before getting underway, have all weight evenly distributed so that the boat will trim properly – level from side to side and slightly down at the stern, never down at the bow. Passengers should be seated toward the centerline of the craft and not hanging over the sides; with not too many forward or aft. If the load is concentrated near the bow or stern, the boat will plow or drag needlessly, reducing the safety margin and increasing fuel consumption. Proper trim is essential to proper performance.

In boarding from a pier, step into the boat as near to the center as possible, keeping body weight low. When boarding from a beach, come in over the bow. Keep lines tight or have someone steady the boat.

Never jump into a boat or step on the gunwale (edge of the hull). Pile gear to be taken aboard on the pier so that it can be easily reached from the center of the boat. Better still, hand it in to someone already aboard. It is the team leader's responsibility to determine that each boat, after loading, is within the maximum allowed load.

Trim the boat as well as possible before getting underway. In smaller craft, it is dangerous for passengers to change places or move while the boat is in motion. If movement becomes essential, slow or stop the boat first, remembering in rough weather to keep enough momentum to retain steerage control and to keep the craft headed into wind and waves. Have the person who must move keep low and near the boat's centerline.

Outboard craft are often operated at relatively high speeds and their stability becomes a matter of safety. Some hulls will run straight ahead quite steadily but have a tendency to heel excessively, or even flip over, when turned sharply. The faster a boat goes, the less keel it requires, and the more important it is to reduce speed before starting a turn. Never turn more sharply than necessary. Normal operation seldom requires a sudden, sharp, high-speed turn. Every outboard operator must carry one or more types of emergency signaling equipment, in good condition and ready for immediate use. If no distress equipment is on board, an outboard boatman in need of help can always signal by slowly and repeatedly raising and lowering his arms outstretched to each side while he stands in the craft (or from a kneeling position if rough water conditions make standing hazardous).

Whenever boating in unfamiliar waters, take advantage of "local knowledge:" watch the operation of boats piloted by skippers who are at home in these waters, and do not hesitate to ask questions about possible hazards.

Many persons who have not handled a small boat have the misconception that one can be maneuvered and stopped as easily as an automobile. This is not the case, however, much can be done with a boat if one takes it slowly and easily. The new boat operator should practice leaving from and returning to the pier, and other maneuvers, until he has developed both skill and confidence. Begin cautiously at first and gradually build up to the procedures of experienced operators.

Always slow down gradually rather than pulling the throttle back quickly. All boats have a stern wave that will catch up with and pass the craft if it comes to an abrupt stop. This can bring water into the boat, especially if it has a low-cut transom with no motor well.

All boating at night will be performed at reduced speeds. Personnel who become disoriented, or unsure of their position, should stop the boat until they can determine where they are.

Radio contact between crews should be more frequent; crew check-ins at set intervals will be mandatory.

Fire Extinguisher

Every motorboat will have a fire extinguisher suitable for putting out a fire of burning liquids or electrical equipment. Fire extinguishers must show approval by Underwriters' Laboratories, Inc. (UL) or another testing laboratory. For boats less than 26 feet in length, the required extinguisher has to have a rating of B-1.

Small extinguishers usually have very limited fire-fighting capability, and may be inadequate for a fire involving liquid fuel. WESTON recommends that new or replacement fire extinguishers be the dry chemical, of the largest capacity that will fit conveniently in the boat. (A 6-pound dry chemical fire extinguisher with a rating of 2A; 40B is commercially available.)

If WESTON has responsibility for a fueling location, WESTON requires that a special extinguisher be available at that location that is effective on spill fires (a foam-type that forms an aqueous film).

Signaling Devices for Navigation

Boats up to 39.4 feet are required to carry a whistle or horn that can be heard for at least one mile. The device can be operated by mouth, hand, or power. Longer boats have the same requirements except that the whistle or horn must be operated by power.

Preventing Accumulation of Fuel Vapors

Powered ventilation is needed for motorboats with enclosed spaces in which flammable fuel vapors may accumulate, such as engine and fuel tank compartments, in order to prevent explosion and fire. Special ventilation is not required in open boats in which flammable vapors are not likely to accumulate. (If gasoline is spilled in any boat, there will be an accumulation of flammable vapors in the boat until the vapors are removed by exhaust blowers or air circulation.)

Personal Flotation Devices

All boats less than 16 feet in length are required by law to carry at least one approved personal flotation device for each person onboard. Boats of greater length are required to carry at least one approved wearable personal flotation device for each person onboard, plus one throw-able flotation device. Five types of personal flotation devices are approved by the Coast Guard. Four of the types are acceptable for recreational boats and readily available: Types I, II, III, and IV. A Type V work-jacket is not approved for recreational boats. Of the four wearable types of approved flotation devices, only two Types I and II are designed to prevent the drowning of an unconscious person.

