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Washington Navy Yard, Washington, DC

Final

# Work Plan
# Interim Removal Action at
# Site 57 – Building 292 TCE Contamination

## Naval Support Facility Indian Head
## Indian Head, Maryland

and

**Contract No. N62470-03-D-4402**
**Task Order No. 025**

**FINAL**
**WORK PLAN**
**INTERIM REMOVAL ACTION AT**
**SITE 57 – BUILDING 292 TCE CONTAMINATION**
**NAVAL SUPPORT FACILITY INDIAN HEAD**
**INDIAN HEAD, MARYLAND**
Contract No. N62470-03-D-4402
Task Order No. 025

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May 2006
Project No. 120359

**Work Plan Distribution**
**for the Interim Removal Action at Indian Head, Maryland**
**Site 57 – Building 292 TCE Contamination**

I have received a copy of the Work Plan and/or relevant sections for activities at Indian Head with respect to my company.

| ***Date*** | ***Name (Print)*** | ***Company*** | ***Relevant Sections*** | ***Acceptance of Relevant Sections (Signature)*** |
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# List of Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| bgs | below ground surface |
| COCs | Chemicals of Concern |
| cis-1,2-DCE | cis-1,2-dichloroethene |
| COMAR | Code of Maryland Regulations |
| EE/CA | Engineering Evaluation/Cost Analysis |
| ESCP | Erosion and Sediment Control Plan |
| FSAP | Field Sampling and Analysis Plan |
| FSSI | Field Support Services, Inc. |
| LANTDIV | Department of the Navy, Atlantic Division |
| MDE | Maryland Department of the Environment |
| MD DOT SHA | Maryland Department of Transportation State Highway Administration |
| mg/kg | milligram per kilogram |
| Navy | United States Department of the Navy |
| NSASP | Naval Support Activity South Potomac |
| NSF-IH | Naval Support Facility, Indian Head |
| NTR | Navy Technical Representative |
| PBA | Project Business Administrator |
| pH | potential of Hydrogen |
| PPE | Personal Protective Equipment |
| PRGs | Preliminary Remediation Goals |
| QA | quality assurance |
| QC | quality control |
| QCP | Quality Control Plan |
| RAO | Removal Action Objectives |
| RI | Remedial Investigation |
| ROICC | Resident Officer in Charge of Construction |
| Shaw | Shaw Environmental, Inc. |
| SOW | Scope of Work |

| | |
|---|---|
| SSHSP | Site-Specific Health and Safety Plan |
| SSO | Site Safety Officer |
| TCE | Trichloroethene |
| TtNUS | Tetra Tech NUS, Inc. |
| ug/kg | microgram per kilogram |
| USEPA | United States Environmental Protection Agency |
| VOCs | Volatile Organic Compounds |

# 1.0 Introduction

The Field Support Services, Inc. and Shaw Environmental, Inc. (FSSI/Shaw) team has been tasked to perform the interim removal action activities at Site 57 – Building 292 TCE Contamination at the Naval Support Facility, Indian Head (NSF-IH) located in Indian Head, Maryland (Figure 1-1). NSF-IH is a Naval Support Activity South Potomac (NSASP) facility within the Naval District Washington Region. FSSI/Shaw has prepared this Work Plan in accordance with the Scope of Work (SOW) for Task Order 025 (Dated October 12, 2005) under the Department of Navy, Atlantic Division (LANTDIV) Contract Number N62470-03-D-4402.

This Work Plan provides a detailed description of the interim removal action activities to be performed at Site 57. Per the SOW, several documents and plans have been prepared in support of this Work Plan and are presented in the following Appendices:

- Appendix A Project Schedule
- Appendix B Erosion and Sediment Control Plan (ESCP)
- Appendix C Site-Specific Health and Safety Plan (SSHSP)
- Appendix D Quality Control Plan (QCP)
- Appendix E Field Sampling and Analysis Plan (FSAP)

## 1.1 Basis of Work Plan

The Work Plan for this task order is based on the following project-specific documents:

- SOW for Contract No. N62470-03-D-4402 Task Order 025, dated October 12, 2005.
- Engineering Evaluation / Cost Analysis for Site 57 – Building 292 TCE Contamination, Tetra Tech NUS, Inc. (TtNUS), dated August 2005.
- FSSI/Shaw Cost Proposal, dated January 9, 2006.

## 1.2 Site Background

Site 57, Building 292 TCE Contamination Area, encompasses the area located south of Building 292 on the Main Area of the NSF-IH (Figure 1-2). Previous operations involved the use of

trichloroethene (TCE) for degreasing and general cleaning. During the 1970s and 1980s, spent TCE was transferred from a tank inside Building 292 into drums via a pipe that passed through the wall near the southern corner of the building. The drums were reportedly stored on a grass-covered area near manhole MH-1. It is believed that these operations have resulted in the contamination of soil and groundwater. The use of TCE at Building 292 ceased in 1989.

A Remedial Investigation (RI) identified volatile organic compounds (VOCs) in soil and groundwater. Arsenic was detected in surface and subsurface soil samples to a depth of 5 feet below ground surface (bgs) at concentrations ranging from 2.4 to 79.9 milligram per kilogram (mg/kg). A baseline human health risk assessment was developed in the RI report. Unacceptable risks were identified for future construction workers exposed to soil and for hypothetical future residents exposed to soil and groundwater. Chemicals of Concern (COCs) are based on protection of human health, protection of the environment, and/or exceedances of regulatory standards. The only soil COC based on protection of human health is arsenic. Soil COCs based on protection of groundwater are cis-1,2-dichloroethene (cis-1,2-DCE) and TCE.

The United States Department of the Navy (Navy), in concurrence with the United States Environmental Protection Agency (USEPA) and the Maryland Department of the Environment (MDE), agreed to perform soil removal due to potential human health risks from arsenic in soil and protection of groundwater from cis-1,2-DCE and TCE. The Navy, with support from the USEPA and the MDE, agreed that a soil removal action based on appropriate Preliminary Remediation Goals (PRGs) would reduce the level of potential human health risk at the site to acceptable levels.

An Engineering Evaluation/Cost Analysis (EE/CA) was completed to develop and evaluate potential removal action alternatives to address remediation of soil contaminated with cis-1,2-DCE, TCE and arsenic. Alternative 1 was the no action alternative and Alternative 2 included the excavation and offsite disposal of the contaminated soil. The EE/CA concluded that Alternative 2 provided the best balance of trade-offs based on the evaluation criteria. Established PRGs were used to determine the areas within Site 57 that require cleanup action.

### *1.3 Scope of Work*

The removal activities to be performed at Site 57 include:

- Mobilization

- Site setup
- Utility relocation
- Erosion and sediment control installation
- Field sampling and off-site analysis
- Contaminated material excavation and handling
- Material transportation and disposal
- Site restoration
- Surveying
- Inspections
- Demobilization
- Closeout report.

## 1.4 Project Objectives and Goals

The removal action objectives (RAOs) at Site 57 are to:

- Prevent exposure to soil contaminated at exposure concentrations greater than PRGs.
- Prevent or minimize further migration of contaminants from soil to groundwater.

PRGs were developed for arsenic based on protection of human health and for cis-1,2-DCE and TCE based on protection of groundwater. The residential PRG for arsenic is 22.5 mg/kg. The soil PRGs for cis-1,2-DCE and TCE are 200 microgram per kilogram (ug/kg) and 28 ug/kg, respectively.

## 1.5 Project Schedule

The Project Schedule is presented in Appendix A, which outlines the major activities to be completed at Site 57. The work activities will be conducted Monday through Friday between 0700 and 1800 hours. The descriptions of the activities to be completed at Site 57 are provided in Section 3.0.

# 2.0 Organization of Project

This section discusses the labor requirements and project organization.

## 2.1 Labor Requirements

The proposed SOW will require one crew to be on site to perform the removal activities. The work crew will perform several activities such as site setup, construction of erosion and sediment controls, excavation, load out activities, backfilling and site restoration. The crew may be augmented with additional personnel as necessary in order to perform the above-mentioned tasks in an efficient manner.

## 2.2 Management Approach to Construction

The Project Manager will work directly with the Program Manager and the Navy to achieve the Navy's satisfaction with the project. The Program Manager will have overall project responsibility to the Navy from a schedule, cost, and resources aspect. The Project Manager will be responsible for accomplishing the work according to the SOW. The Site Superintendent will report directly to the Project Manager and will be responsible for the day-to-day activities in the field. The responsibilities of the FSSI/Shaw team are to:

- Report conflicts, errors, or discrepancies found in Contract Documents to the Navy Technical Representative (NTR) in writing before proceeding to obtain a written interpretation or clarification from the Navy.
- Notify the NTR in writing of any subsurface or latent physical conditions encountered that differ materially from those specified or indicated.
- Furnish or utilize a substitute acceptable to the NTR if materials or equipment, or specific means, methods, techniques, sequence, or procedure of construction are different than indicated in or required by the Work Plan.
- Procure subcontractor services and submit these services to the Navy for acceptance.
- Maintain at the site two record copies of all as-built drawings, one copy of plans, addenda, written amendments, change orders, work directive changes, field test records, field orders, and written interpretations and clarifications. Upon completion of the work, deliver these records to the Navy. At completion of the work, provide a report on the construction activities.

- Perform the removal activities defined in the Work Plan and required under this delivery order.
- Initiate, maintain, and supervise all safety precautions and programs in connection with the work.
- Provide a Site Superintendent who will be the onsite representative and who will not be replaced without written notice to the Navy.
- Prepare submittals in accordance with the basic contract and Work Plan.

## 2.3 Responsibilities of the Project Management Team

The removal action at Site 57 will be led by a project-dedicated team who will be responsible for the management and completion of the overall project. The project organization chart (Figure 2-1) defines the primary "chain of command."

The Program Manager will have the overall responsibility for project efforts including technical, scheduling, and budgetary aspects. The Project Manager will be responsible for the day-to-day management and integration of all elements of the project and will be accountable for each activity. Supporting the Project Manager in the field will be the Site Superintendent, Site Safety Officer (SSO), Project Business Administrator (PBA), and other support personnel as needed.

Separate from the project management chain of command is the quality control (QC) chain of command. The Site QC Manager will report, independently of the project team, as shown on the project organization chart on Figure 2-1.

Responsibilities and authority of the project team and supporting field personnel fundamental to the project are discussed in the following sections.

### 2.3.1 Program Manager/Project Manager

The Program Manager/Project Manager as designated is the person in charge of the overall project and has full authority for coordination and direction of the project. The Program Manager/Project Manager will communicate directly with the Resident Officer in Charge of Construction (ROICC). Specific responsibilities of the Program Manager/Project Manager include:

- Approve work products, plans, and deliverables.
- Oversee the implementation of the QCP (Appendix D).
- Respond to resource requirements by defining resource needs and securing the commitments for staff and equipment.
- Monitor subcontractor performance, schedules, budgets, and invoices.
- Develop, review, and meet the work schedule and budget objectives.
- Ensure technical adequacy of field, laboratory, data management, and construction activities.
- Prepare for and attend meetings with the Navy, as required.
- Manage and coordinate group interfaces.
- Document contract modifications, if needed.
- Approve subcontractor work and invoices.