A Type I device is the familiar collar-type life jacket. It provides more than 20 pounds of buoyancy and is designed to deep the wearer afloat for extended periods of time in rough water. A Type I device is recommended for maximum protection. Type I devices are required on commercial vessels and on licensed passenger-carrying vessels. (Reflective tape is required on Type I devices on passenger-carrying vessels.)

A Type II device is more comfortable to wear than a Type I device, but has less buoyancy (15.5 pounds) and is less able to turn an unconscious person face upwards.

A Type III personal flotation device is designed to keep a conscious person in a vertical or slightly backward position, but not to turn an unconscious person over from a face downward position (even though it does have some turning ability). Buoyancy provided is 15.5 pounds minimum.

A Type IV personal flotation device is not designed to be worn but to be thrown to a conscious person in the water. Buoyancy provided is 16.5 pounds. One Type IV device is required for each boat 16 feet and over in length. Type IV devices are permitted as the minimum required in canoes, kayaks, and other vessels less than 16 feet in length.

A Type V personal flotation device is a wearable work jacket designed to deep a conscious person in a vertical or slightly backward position, but it is not designed to turn an unconscious person over from a face-downward position. Buoyancy provided is 27 pounds minimum. (Type V devices are not approved for use in recreational boats, and they usually cannot be purchased in stores that sell only recreational boats and equipment.)

WESTON personnel working on a boat are required to use either a Type I or II personal flotation device while underway. For cold weather operations, recommended devices are float coats or exposure suits, both Coast Guard approved. Other types of PFDs may be approved for use based upon location (i.e., ponds, lakes, etc.) and task activities (i.e., sampling, surveying, etc.) under a site-specific HASP and Float Plan.

Visual Distress Signals

Visual distress signals are needed for any boating activity where the need to signal for emergency help may arise. Personnel who are close to another boat can wave their outstretched arms up and down to signal distress. However, at distances farther from shore or other boats, another way may be needed to signal for help. By carrying approved visual distress signals, boaters can assure that they have a noticeable and effective way of attracting attention to secure prompt assistance in case of an emergency.

Since January 1981, visual distress signals have been required for all recreational boats except manually-propelled boats, boats less than 16 feet in length, open sailboats less than 26 feet in length,
boats on Western rivers, and boats participating in organized events such as races and regattas.

When a search is underway, the time it takes to locate a boat in difficulty or a person in the water can be reduced by the use of visual distress signals.

There are two types of signaling devices: non-pyrotechnic and pyrotechnic. Each device is approved for day use, for night use, or for both day and night. Visual distress signaling devices must carry the manufacturer's certification that they meet Coast Guard requirements.

Non-pyrotechnic devices include:

- An orange distress flag, 3-feet square with a black square and a black ball. This is accepted as a day signal only.

- An electric distress light, which must automatically flash the international SOS distress signal (three short flashes, three long flashes, and three short flashes) four to six times each minute. This is accepted as a night signal only. (An ordinary flashlight is not acceptable since it must be flashed manually and does not normally produce enough candle power.)

One flag and one electric distress light will meet the requirements for visual distress signals. These are best for small boats because there is less chance for fire and explosion than with pyrotechnic devices.

Pyrotechnic devices that meet the requirements include:

- Hand-held orange smoke distress signals (day use only)
- Floating orange smoke distress signals lasting 5 or 15 minutes (day use)
- Hand-held red flare distress signals (day or night use)

The minimum number of pyrotechnic devices required (because they are single-use devices, with limited burning time) is three for day use and three for night use, or three that can be used effectively either day or night.

Pistol-projected parachute red flare distress signals, which require suitable approved launching devices, can be used in the day or at night. Also approved for day or night use are self-contained rocket-propelled parachute red flares and red aerial pyrotechnic flare signals, which may need approved, suitable launching devices.

Visual distress signals are an important part of a boat's safety and survival gear. They should be in good condition and easily accessible. Pyrotechnic devices must be stored to protect them from water, puncturing and access by children. They must also be handled very carefully to prevent setting fire to the boat.

Pyrotechnic devices that have passed their expiration date (42 months from the date of manufacture) need to be replaced. The expiration date on pyrotechnic devices, if used, should be checked before the boat is launched.

Identification Lights

Every boat is required to be equipped with certain lights if it is on the water at any time after sunset and before sunrise. The purpose of these lights is to identify the boat's location so that collision can be avoided.