### *2.3.2 Site Superintendent*

The Site Superintendent is the contact at the site and will be responsible for performing the removal activities in accordance with the Work Plan. When the Site Superintendent is not on site, the Operations Supervisor will be responsible for his duties. The Site Superintendent's responsibilities include, but are not limited to, the following:

- Implement the day-to-day aspects of the SSHSP.
- Manage the day-to-day execution of the project at the site including administrative and procurement activities.
- Monitor work progress and schedule, and advise the Project Manager of variances.
- Implement state and federal regulations pertinent to the work.
- Prepare daily logs, which will be forwarded to the Project Manager.
- Attend work progress meetings.
- Report to the Project Manager changes desired in the Contract Documents so that required review and approval can be accomplished prior to when the change is made.

- Report for review and approval changes necessitated by unanticipated site conditions.

### 2.3.3 Site Safety Officer

The SSO will be responsible for implementing the SSHSP (Appendix C), which satisfies federal, state, and local regulations and is consistent with site conditions. The SSO may take actions independent of the project group to stop the project, if required, for compliance with the SSHSP.

The Site Superintendent is responsible for the day-to-day implementation of the SSHSP during site activities. However, the SSO will oversee this day-to-day implementation, including the following responsibilities:

- Direct the entrance and exit medical physical requirements, if required.
- Approve personal protective equipment (PPE) and safety procedures specified in the SSHSP.
- Oversee the maintenance and use of field monitoring equipment necessary to define on site hazards associated with removal.
- Designate appropriate PPE level; determine protection level upgrades and downgrades as site conditions permit.
- Maintain the medical and training files for the site personnel.
- Provide necessary guidance to the project staff so they can safely perform their functions in accordance with federal and state regulations.

### 2.3.4 Project Business Administrator

The responsibilities of the PBA are to:

- Assist the Project Manager in preparation of schedules, budgets, and invoices.
- Establish tracking systems to track costs and budget variances.
- Provide weekly progress reports on budget and schedule status to the Project Manager.
- Prepare daily report deliverables.
- Audit weekly postings of charges to work budgets.
- Assist Site Superintendent in procurement activities.

### *2.3.5 Quality Control Manager*

The Site QC Manager will be responsible for implementing the QCP (Appendix D) and coordinating inspection and surveillance activities. The Site QC Manager will monitor the full site activities on a daily basis. The results of inspections and surveillance will be documented in a report describing the events reviewed that day. The Site QC Manager will also be responsible for the following:

- Coordinate day-to-day QC activities.
- Implement appropriate provisions of this Work Plan.
- Serve as the collection point for removal-related nonconformance.
- Perform a pre-construction site photographic survey and prepare an Environmental Conditions Report.
- Perform daily inspections and tests of the scope and character necessary to achieve the quality of construction outlined in the plans for work under the contract performed on or offsite.
- Perform inspections of the E&S controls weekly and after each rain event; maintain a log of E&S inspections.
- Maintain the latest applicable drawings with amendments and/or approved modifications at the job site and assure that they are used for shop drawings, fabrication, construction, inspections, and testing.
- Maintain marked-up drawings at the site depicting as-built conditions. The drawings will be available for review by the government at all times.
- Perform and/or oversee all sampling activities in accordance with the approved protocols. Navy quality assurance (QA) procedures are the approved protocols for this Project.
- Hold and preside over bi-weekly QC meetings of the site work being performed, and review proposed work procedures and type of work scheduled.
- Maintain a contractor-generated submittal register, ENG Form 4288, for the duration of the contract. A review of the register will be performed at least every 14 days in conjunction with the scheduled dates on the register and in relation to the actual work status. Appropriate actions will be undertaken in the event that slippages or other changes occur.

- Review shop drawings and/or other submittals for compliance with the contract requirements prior to their transmission to the government.
- Establish and maintain a Rework Items List of work that does not conform to the Work Plan. Track and monitor the items on the list to assure the rework inspection and testing activities and frequencies are in accordance with the contract requirements.
- Attend and assist the government at the pre-final and final inspections.
- Conduct inspections of the haul trucks and manifest documentation prior to their leaving the site.
- Confirm the quality and quantity of materials delivered to the site as referenced by the Work Plan.
- Prepare a photo log to document daily site activities.

# 3.0 Description of Activities

This section discusses the major field activities associated with the removal activities to be performed at Site 57. These activities are listed in Section 1.3 of this Work Plan, and a Project Schedule is presented in Appendix A of this Work Plan. The activities described below are in sequential order; however, field conditions, weather, and/or client direction may alter the sequencing of these activities. Figure 3-1 presents the site layout for the removal activities at Site 57.

## 3.1 Mobilization

Upon completion of the Pre-Construction Conference and acceptance of this Work Plan, FSSI/Shaw will proceed with the mobilization of personnel and equipment from Shaw's resource facilities located in Windsor, New Jersey and Tidewater, Virginia and through FSSI's Greenbelt, Maryland office. Additional rental equipment and material resources will be obtained from local vendors.

Initially, FSSI/Shaw will mobilize employees to begin site setup activities. The main project office for the work at the site will be located within the construction trailer area adjacent to Building 892. FSSI/Shaw will mobilize one decon trailer to Site 57 to accommodate the onsite decontamination activities. A local subcontractor will be utilized to connect power to the trailer.

## 3.2 Site Setup

Site setup activities for the removal at Site 57 will include site layout and photographic documentation, a utility search, and installation of the decontamination and material storage pads.

### 3.2.1 Site Layout and Photographic Documentation

During site setup, FSSI/Shaw will establish survey control in the work area using existing survey control points. Information regarding the existing survey control points will be received from the Navy. FSSI/Shaw will stakeout the proposed limits of excavation. High-visibility safety fence will be installed around the three excavation areas.

FSSI/Shaw will photograph the site prior to the start of any significant ground-disturbing activities and the documentation will be presented in the Environmental Conditions Report.

Additional photographs will be taken during the implementation of all tasks to document construction operations. These photographs will be included in the Closeout Report.

### 3.2.2 Utility Search

FSSI/Shaw will subcontract an independent utility locator and work with the Public Works Officer to confirm/identify the locations of underground and/or overhead utilities on site. In addition, Miss Utility of Maryland (800) 257-7777 will be contacted prior to any intrusive activities. Locations of underground utilities will be identified and marked prior to any ground disturbance. FSSI/Shaw will also provide additional notifications and/or permit applications identified by the ROICC and/or Base Officers.

### 3.2.3 Decontamination Pad Construction

One temporary decontamination pad will be constructed within the limits of Site 57. The decontamination pad will be constructed with wooden timbers and visqueen and will drain to a sump area where a submersible pump will be installed. Water collected in the sump will be containerized and sampled in accordance with the FSAP (Appendix E) for off-base disposal at an approved facility.

### 3.2.4 Material Storage Pad Construction

The material storage area will measure 50-feet by 60-feet and will consist of a bermed polyethylene lined pad. Imported sand or backfill, obtained from an approved source, will be used to construct 2-foot tall soil berms around the area. The polyethylene will be placed over the soil berms and will be held in place with sand bags. The polyethylene will be covered with a 6-inch layer of sand. Visqueen will be used to cover the stockpiled soil. The visqueen will extend over the soil berms and be held in place with sand bags to prevent the generation of waste water. Water that is collected within the material storage pad will be containerized, sampled and analyzed in accordance with the FSAP (Appendix E) prior to off-base disposal at an approved facility.

## 3.3 Utility Relocation

Prior to commencing removal activities, it will be necessary to relocate the smoking gazebo. The gazebo will be relocated to the asphalt lot located southeast of its current location as shown on Figure 3-1.

### 3.4 Erosion and Sediment Control Installation

This section describes the various temporary erosion and sediment controls that will be used during removal activities at the site. All erosion and sediment controls will comply with the manufacturer's installation specifications, the 1994 Standards and Specifications for Soil Erosion and Sediment Control, MDE requirements, and the ESCP (Appendix B). All erosion and sediment control features will be installed under the direction of the Site Supervisor and will remain in-place until the site is vegetated and approval is received from the ROICC.

#### 3.4.1 Silt Fence and Straw Bales

Prior to any earth disturbance, FSSI/Shaw will install silt fence and straw bales at the locations shown on Figure 3-1 and in accordance with the ESCP (Appendix B). The silt fence and straw bales will be placed along the down slope sides of the identified excavation areas.

#### 3.4.2 Stabilized Construction Entrance

A stabilized construction entrance will be provided to access Area B as shown on Figure 3-1 and in accordance with the ESCP (Appendix B). The stabilized construction entrance will be installed to reduce the amount of soil transported onto paved roads by motor vehicles. The stabilized construction entrance will consist of a stone pad underlain with a layer of filter fabric. Heavy equipment such as an excavator will be utilized for the installation of the construction entrance. New stone will be added as necessary or soil covering the stone will be removed, so that the stone at the entrance will aid in removing soil from vehicle tires.

#### 3.4.3 Diversion Berms

Sand bags and earth dikes will be used as diversion berms and may be placed along the upstream side of the excavation area in order to divert the storm water run-on. These diversion berms will be installed on an as-needed basis and will depend on the actual field and slope conditions. The proposed locations of the diversion berms are shown on Figure 3-1 and will be installed in accordance with the ESCP (Appendix B).

### 3.5 Field Sampling and Offsite Analysis

FSSI/Shaw will perform waste characterization sampling and analysis for soil and water to be properly disposed offsite. Confirmation sampling within the removal areas will be conducted by TtNUS. FSSI/Shaw will collect samples for all incoming backfill and topsoil sources and have

them analyzed for chemical parameters. The field sampling and analytical requirements for Site 57 are presented in the FSAP (Appendix E).

### 3.6 Contaminated Material Excavation and Handling

The excavation of contaminated materials will occur at three locations within Site 57 as shown on Figure 3-1. The large area near Building 292 (Area A) is approximately 1,695 square feet. The small area near Building 292 (Area B) is approximately 225 square feet. The area south of Building 292 (Area C) is approximately 125 square feet. The vertical limit of excavation will be 8 feet bgs or the water table, whichever is encountered first. The estimated volume of contaminated soil to be removed at Site 57 is 606 cubic yards.

The contaminated soil will be removed by hand excavation only near existing utility lines and/or with a hydraulic excavator. The excavated material will be transferred into a loader bucket and transported to the material storage pad. The stockpiled material will be sampled in accordance with the FSAP (Appendix E) and disposed off-base at an approved disposal facility.

Approximately four monitoring wells will be disturbed during excavation activities. The monitoring wells disturbed within the excavation areas will not be replaced. The top portions of the monitoring wells within the excavation limits will be broken off and removed. The remaining portions of the monitoring wells below the excavation limits will be abandoned in accordance with the Code of Maryland Regulations (COMAR), 26.04.04.11 Abandonment Standards.

Following excavation to the limits and depth specified above, confirmation sampling will be performed by TtNUS. FSSI/Shaw will receive approval from the ROICC prior to backfilling the excavation areas.

### 3.7 Material Transportation and Disposal

The contaminated material stockpiled within the material storage pad will be disposed of at an offsite disposal facility based on the results of the waste characterization sampling. FSSI/Shaw will subcontract the transportation and disposal of the contaminated material. A facility permit will be obtained from the receiving disposal facility verifying the facility is approved to and will accept the contaminated material. Copies of the waste manifests shall be kept on site with the generator and transporter signatures and dates until the original waste manifests are received

from the disposal facility. The original waste manifests shall be received from the disposal facility with the facility signature and date verifying that contaminated materials were accepted by the disposal facility. The original waste manifests will be given to the Navy and copies of the original waste manifests will be included in the Closeout Report.

## 3.8 Site Restoration

Site restoration activities will include placement of backfill, topsoil, and asphalt within the excavated areas. In addition, the areas covered by topsoil will be seeded, fertilized and mulched.

### 3.8.1 Backfill Placement

Backfill material will be obtained from an offsite borrow source and will be sampled and analyzed for conformance to clean fill requirements in accordance with the FSAP (Appendix E) prior to delivery. A letter will need to be obtained from the borrow source stating that the material is a native borrow source and/or the material is not known to be hazardous. If determined necessary by the Navy, the approved backfill material will be tested in accordance with American Society for Testing and Materials (ASTM) Method D1557 (Modified Proctor) to determine the maximum dry density.

The backfill material will be placed with a skid steer loader in 8-inch loose lifts and compacted with a CAT CS563 vibratory roller or a plate compactor where areas prohibit the CAT CS563 compactor. The backfill will be compacted to a minimum of 90 percent of the maximum dry density based on ASTM Method D1557 (Modified Proctor). FSSI/Shaw will perform density testing using a Troxler Nuclear Moisture/Density Gauge, if determined necessary by the Navy. The testing frequency will be one test per 500 square feet per lift.

### 3.8.2 Topsoil Placement

Topsoil will be obtained from an offsite borrow source and will be chemically analyzed for its conformance to the clean fill requirements in accordance with the FSAP (Appendix E) prior to its use onsite. A letter will need to be obtained from the borrow source stating that the material is a native borrow source and/or the material is not known to be hazardous. Material to be used as topsoil will also be tested for organic matter, potential of Hydrogen (pH) and soluble salts.

Placement of the topsoil will begin immediately upon completion of the backfill. A CAT 320 excavator will be utilized to roughen the surface of the backfill material prior to placement of the

topsoil. The topsoil will be placed in one 6-inch thick lift with the CAT 320 excavator and a skid steer loader. The compaction of this layer will be incidental to the placement of the soil and tracking of the equipment. The topsoil layer will not be spread or placed when the underlying fill is frozen or excessively wet. All irregularities in the finished surface will be corrected to eliminate depressions prior to seeding. The topsoil will be placed and spread to restore the site to the existing pre-construction grades.

### *3.8.3 Seeding, Fertilizing and Mulching*

Upon completion of the soil placement activities, all disturbed areas will be fine graded and seeded. FSSI/Shaw will subcontract the seeding, fertilizing and mulching activities. Seed, fertilizer and mulch will be applied to all disturbed areas in accordance with the ESCP (Appendix B). The purpose of this activity is to restore the area to as natural a condition as practical and to minimize environmental damage during the post-construction period.

### *3.8.4 Asphalt Cover Installation*

A total maximum area of 1,050 square feet will require an asphalt cover. Subbase preparation for the asphalt cover will consist of a 6-inch layer of crusher run aggregate CR-6 in accordance with the Maryland Department of Transportation State Highway Administration (MD DOT SHA) Standard Specifications for Construction Materials Section 901, Table 901B. If determined necessary by the Navy, the CR-6 subbase material will be tested in accordance with ASTM Method D1557 (Modified Proctor) to determine the maximum dry density.

The subbase material will be placed with a skid steer loader and a Cat CS563 roller or equivalent compactor will be used to compact the subbase. The subbase material will be compacted to 97 percent of maximum dry density in accordance with ASTM Method D1557 (Modified Proctor). FSSI/Shaw will perform density testing using a Troxler Nuclear Moisture/Density Gauge, if determined necessary by the Navy. The testing frequency will be one test per 500 square feet.

FSSI/Shaw will subcontract the installation of the asphalt. The subcontractor will install two layers of asphalt. A 4-inch layer of bituminous concrete binder (base) course will be placed on top of the CR-6 subbase, followed by a 2-inch layer of bituminous concrete wearing (surface) course. A tack coat will be applied to existing bituminous surfaces and the vertical cut surfaces of an existing pavement section to ensure bonding between the surfaces being paved and the new bituminous concrete material.

### 3.9 Surveying

FSSI/Shaw will complete a survey of the limits of excavation (horizontal and vertical) and a final survey of the site. The limits of excavation survey will be completed following confirmation sampling and prior to backfilling. The final survey will be conducted upon completion of restoration activities. The data from the surveys will be used to prepare as-built drawings of the excavated areas and the restored site.

### 3.10 Inspections

An ongoing rework items list will be kept by the Site QC Manager to track and record actionable corrections during the life of the project. The contractor production and quality control reports will track daily activities, variances and any actions made to correct the rework list items.

A pre-final inspection will be conducted within one week from completion of site restoration activities. The pre-final inspection will be attended by the ROICC, the Site Superintendent and the Site QC Manager. The rework items list will be reviewed during the pre-final inspection to verify that all the items on the list have been completed. During the pre-final inspection, the Site QC Manager will maintain a punch list of items that remain to be completed.

FSSI/Shaw will complete the punch list items within one week following the pre-final inspection. The final inspection will be held once all the punch list items have been completed. The purpose of this final inspection is to verify that all the tasks identified on the punch list and all tasks detailed in the contract have been completed to the Navy's satisfaction such that the ROICC will sign off on the completion. At the completion of this last inspection, there should be no incomplete or unacceptable work remaining. The completion of this task should constitute final acceptance of the project.

### 3.11 Demobilization

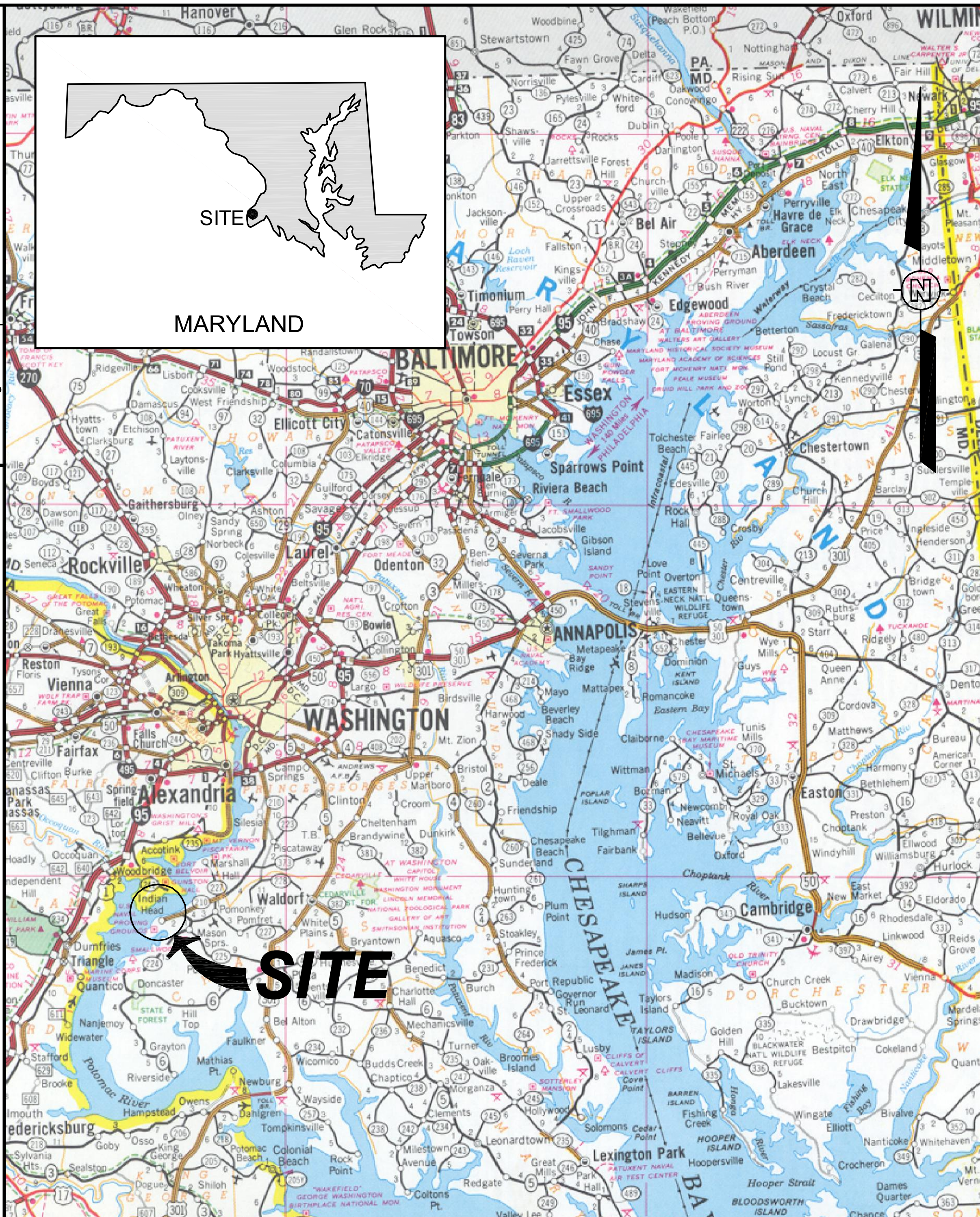
Upon completion of site restoration activities and prior to demobilization, the temporary controls (i.e. the construction entrance, decontamination pad, staging areas and material storage pad) will be removed and disposed off-base. FSSI/Shaw will return to the site to remove the silt fence after vegetation is established and approval is received from the ROICC. All silt fence will also be disposed off-base.

At the completion of all construction activities at Site 57, and upon approval from the Navy, FSSI/Shaw will officially demobilize from the site.

### *3.12 Closeout Report*

FSSI/Shaw will prepare a Draft Closeout Report under separate cover within three weeks from completion of site restoration. The Closeout Report will present a text narrative describing the details of the removal action work. The report will include the means and methods utilized for the work, transportation and disposal records, contractor production reports, quality control reports, analytical results, removal volumes and as-built drawings. The review period for the Draft Closeout Report will extend 60 days from receipt of the package. FSSI/Shaw will respond to draft comments within two weeks from receipt of comments. A Final Closeout Report will be submitted within two weeks from resolution of the draft comments. A disk will be included with the Final Closeout Report that provides electronic AutoCAD drawings and a PDF version of the report.

***Figures***

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APPROXIMATE SCALE

0 25 50 MILES

OFFICE Pittsburgh, PA

DRAWING NUMBER 120359-A3

| REV | DATE | BY | CHK'D | APPR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | SC | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Shaw Environmental, Inc.

| | | |
|---|---|---|
| DRAWN BY | G. Jones | 3/16/06 |
| DESIGNED BY | -- | |
| CHECKED BY | -- | |
| APPROVED BY | S. Carriere | 3/21/06 |
| | P.Gamble | 3/21/06 |

NAVFAC Naval Facilities Engineering Command

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND

SITE 57 – WORK PLAN

SITE VICINITY MAP

SCALE: AS SHOWN

SIZE: A

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D.