Vessels underway after sunset and before sunrise are required to display at least three lights: a green light and a red running light, each visible for one mile, and a white anchor light visible for two miles. (Details of location and visibility distance may vary, depending on the area in which the boat will be operating.)

The green light must be visible only from directly ahead of a boat and on the right or starboard side of the boat through an arc of 112½ degrees, or only as far back as an angle of 22½ degrees to the rear of a right angle from the centerline of the boat. In the corresponding sector on the left side of a vessel, from dead ahead to 2 points aft of the port beam, the vessel must display a red light.

Each vessel must display a white anchor light that can be seen from all directions. Two white lights are required for vessels operating in international waters, and two lights may be used by vessels in other waters. One white light must be visible through the combined arcs of the red and green lights and be mounted 1 meter (3.3 feet) higher than they are. The second white light must be visible from the rear of the boat, through the arc that is not covered by the front white light.

Under the rules governing all United States waters (except the Great Lakes until March 1983), motorboats from 26 feet up to 65 feet in length must have an additional white light in the forepart of the vessel that is visible for a distance of 2 miles through the same arc of visibility as the red and green lights (20 points).

The nautical jargon for the 112½ degree arc of visibility for the starboard green light is: "Visible from dead ahead to 2 points abaft the starboard beam." In nautical terminology, a circle of 360 degrees has 32 points, corresponding to the points of the compass, and each point equals 11¼ degrees of the circle. Another way of describing the arc of visibility would be to say that on a boat heading north, the green light would have to be seen by boats approaching from any direction between north and east-south-east.

The particular arc of 112½ degrees, or 10 points, represents the "Danger Zone" for the boat, the directions in which the boat must yield the right of way to other vessels. Any vessel that can see the green light on the boat can "Go," because it has the right of way.

In that sector of approach, you are in the Give Way vessel (or Burdened vessel). The other vessel is the Stand On vessel (or Privileged Vessel).

Personnel who expect to be out in a boat after dark in waters where large vessels, tugboats, or working boats may be encountered, need to learn exactly what lighting such vessels will display in order to avoid dangerous situations.

Additional Equipment Recommended

In addition to required equipment, other equipment is recommended for safe boating operations,

including an up-to-date chart of the area of operations, a compass for open waters, paddles or oars, a boat hook, and a bailing bucket or bilge pump.

The Coast Guard Auxiliary recommends that each boat carry a first aid kit, emergency water and food, an anchor and rope, a radio for monitoring weather information, and a radiotelephone for emergencies.

The Coast Guard Auxiliary also recommends that spare parts and tools be carried in case of engine trouble or an emergency. For outboard motorboats this includes:

- spare spark plugs
- starter cord
- shear pins
- cotter pins
- a propeller

For inboard motorboats, spare equipment includes:

- bilge pump
- carburetor drip pan
- backfire arrestor
- spark plugs
- coil
- fuel pump
- fuel filter element and gasket

- points and condenser
- propeller
- distributor or parts
- generator and starter brushes
- fuses
- V-belts
- spare oil

The anchor should be selected for the type of bottom where it will be used and be capable of holding the boat against wind and current. Since anchors hold better against a horizontal pull, a 3-foot length of chain is recommended to hold the top of the anchor down. The length of anchor rope should be seven times as the deep as the water.

Personal Gear

Personal gear should include appropriate footwear, clothing to provide protection from extremes of heat and cold, extra dry clothing, medication for motion sickness, if needed, and a water-resistant outer garment. If water temperatures below 60°F or 16°C are expected, wearing a float coat, wet suit, or exposure coveralls is recommended.

Sampling Apparatus and Equipment

Sampling apparatus and equipment should be weighed and the weight marked on an outside surface for convenience in balancing the load in a boat. It will also make it easier to calculate the total load being placed in a boat and to avoid overloading. In figuring the load on the boat, remember to add the estimated weight of samples to be gathered on the trip.

Preparation for Emergencies

Preparation for emergencies should include making sure that everyone in the boat can put on his or her personal flotation device quickly and correctly, and that everyone knows to stay with the boat if it should capsize. Preparation should also be made for any other emergency procedures. (If the passengers on the boat include non-swimmers, they should wear personal flotation devices when there is any likelihood that they may fall into the water.) A site-specific H&S meeting should be given immediately prior to conducting boat operations.

One of the Coast Guard requirements for personal flotation devices that are not worn is that they be readily accessible. They must not be in a locker or be obstructed by other gear.