FIGURE 1-1

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NAVFAC

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LOCATION
NAVFAC

| OFFICE | DRAWING NUMBER | 120359-A6 |
|---|---|---|
| Pittsburgh, PA | | |

NAVFAC Naval Facilities Engineering Command
NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND
SITE 57 – WORK PLAN
SITE LOCATION MAP

Shaw Shaw Environmental, Inc.

| DESIGNED BY | -- | -- | CHECKED BY | P.Gamble | 3/21/06 |
|---|---|---|---|---|---|
| DRAWN BY | K. Masterson | 3/16/06 | APPROVED BY | S. Carriere | 3/21/06 |

| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | SC | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

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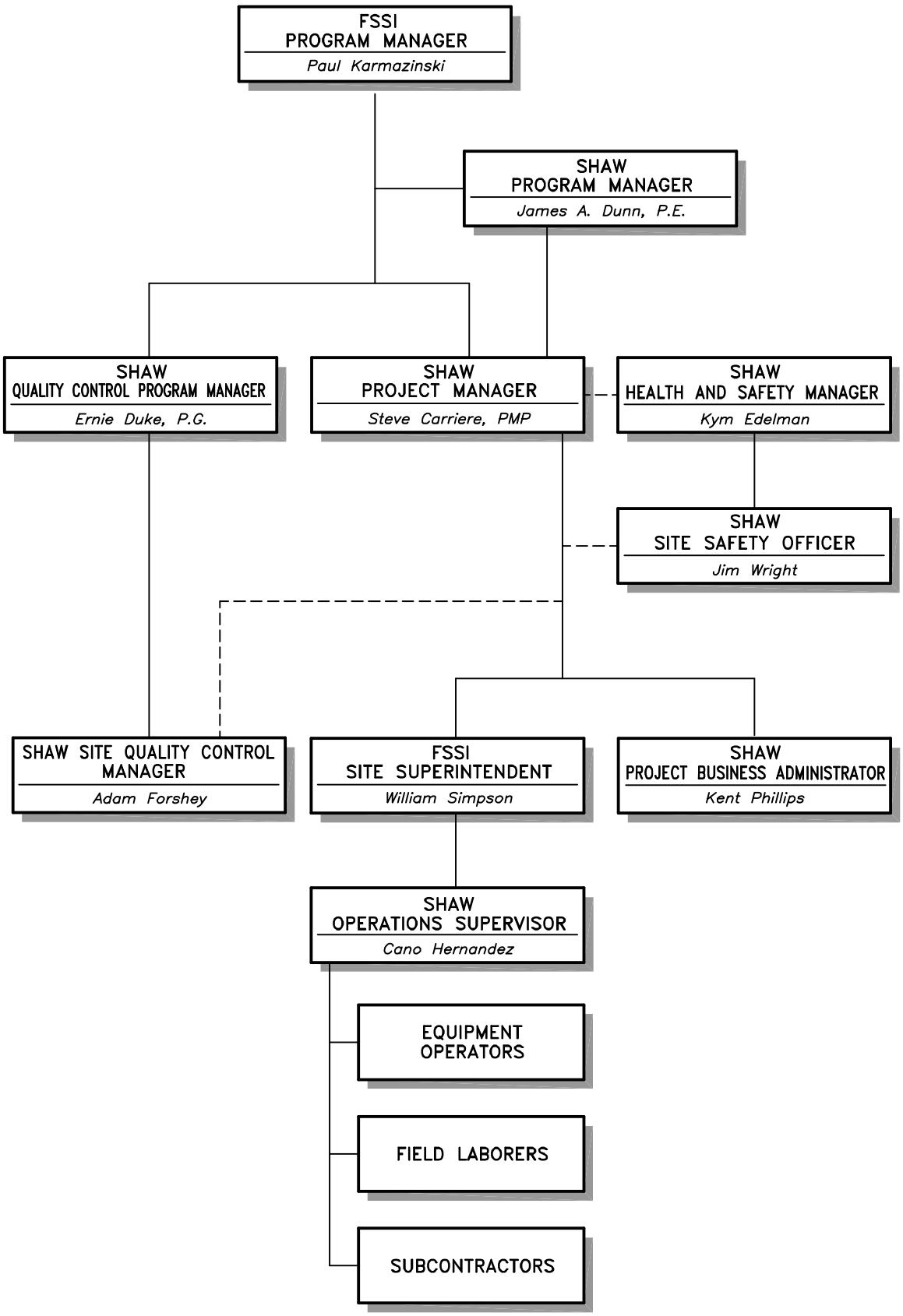
DELIVERY ORDER NO. 025
CONSTR. CONTRACT NO. N62470-03-D-4402
NAVFAC DRAWING NO. --
SIZE: A
SHEET I.D.
FIGURE 1-2

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| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | SC | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Environmental, Inc.

| | | | | |
|---|---|---|---|---|
| DESIGNED BY | -- | CHECKED BY | P.Gamble | 3/21/06 |
| DRAWN BY | G. Jones | 3/18/06 | APPROVED BY | S. Carriere | 3/21/06 |

NAVFAC Naval Facilities Engineering Command

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND

SITE 57 – WORK PLAN

PROJECT ORGANIZATION CHART

| SCALE: | SIZE: |
|---|---|
| AS SHOWN | A |

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D.

FIGURE 2-1

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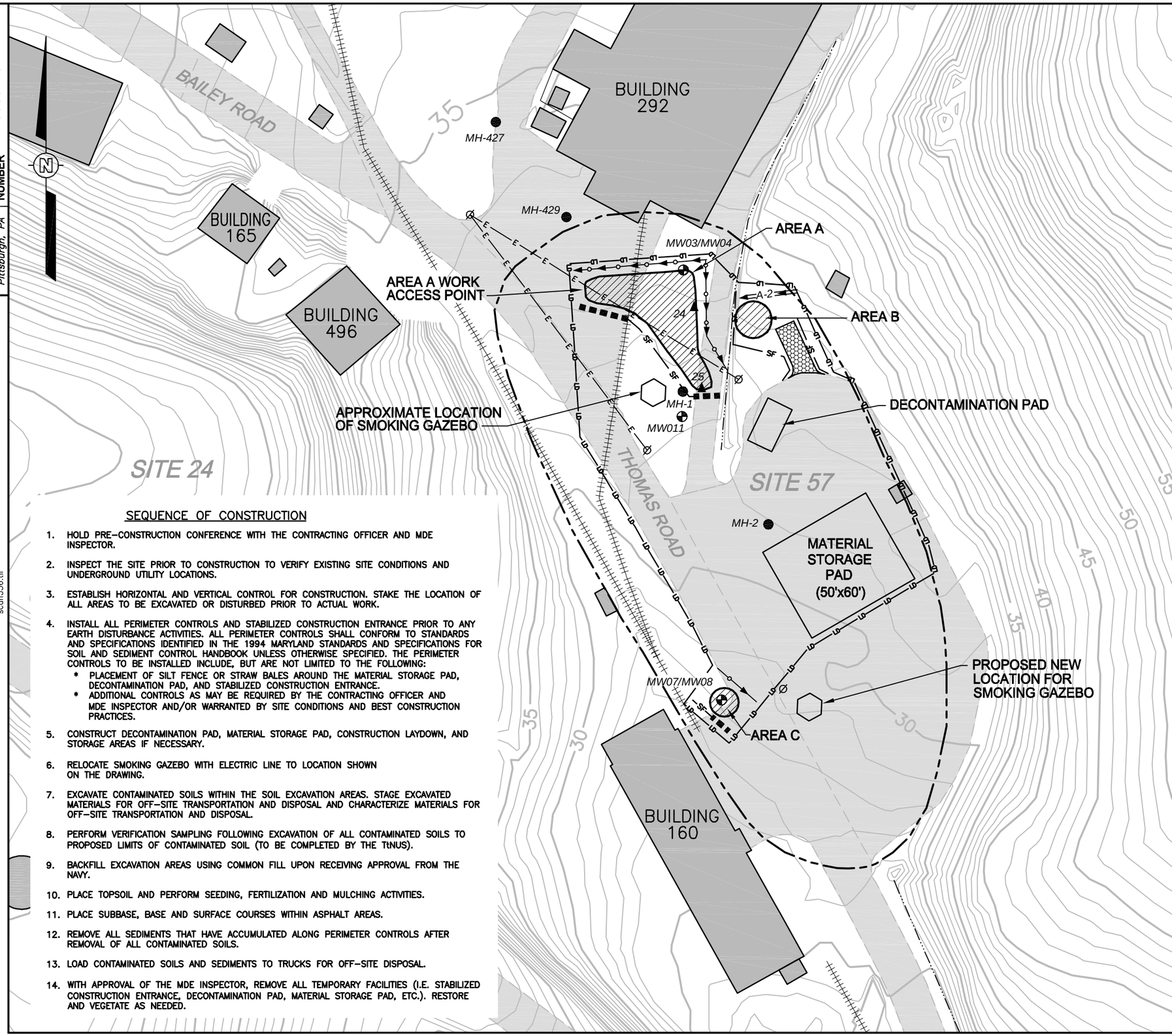


## SEQUENCE OF CONSTRUCTION

1. HOLD PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTING OFFICER AND MDE INSPECTOR.
2. INSPECT THE SITE PRIOR TO CONSTRUCTION TO VERIFY EXISTING SITE CONDITIONS AND UNDERGROUND UTILITY LOCATIONS.
3. ESTABLISH HORIZONTAL AND VERTICAL CONTROL FOR CONSTRUCTION. STAKE THE LOCATION OF ALL AREAS TO BE EXCAVATED OR DISTURBED PRIOR TO ACTUAL WORK.
4. INSTALL ALL PERIMETER CONTROLS AND STABILIZED CONSTRUCTION ENTRANCE PRIOR TO ANY EARTH DISTURBANCE ACTIVITIES. ALL PERIMETER CONTROLS SHALL CONFORM TO STANDARDS AND SPECIFICATIONS IDENTIFIED IN THE 1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL AND SEDIMENT CONTROL HANDBOOK UNLESS OTHERWISE SPECIFIED. THE PERIMETER CONTROLS TO BE INSTALLED INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:
   * PLACEMENT OF SILT FENCE OR STRAW BALES AROUND THE MATERIAL STORAGE PAD, DECONTAMINATION PAD, AND STABILIZED CONSTRUCTION ENTRANCE.
   * ADDITIONAL CONTROLS AS MAY BE REQUIRED BY THE CONTRACTING OFFICER AND MDE INSPECTOR AND/OR WARRANTED BY SITE CONDITIONS AND BEST CONSTRUCTION PRACTICES.
5. CONSTRUCT DECONTAMINATION PAD, MATERIAL STORAGE PAD, CONSTRUCTION LAYDOWN, AND STORAGE AREAS IF NECESSARY.
6. RELOCATE SMOKING GAZEBO WITH ELECTRIC LINE TO LOCATION SHOWN ON THE DRAWING.
7. EXCAVATE CONTAMINATED SOILS WITHIN THE SOIL EXCAVATION AREAS. STAGE EXCAVATED MATERIALS FOR OFF-SITE TRANSPORTATION AND DISPOSAL AND CHARACTERIZE MATERIALS FOR OFF-SITE TRANSPORTATION AND DISPOSAL.
8. PERFORM VERIFICATION SAMPLING FOLLOWING EXCAVATION OF ALL CONTAMINATED SOILS TO PROPOSED LIMITS OF CONTAMINATED SOIL (TO BE COMPLETED BY THE TtNUS).
9. BACKFILL EXCAVATION AREAS USING COMMON FILL UPON RECEIVING APPROVAL FROM THE NAVY.
10. PLACE TOPSOIL AND PERFORM SEEDING, FERTILIZATION AND MULCHING ACTIVITIES.
11. PLACE SUBBASE, BASE AND SURFACE COURSES WITHIN ASPHALT AREAS.
12. REMOVE ALL SEDIMENTS THAT HAVE ACCUMULATED ALONG PERIMETER CONTROLS AFTER REMOVAL OF ALL CONTAMINATED SOILS.
13. LOAD CONTAMINATED SOILS AND SEDIMENTS TO TRUCKS FOR OFF-SITE DISPOSAL.
14. WITH APPROVAL OF THE MDE INSPECTOR, REMOVE ALL TEMPORARY FACILITIES (I.E. STABILIZED CONSTRUCTION ENTRANCE, DECONTAMINATION PAD, MATERIAL STORAGE PAD, ETC.). RESTORE AND VEGETATE AS NEEDED.

## LEGEND:

- BUILDING
- STREAM
- LIMITS OF DISTURBANCE
- STRAW BALE
- SAND BAG DIVERSION BERM
- SILT FENCE
- EARTH DIKE
- ROAD
- EXCAVATION AREA
- SITE LIMITS
- RAILROAD TRACKS
- MH-429 MANHOLE
- CONSTRUCTION ENTRANCE
- ASPHALT
- OVERHEAD ELECTRIC LINES
- UTILITY POLE (APPROXIMATE LOCATION)
- MW011 STICK UP MONITORING WELL (APPROXIMATE LOCATION)
- 24 FLUSH MOUNT MONITORING WELL (APPROXIMATE LOCATION)

## NOTES:

1. SEE FIGURE 2-3 FOR EROSION AND SEDIMENT CONTROL PLAN NOTES.
2. SEE FIGURE 2-4 FOR REVEGETATION NOTES.
3. SEE FIGURE 2-5 FOR CONSTRUCTION ENTRANCE, SILT FENCE AND EARTH DIKE DETAILS.
4. SEE FIGURE 2-6 FOR MATERIAL STORAGE PAD AND DECONTAMINATION PAD DETAILS.

| REVISIONS | | | | | |
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| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

Shaw Environmental, Inc.

| DESIGNED BY | Lin Liu | 3/16/06 | CHECKED BY | P. Gamble | 3/21/06 |
|---|---|---|---|---|---|
| DRAWN BY | G. Jones | 3/16/06 | APPROVED BY | S. Carriere | 3/21/06 |

NAVFAC Naval Facilities Engineering Command Washington, D.C. 20374-5065

NAVAL SUPPORT FACILITY, INDIAN HEAD — INDIAN HEAD, MARYLAND

SITE 57 – WORK PLAN

SITE LAYOUT PLAN

| SCALE: | SIZE: |
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| AS SHOWN | B |

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D. FIGURE 3-1

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DRAWING NUMBER: 120359-B6

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Plotted By: greg.jones

# *Appendix A*
# *Project Schedule*

**APPENDIX A**

# PROJECT SCHEDULE FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

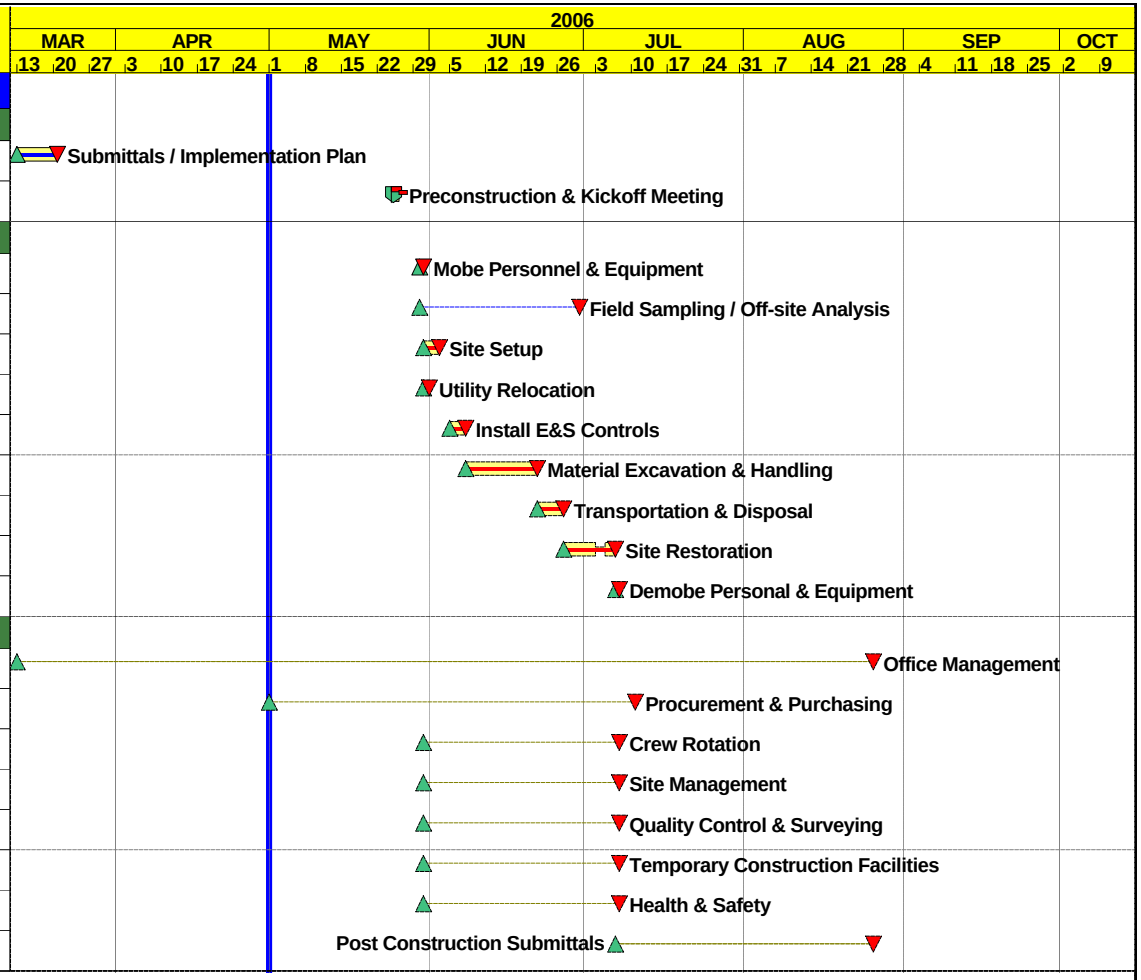
**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
5700 Thurston Avenue, Suite 116
Virginia Beach, Virginia 23455

May 2006
Project No. 120359

| Activity ID | Activity Description | Orig Dur | % | Early Start | Early Finish |
|---|---|---|---|---|---|
| **FSSI 25 - SITE 57 INDIAN HEAD - MD** | | | | | |
| Preconstruction Activities | | | | | |
| 01003000 | Submittals / Implementation Plan | 6 | 100 | 13MAR06A | 20MAR06A |
| 01000010 | Preconstruction & Kickoff Meeting | 1 | 0 | 25MAY06* | 25MAY06 |
| Field Activities | | | | | |
| 01002000 | Mobe Personnel & Equipment | 1 | 0 | 30MAY06* | 30MAY06 |
| 03004000 | Field Sampling / Off-site Analysis | 23 | 0 | 30MAY06 | 29JUN06 |
| 01004000 | Site Setup | 3 | 0 | 31MAY06 | 02JUN06 |
| 03001000 | Utility Relocation | 1 | 0 | 31MAY06 | 31MAY06 |
| 05007000 | Install E&S Controls | 3 | 0 | 05JUN06 | 07JUN06 |
| 08001000 | Material Excavation & Handling | 10 | 0 | 08JUN06 | 21JUN06 |
| 19020010 | Transportation & Disposal | 3 | 0 | 22JUN06 | 26JUN06 |
| 20004000 | Site Restoration | 6 | 0 | 27JUN06 | 06JUL06 |
| 21005000 | Demobe Personal & Equipment | 1 | 0 | 07JUL06 | 07JUL06 |
| Management & Administrative Activities | | | | | |
| 99003000 | Office Management | 81 | 0 | 13MAR06A | 25AUG06 |
| 99005000 | Procurement & Purchasing | 47 | 0 | 01MAY06 | 10JUL06 |
| 21005500 | Crew Rotation | 26 | 0 | 31MAY06 | 07JUL06 |
| 99001000 | Site Management | 26 | 0 | 31MAY06 | 07JUL06 |
| 99004000 | Quality Control & Surveying | 26 | 0 | 31MAY06 | 07JUL06 |
| 99008000 | Temporary Construction Facilities | 26 | 0 | 31MAY06 | 07JUL06 |
| 99015000 | Health & Safety | 26 | 0 | 31MAY06 | 07JUL06 |
| 21006000 | Post Construction Submittals | 36 | 0 | 07JUL06 | 25AUG06 |

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| Start Date | 13MAR06 | F25A | Sheet 1 of 1 |
| Finish Date | 25AUG06 | | |
| Data Date | 01MAY06 | | |
| Run Date | 22MAY06 11:32 | | |

FSSI

FSSI 25 - SITE 57 INDIAN HEAD - MD

Classic Schedule Layout

| Date | Revision | Checked | Approved |
|---|---|---|---|
| | | | |

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# *Appendix B*
# *Erosion and Sediment Control Plan (ESCP)*

**APPENDIX B**

# EROSION AND SEDIMENT CONTROL PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
2790 Mosside Boulevard
Monroeville, Pennsylvania 15146

May 2006
Project No. 120359

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| 2-4 | Vegetation Stabilization Methods and Materials |
| 2-5 | Erosion and Sediment Control Details 1 of 2 |
| 2-6 | Erosion and Sediment Control Details 2 of 2 |


## List of Attachments


| Attachment | Title |
|---|---|
| 1 | Stormwater Management Waiver Application |


## List of Acronyms

| | |
|---|---|
| bgs | below ground surface |
| ESCP | Erosion and Sediment Control Plan |
| FSSI | Field Support Services, Inc. |
| LANTDIV | Department of Navy, Atlantic Division |
| MSL | mean sea level |
| NSF-IH | Naval Support Facility, Indian Head |
| PRGs | preliminary remediation goals |
| SCS | Soil Conservation Service |
| Shaw | Shaw Environmental, Inc. |
| TCE | trichloroethene |
| USDA | United States Department of Agriculture |

# 1.0 Introduction

This Erosion and Sediment Control Plan (ESCP) Report was prepared under Contract Task Order No. 025 under the Department of Navy, Atlantic Division (LANTDIV) Contract Number N62470-03-D-4402. Under this Contract Task Order, the Field Support Services, Inc. (FSSI) and Shaw Environmental, Inc. (Shaw) team is performing a removal action at Site 57 - Building 292 TCE Contamination at the Naval Support Facility, Indian Head (NSF-IH) located in Indian Head, Maryland.

NSF-IH is located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, D.C. (Figure 1-1 Site Vicinity Map). The NSF-IH is a military facility consisting of the Main Area on the Cornwallis Neck Peninsula and the Annex on Stump Neck. The Main Area is bounded by the Potomac River to the northwest, west and south, Mattawoman Creek to the south and east, and the Town of Indian Head to the northeast. Stump Neck Annex is located across Mattawoman Creek and is not contiguous with the Main Area.

## 1.1 Site History

Site 57, Building 292 TCE Contamination Area, encompasses the area located south of Building 292 on the Main Area of the NSF-IH (Figure 1-2 Site Location Map). Previous operations from the mid-1960s until 1989 involved the use of trichloroethene (TCE) for vapor degreasing and general cleaning. During the 1970s and 1980s, spent TCE was transferred from a tank inside Building 292 into drums via a pipe that passed through the wall near the southern corner of the building. The drums were reportedly stored on a grass-covered area near manhole MH-1. It is believed that these operations have resulted in the contamination of soil and groundwater. The use of TCE at Building 292 ceased in 1989.

## 1.2 Report Objective

The objective of this report is to describe the project and present the erosion and sediment control measures that will be used during implementation of the removal action at Site 57.