Field personnel should plan how to conduct scheduled sampling activities with minimum disturbance of the balance of the boat or risk of capsizing or falling out of the boat. Planning should include any special precautions that may be needed (such as using a safety line on a piece of apparatus or on a person using sampling equipment).

In order to prevent capsizing or swamping, a boat must not be overloaded. The total load of passengers, motor, sampling apparatus and other gear should not exceed the weight limit stated on the capacity plate on the boat. It may be prudent to reduce the load in the boat if inclement weather, turbulent water conditions, or vigorous sampling activities are anticipated.

Getting Into and Loading a Boat

Getting into and loading a boat at a dock takes a little care and practice, because it is different from simply stepping down to another level. If you board a boat the wrong way, it may move away from the dock or it may tip precariously. Be sure that the boat is secured to the dock, then grasp one or both sides of the boat and step into the center of the boat. Stepping into the center of the boat, or as near the centerline as possible, reduces the chance of tipping the boat and losing your balance.

Loading gear into a boat also takes care and practice. Incorrect loading may cause the boat to tip and the gear may fall into the boat or the water.

It is always preferable to load a boat with another person. One person stands with both feet on the dock, passing the gear over and down to another person standing in the center of the boat.

Sampling apparatus, equipment and containers must be loaded into a boat in a safe manner so there is no damage or spill. In the boat, the load should be stashed equally on both sides fore and aft (front and back) with the weight distributed as evenly as possible.

All sampling gear, particularly any that is heavy, should be tied down or secured to keep it from moving around when the boat gets underway, turns, vibrates, or reacts to rough waters.

Although sampling activities may require standing up or leaning over the side of the boat, such actions

should be done carefully and under controlled conditions, when the boat is not moving. When the boat is moving, personnel should sit on the seats provided. No one should ride on the bow or gunwales (sides) of the boat.

Personal flotation devices should be worn whenever there is a higher than normal risk of falling out of a boat, such as when the boat is moving at high speed or in rough water. (In some boating activities the safe practice would be to wear a personal flotation device at all times.)

ATTACHMENT C

WEIGHT CAPACITY CALCULATION

Weight Carrying Capacity

One of the most important safety requirements is to limit the weight of the total load on a boat to the rated capacity of the boat. Most boats built since 1972 have been required to display their load capacity on a plate mounted in the boat.

Capacity Considerations

a. Listed capacity of vessel:	_____	Certified Capacity of the Vessel in Pounds	
b. # of People & Weight:	_____	Approximate Weight of Personnel in Pounds	
c. Weight of Motor:	_____	Listed Weight of Motor in Pounds	
d. Weight of Gear:	_____	List Equipment and Weight	
……Fuel (Gallons/Pounds)…….	_____	…….	_____
…….	_____	…….	_____
…….	_____	…….	_____
…….	_____	…….	_____
…….	_____	…….	_____
e.Total Weight of Gear/Equip:	**_____**	Add items (c + d)	
e.Number/Volume of water samples:	_____	List the number and Volume of Water Samples (in Gallons) to be collected	
f. Weight of Water Samples:	_____	Multiply (# of Samples x Volume in Gallons x 8.33 lbs/gallon)	
g. Weight of Other Samples:	_____	Estimate the number and weight of other samples	
h. Total Weight of Samples:	**_____**	Add items (f + g)	
i.Weight of Personnel & Equip:	**_____**	**Add items (b + e + h)**	
j. Capacity Factor:	**_____**	**Insert a Capacity Reduction for Rough Weather**	
k. Planned Weight:	**_____**	**Add (i +j)**	

If The Planned Weight in (k) is greater than the Certified Weight in (a), then the weight shall be adjusted be limiting equipment, personnel or samples as necessary to reduce the weight in the vessel.

In the combination capacity plate and certificate of compliance for an outboard motorboat, the first entry lists the manufacturer's rating of the maximum horsepower engine that is safe to use on the boat. The second entry lists the maximum number and weight of persons that can be carried and the third entry lists the maximum weight that can safely be carried by the boat (including persons, motor, and gear). Some boats may have two plates: a certificate of compliance and a separate capacity plate.

In order to avoid exceeding the load carrying capacity of a boat, it is necessary to know the number and total weight of all passengers and the weight of all the equipment and gear planned to be taken on board, including fuel, food, and environmental sampling apparatus. To this total weight must be added the estimated weight of the water or other samples to be collected and brought on board.

The recommended maximum weight shown on the capacity plate may be more than can be carried safely under some weather conditions and for some activities. For example, if rough water is expected, less weight should be carried so that the boat rides higher in the water and is less likely to be swamped by waves.