## 1.3 Report Format

Section 2.0 presents a narrative on the requirements for ESCPs. Section 3.0 presents a generalized sequence of construction. Section 4.0 presents conclusions.

# 2.0 Narrative Requirements

The areas that require soil removal are presented on Figure 2-1 (Site Layout Plan). The large area near Building 292 (Area A) is approximately 1,695 square feet. The small area near Building 292 (Area B) is approximately 225 square feet. The area south of Building 292 (Area C) is approximately 125 square feet. The water table, which past investigations indicate to be approximately 8 feet below ground surface (bgs), is set as the vertical limit of the removal action. Therefore, the total volume of contaminated soil to be removed is estimated to be 606 cubic yards.

## 2.1 Project Description

The proposed removal action for Site 57 will include general site preparation, excavation, and off-site disposal of contaminated soils. Excavation and backfilling will be performed to the extent necessary to remove contaminated soils that exceed the preliminary remediation goals (PRGs). The soil being removed from Site 57 will be transported and disposed at a Navy-approved off-site facility. The excavated areas will be backfilled with an approved clean material and seeded with native grasses.

## 2.2 Existing Site Conditions

Building 292 is located in a valley approximately 1,300 feet north of Mattawoman Creek at an elevation of approximately 35 feet above mean sea level (MSL). The valley trends approximately southeast toward Mattawoman Creek to approximately MSL. The valley slopes are much steeper east, north, and west of the site. A storm drain from Building 292 generally follows the valley and discharges to Mattawoman Creek. An unnamed stream also flows through the valley before discharging to Mattawoman Creek. Portions of an abandoned railroad track are located in the valley.

## 2.3 Off-Site Areas

Areas not within the limits of Site 57 include Thomas Road, the unnamed stream that collects and removes surface water run-off from Site 57, and the borrow source(s) where soils for site restoration may be obtained. Each of these areas, with the exception of the borrow source(s), are located within the limits of disturbance for this removal action. Therefore, the erosion and sediment control devices required to protect these areas and prevent the migration of contaminants to Mattawoman Creek are described in this report. The borrow source(s) will be

selected by the Contractor during construction and will not be located within the limits of disturbance of this removal action.

## 2.4 Soils

A soils map of the site from the Soil Conservation Service (SCS), United States Department of Agriculture (USDA), is provided as Figure 2-2. The approximate location of the site has been indicated on the map. The soil types present at the site are:

AuC2 Aura gravelly sandy loam (5 to 10 percent slopes)

AuD2 Aura gravelly sandy loam (10 to 15 percent slopes)

**Aura Gravelly Sandy Loam**: This soil is deep and well drained. The soil is most often found on uplands. Properties of this soil include a moderately slow permeability, a moderate available water capacity and a severe erosion hazard.

## 2.5 Critical Areas

Critical areas are those that have potentially serious erosion problems due to the presence of steep slopes, poor vegetative cover, run-off channels or areas identified as wetlands. The critical areas associated with Site 57 include the streams that carry stormwater run-off from the site to Mattawoman Creek and Mattawoman Creek. During construction, the unnamed stream will be protected using straw bales, silt fence and various other controls. No other critical areas have been identified on or adjacent to Site 57. However, during construction areas may require temporary protection while portions of the site are unvegetated. FSSI/Shaw will identify and protect these areas during construction.

## 2.6 Erosion and Sediment Control Measures

The required erosion and sediment control measures for Site 57 are shown in Figure 2-2. Erosion and sediment control measures will be implemented, installed, and maintained according to the standards and specifications of the Maryland Erosion and Sediment Control Handbook unless otherwise noted in this plan and on Figure 2-3. The required erosion and sediment control measures are as follows:

- A stabilized construction entrance will be provided north of existing parking lot near Thomas Road and will be protected with silt fence.
- Silt fence and straw bales will be placed along the downslope sides of access roads, stabilized construction entrance, and around identified excavation areas.
- Sand bags with plastic sheets will be placed around the support facilities, such as decontamination pad and material storage pad areas.
- Sand bag berms or earth dikes will be installed to divert water away from the excavation areas as necessary.
- Permanent erosion and sediment control will include vegetation establishment as described in the revegetation notes on Figure 2-4.

### *2.6.1 Structural Practices*

The following structural practices will be used during and/or following construction activities at Site 57 to control erosion and sedimentation. The number listed, if any, references the Maryland Standards and Specifications for Soil Erosion and Sediment Control Handbook, 1994.

Stabilized Construction Entrance – F17.0. A temporary stabilized construction entrance will be installed to provide access to Excavation Area B at Site 57 via parking lot. Construction vehicles will be cleaned before exiting the site. A detail of the stabilized construction entrance is provided on Figure 2-5.

Silt Fence – H15.0. Silt fence and/or straw bales will be installed along the downslope sides of access roads, stabilized construction entrance and excavation areas. A silt fence detail is provided on Figure 2-5.

Surface Roughening – NA. The surface of regraded areas will be roughened to reduce run-off velocity and to aid in the establishment of vegetative cover.

Vegetative Stabilization – G20.0

*Temporary Seeding* It is not anticipated that temporary seeding will be needed at Site 57. However if regraded areas will be left dormant for extended periods of time, the areas will be

seeded with fast germinating temporary vegetation immediately following grading. Temporary seeding will be performed in accordance with the notes on Figure 2-4.

*Permanent Seeding* All regraded areas will be permanently seeded with a seed mixture that will minimize erosion and provide suitable cover for wildlife. Permanent seeding will be performed in accordance with the notes on Figure 2-4.

*Mulching* All areas receiving permanent seed will be mulched with an organic material to prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of the overland flow.

Earth Dike – A1.0. Earth dikes and/or sand bag berms will be used as diversion berms and may be placed along the upstream side of the excavation area in order to divert the storm water run-on. This will be performed on an as-needed basis and will depend on the actual field and slope conditions.

### 2.6.2 Management Strategies

The following management strategies will be utilized throughout the course of the project at Site 57.

1. Unstabilized, disturbed areas will be minimized and construction activities will be staged.

2. Seeding or other stabilization measures will follow immediately after grading.

3. Areas that are not to be disturbed will be clearly marked by flags, signs, etc.

4. The Site Superintendent will be responsible for ensuring the installation and maintenance of all erosion and sediment control practices.

5. Erosion and sediment control structures will be installed and/or constructed before the start of any earth disturbance activities.

6. Erosion and sediment control structures will remain in place until permanent vegetation is established over disturbed surfaces.

## 2.7 Permanent Stabilization

All areas disturbed by removal action activities will be stabilized with permanent seeding as soon as possible following final grading, but no later than 14 days after final grading. The permanent seed mixture will consist of native warm season grasses which will, over the long term, result in lower maintenance costs and more beneficial natural habitat. The mix will include weeping lovegrass and serecia lespedeza and will be placed in accordance with Figure 2-4.

## 2.8 Stormwater Run-Off Control

Following completion of the removal action, the site will be returned to natural existing conditions (grass or asphalt). Therefore, permanent stormwater management controls are not required for this site in accordance with Section 3.3.A.1 of the Stormwater Management Guidelines. A signed Stormwater Management Waiver Application is included in Attachment 1 to this ESCP.

Each site area will be graded in such a way as to promote stormwater run-off as sheet flow off the area. During backfilling, the stormwater run-off from the areas will pass through erosion and sediment control features (silt fence) prior to discharge.

## 2.9 Maintenance

In general, all erosion and sediment control measures will be checked weekly and after each significant rainfall event to assure that all erosion and sediment controls remain in effective operating conditions. Any required repairs will be made immediately. The following items will be checked:

- The stabilized construction entrance will be maintained in a condition that will minimize tracking sediment onto roads, including the addition of stone or other repairs.
- The silt fence will be checked regularly for undermining or deterioration of the fabric. Sediment will be removed when the level of sediment deposition causes “bulging” or reaches half of the fabric height.

- Straw bales will be checked for sediment accumulation. Sediment will be removed when it reaches one half the bale height. Straw bales will be replaced if required.
- The seeded areas will be checked regularly to ensure that a good stand of vegetation is maintained. Areas shall be fertilized and re-seeded as needed.
- The temporary erosion and sediment controls will be removed only after vegetative cover has been established and approved by the Navy.

# 3.0 Sequence of Construction

The time to perform the required construction activities is estimated to be approximately 6 weeks. The generalized sequence of construction activities is:

1. Hold pre-construction conference with the Contracting Officer and MDE Inspector.

2. Inspect the site prior to construction to verify existing site conditions and underground utility locations.

3. Establish horizontal and vertical control for construction. Stake the location of all areas to be excavated or disturbed prior to actual work.

4. Install all perimeter controls and stabilized construction entrance prior to any earth disturbance activities. All perimeter controls shall conform to Standards and Specifications identified in the 1994 Maryland Standards and Specifications for Soil and Sediment Control Handbook unless otherwise specified. The perimeter controls to be installed include, but are not limited to the following:
   - Placement of silt fence or straw bales around the material storage pad, decontamination pad and stabilized construction entrance.
   - Additional controls as may be required by the Contracting Officer and MDE Inspector and/or warranted by site conditions and best construction practices.

5. Construct decontamination pad, material storage pad, construction laydown, and storage areas if necessary.

6. Relocate the smoking gazebo with electric line to the location shown on the drawing.

7. Excavate contaminated soils within the soil excavation areas. Stage excavated materials for off-site transportation and disposal and characterize materials for off-site transportation and disposal.

8. Perform verification sampling following excavation of all contaminated soils to proposed limits of contaminated soil (to be completed by TtNUS).

9. Backfill excavation areas using common fill upon receiving approval from the Navy.

10. Place topsoil and perform seeding, fertilization and mulching activities.

11. Place subbase, base and surface courses within asphalt areas.

12. Remove all sediments that have accumulated along perimeter controls after removal of all contaminated soils.

13. Load contaminated soils and sediments to trucks for off-site disposal.

14. With approval of the MDE Inspector, remove all temporary facilities (i.e. stabilized construction entrance, decontamination pad, material storage pad, etc.). Restore and vegetate as needed.

# 4.0 Conclusions

This removal action will result in the improvement of the site over the long term. Contaminated soils will be removed and disposed of at an approved off-site facility. Appropriate steps will be implemented during construction to control run-off from the site and to reduce the impacts of erosion and sedimentation.

Run-off quality during the removal action will be addressed via temporary erosion and sediment control devices around the perimeter of the disturbed areas.

***Figures***

## INDEX OF DRAWINGS


| SHAW DRAWING NUMBER | SHEET REFERENCE NUMBER | DESCRIPTION |
|---|---|---|
| 120359-T1 | T-1 | TITLE SHEET |
| 120359-A1 | 1-1 | SITE VICINITY MAP |
| 120359-A5 | 1-2 | SITE LOCATION MAP |
| 120359-B1 | 2-1 | SITE LAYOUT PLAN |
| 120359-A2 | 2-2 | SOILS MAP |
| 120359-B4 | 2-3 | EROSION AND SEDIMENT CONTROL PLAN NOTES |
| 120359-B5 | 2-4 | VEGETATION STABILIZATION METHODS AND MATERIALS |
| 120359-B3 | 2-5 | EROSION AND SEDIMENT CONTROL DETAILS (1 OF 2) |
| 120359-B7 | 2-6 | EROSION AND SEDIMENT CONTROL DETAILS (2 OF 2) |


# EROSION AND SEDIMENT CONTROL PLAN

LANTDIV CONTRACT NO. N62470-03-D-4402

SITE 57 - BUILDING 292 TCE CONTAMINATION

INDIAN HEAD, MARYLAND

PREPARED FOR

# NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

STATE OF MARYLAND P.S. VERIFIED LICENSE NO. 28... PROFESSIONAL ENGINEER

| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/21/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Shaw Environmental, Inc.

| | | | |
|---|---|---|---|
| DESIGNED BY | Lin Liu | 3/16/06 | CHECKED BY P. Gamble 3/21/06 |
| DRAWN BY | G. Jones | 3/16/06 | APPROVED BY S. Carriere 3/21/06 |

NAVFAC Naval Facilities Engineering Command NAVFAC WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND

SITE 57 – EROSION & SEDIMENT CONTROL PLAN

TITLE SHEET

SCALE: AS SHOWN | SIZE: B

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D. T-1

OFFICE Pittsburgh, PA | DRAWING NUMBER 120359-T1

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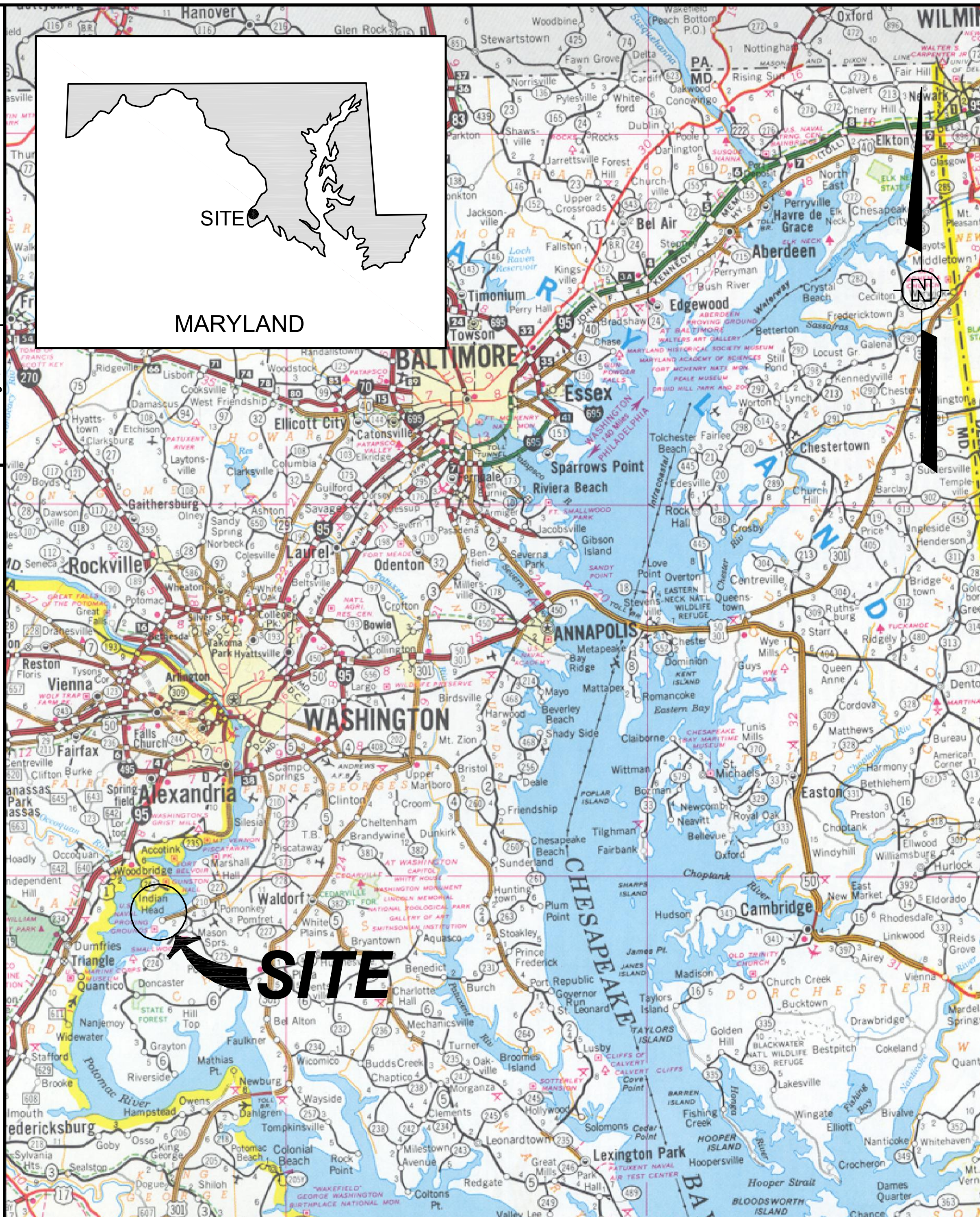
Plotted By: greg.jones




REFERENCE:

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APPROXIMATE SCALE

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OFFICE: Pittsburgh, PA

DRAWING NUMBER: 120359-A1

| REV | DATE | BY | CHK'D | APPR'VD | DESCRIPTION/ISSUE |
| --- | --- | --- | --- | --- | --- |
| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Environmental, Inc.

| DESIGNED BY | -- | -- | CHECKED BY | P.Gamble | 3/21/06 |
| --- | --- | --- | --- | --- | --- |
| DRAWN BY | G. Jones | 3/16/06 | APPROVED BY | S. Carriere | 3/21/06 |

NAVFAC Naval Facilities Engineering Command NAVFAC WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND

SITE 57 - EROSION & SEDIMENT CONTROL PLAN

SITE VICINITY MAP

SCALE: AS SHOWN

SIZE: A

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D. FIGURE 1-1

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| REVISIONS | | | | | | |

NAVFAC Naval Facilities Engineering Command NAVFAC WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD — INDIAN HEAD, MARYLAND

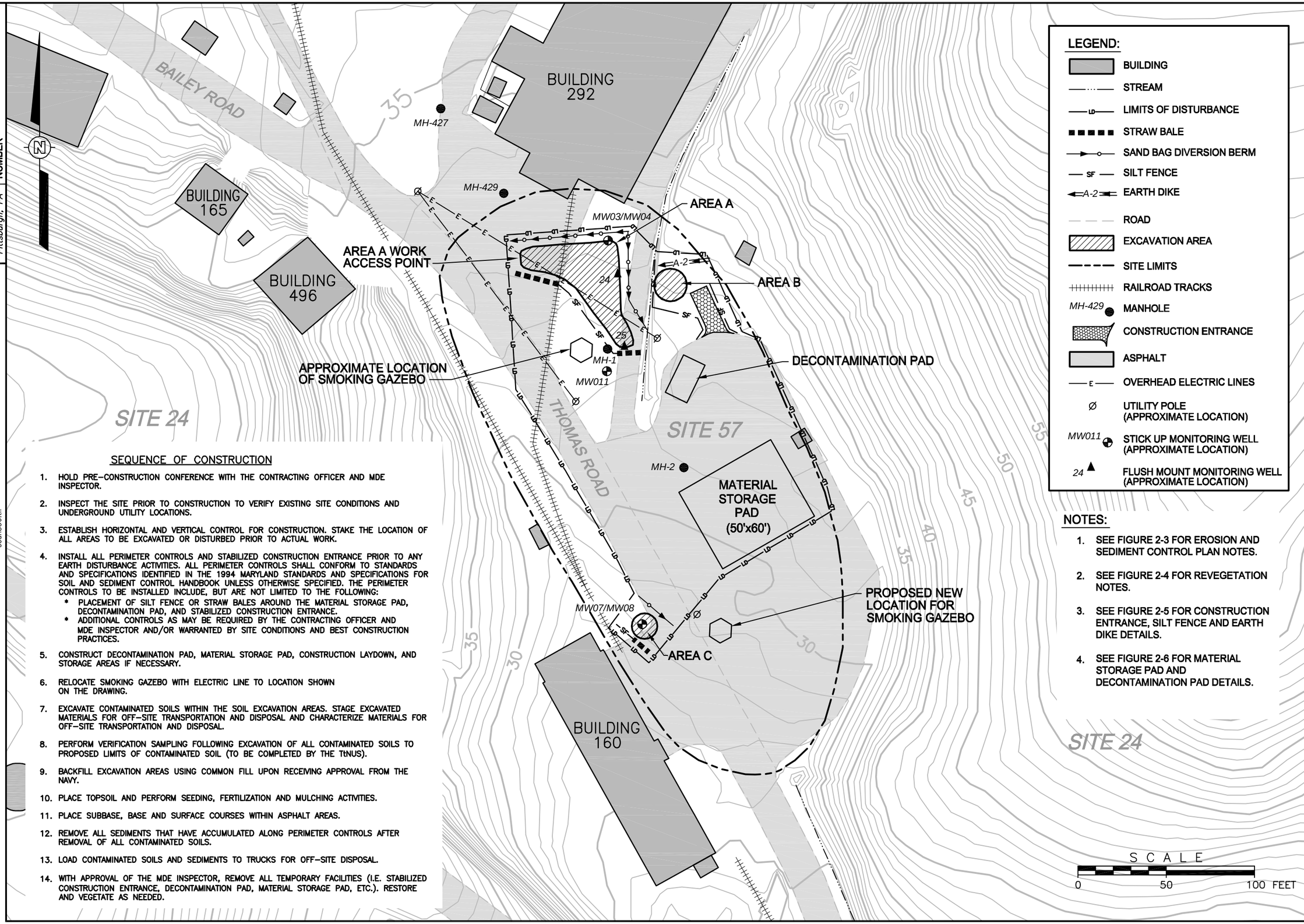
SITE 57 – EROSION & SEDIMENT CONTROL PLAN

SITE LOCATION MAP

Shaw Environmental, Inc.

| | | | | | |
|---|---|---|---|---|---|
| DESIGNED BY | -- | -- | CHECKED BY | P.Gamble | 3/21/06 |
| DRAWN BY | K. Masterson | 3/16/06 | APPROVED BY | S. Carriere | 3/21/06 |

SCALE: AS SHOWN
SIZE: A
DELIVERY ORDER NO. 025
CONSTR. CONTRACT NO. N62470-03-D-4402
NAVFAC DRAWING NO. --
SHEET I.D. FIGURE 1-2




## SEQUENCE OF CONSTRUCTION

1. HOLD PRE-CONSTRUCTION CONFERENCE WITH THE CONTRACTING OFFICER AND MDE INSPECTOR.
2. INSPECT THE SITE PRIOR TO CONSTRUCTION TO VERIFY EXISTING SITE CONDITIONS AND UNDERGROUND UTILITY LOCATIONS.
3. ESTABLISH HORIZONTAL AND VERTICAL CONTROL FOR CONSTRUCTION. STAKE THE LOCATION OF ALL AREAS TO BE EXCAVATED OR DISTURBED PRIOR TO ACTUAL WORK.
4. INSTALL ALL PERIMETER CONTROLS AND STABILIZED CONSTRUCTION ENTRANCE PRIOR TO ANY EARTH DISTURBANCE ACTIVITIES. ALL PERIMETER CONTROLS SHALL CONFORM TO STANDARDS AND SPECIFICATIONS IDENTIFIED IN THE 1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL AND SEDIMENT CONTROL HANDBOOK UNLESS OTHERWISE SPECIFIED. THE PERIMETER CONTROLS TO BE INSTALLED INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING:
   * PLACEMENT OF SILT FENCE OR STRAW BALES AROUND THE MATERIAL STORAGE PAD, DECONTAMINATION PAD, AND STABILIZED CONSTRUCTION ENTRANCE.
   * ADDITIONAL CONTROLS AS MAY BE REQUIRED BY THE CONTRACTING OFFICER AND MDE INSPECTOR AND/OR WARRANTED BY SITE CONDITIONS AND BEST CONSTRUCTION PRACTICES.
5. CONSTRUCT DECONTAMINATION PAD, MATERIAL STORAGE PAD, CONSTRUCTION LAYDOWN, AND STORAGE AREAS IF NECESSARY.
6. RELOCATE SMOKING GAZEBO WITH ELECTRIC LINE TO LOCATION SHOWN ON THE DRAWING.
7. EXCAVATE CONTAMINATED SOILS WITHIN THE SOIL EXCAVATION AREAS. STAGE EXCAVATED MATERIALS FOR OFF-SITE TRANSPORTATION AND DISPOSAL AND CHARACTERIZE MATERIALS FOR OFF-SITE TRANSPORTATION AND DISPOSAL.
8. PERFORM VERIFICATION SAMPLING FOLLOWING EXCAVATION OF ALL CONTAMINATED SOILS TO PROPOSED LIMITS OF CONTAMINATED SOIL (TO BE COMPLETED BY THE TtNUS).
9. BACKFILL EXCAVATION AREAS USING COMMON FILL UPON RECEIVING APPROVAL FROM THE NAVY.
10. PLACE TOPSOIL AND PERFORM SEEDING, FERTILIZATION AND MULCHING ACTIVITIES.
11. PLACE SUBBASE, BASE AND SURFACE COURSES WITHIN ASPHALT AREAS.
12. REMOVE ALL SEDIMENTS THAT HAVE ACCUMULATED ALONG PERIMETER CONTROLS AFTER REMOVAL OF ALL CONTAMINATED SOILS.
13. LOAD CONTAMINATED SOILS AND SEDIMENTS TO TRUCKS FOR OFF-SITE DISPOSAL.
14. WITH APPROVAL OF THE MDE INSPECTOR, REMOVE ALL TEMPORARY FACILITIES (I.E. STABILIZED CONSTRUCTION ENTRANCE, DECONTAMINATION PAD, MATERIAL STORAGE PAD, ETC.). RESTORE AND VEGETATE AS NEEDED.

## LEGEND:

- BUILDING
- STREAM
- LIMITS OF DISTURBANCE
- STRAW BALE
- SAND BAG DIVERSION BERM
- SILT FENCE
- EARTH DIKE
- ROAD
- EXCAVATION AREA
- SITE LIMITS
- RAILROAD TRACKS
- MH-429 MANHOLE
- CONSTRUCTION ENTRANCE
- ASPHALT
- OVERHEAD ELECTRIC LINES
- UTILITY POLE (APPROXIMATE LOCATION)
- MW011 STICK UP MONITORING WELL (APPROXIMATE LOCATION)
- 24 FLUSH MOUNT MONITORING WELL (APPROXIMATE LOCATION)

## NOTES:

1. SEE FIGURE 2-3 FOR EROSION AND SEDIMENT CONTROL PLAN NOTES.
2. SEE FIGURE 2-4 FOR REVEGETATION NOTES.
3. SEE FIGURE 2-5 FOR CONSTRUCTION ENTRANCE, SILT FENCE AND EARTH DIKE DETAILS.
4. SEE FIGURE 2-6 FOR MATERIAL STORAGE PAD AND DECONTAMINATION PAD DETAILS.

| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
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| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Environmental, Inc.

| | | | |
|---|---|---|---|
| DESIGNED BY | Ln Liu | 3/16/06 | CHECKED BY P. Gamble 3/21/06 |
| DRAWN BY | G. Jones | 3/16/06 | APPROVED BY S. Carriere 3/21/06 |

NAVFAC Naval Facilities Engineering Command www.navfac.navy.mil

NAVAL SUPPORT FACILITY, INDIAN HEAD — INDIAN HEAD, MARYLAND

SITE 57 – EROSION & SEDIMENT CONTROL PLAN

SITE LAYOUT PLAN

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| SCALE: AS SHOWN | SIZE: B |
| DELIVERY ORDER NO. 025 | |
| CONSTR. CONTRACT NO. N62470-03-D-4402 | |
| NAVFAC DRAWING NO. -- | |
| SHEET I.D. FIGURE 2-1 | |

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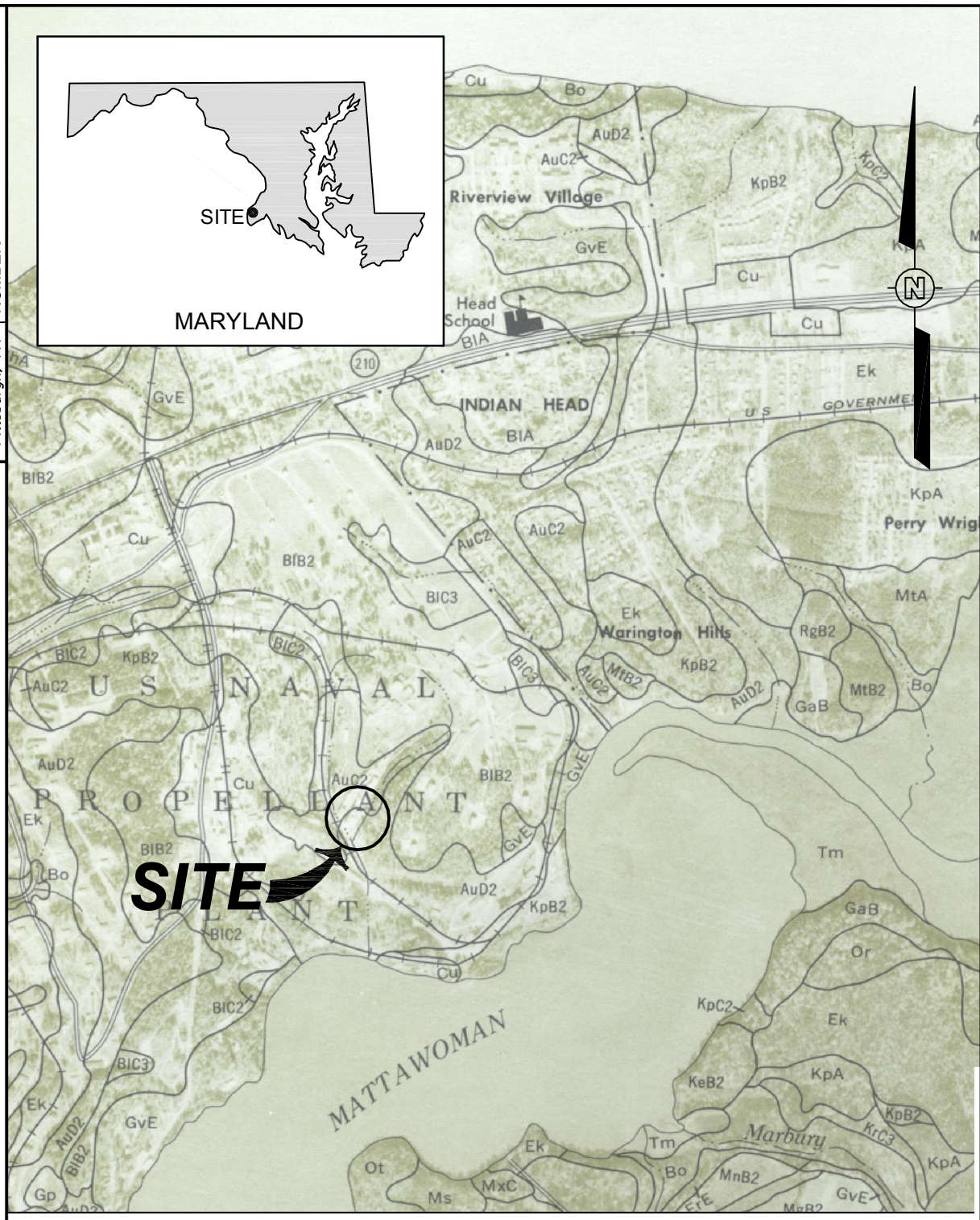


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| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

REVISIONS

Shaw Environmental, Inc.

| | | | |
|---|---|---|---|
| DESIGNED BY | -- | CHECKED BY | Lin Liu 3/21/06 |
| DRAWN BY | G. Jones 3/16/06 | APPROVED BY | P. Gamble 3/21/06 |

NAVFAC Naval Facilities Engineering Command

NAVAL SUPPORT FACILITY, INDIAN HEAD — INDIAN HEAD, MARYLAND

SITE 57 – EROSION & SEDIMENT CONTROL PLAN

SOILS MAP

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DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D. FIGURE 2-2

REFERENCE:

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Plotted by: greg.jones Image: NAVFAC soil

# EROSION AND SEDIMENT CONTROL PLAN NOTES

1. THE CONTRACTOR SHALL NOTIFY THE WATER MANAGEMENT ADMINISTRATION (WMA) AT (410) 537-3510 SEVEN (7) DAYS BEFORE COMMENCING ANY LAND DISTURBING ACTIVITY AND, UNLESS WAIVED BY WMA, SHALL BE REQUIRED TO HOLD A PRE-CONSTRUCTION MEETING BETWEEN PROJECT REPRESENTATIVES AND A REPRESENTATIVE OF WMA.

2. THE CONTRACTOR MUST NOTIFY WMA IN WRITING AND BY TELEPHONE AT THE FOLLOWING POINTS:
   A. THE REQUIRED PRE-CONSTRUCTION MEETING.
   B. FOLLOWING INSTALLATION OF SEDIMENT CONTROL MEASURES.
   C. DURING THE INSTALLATION OF SEDIMENT BASINS (TO BE CONVERTED INTO PERMANENT STORMWATER MANAGEMENT STRUCTURES) AT THE REQUIRED INSPECTION POINTS (SEE INSPECTION CHECKLIST ON PLAN). NOTIFICATION PRIOR TO COMMENCING CONSTRUCTION OF EACH STEP IS MANDATORY.
   D. PRIOR TO REMOVAL OR MODIFICATION OF ANY SEDIMENT CONTROL STRUCTURE(S).
   E. PRIOR TO REMOVAL OF ALL SEDIMENT CONTROL DEVICES.
   F. PRIOR TO FINAL ACCEPTANCE.

3. THE CONTRACTOR SHALL CONSTRUCT ALL EROSION AND SEDIMENT CONTROL MEASURES PER THE APPROVED PLAN AND CONSTRUCTION SEQUENCE AND SHALL HAVE THEM INSPECTED AND APPROVED BY THE AGENCY INSPECTOR OR WMA INSPECTOR PRIOR TO BEGINNING ANY OTHER LAND DISTURBANCES. MINOR SEDIMENT CONTROL DEVICE LOCATION ADJUSTMENTS MAY BE MADE IN THE FIELD WITH THE APPROVAL OF THE WMA INSPECTOR. THE CONTRACTOR SHALL ENSURE THAT ALL RUNOFF FROM DISTURBED AREAS IS DIRECTED TO THE SEDIMENT CONTROL DEVICES AND SHALL NOT REMOVE ANY EROSION OR SEDIMENT CONTROL MEASURE WITHOUT PRIOR PERMISSION FROM THE WMA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR MUST OBTAIN PRIOR AGENCY AND WMA APPROVAL FOR CHANGES TO THE SEDIMENT CONTROL PLAN AND/OR SEQUENCE OF CONSTRUCTION.

4. THE CONTRACTOR SHALL PROTECT ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS TO PREVENT THE DEPOSITION OF MATERIALS ONTO PUBLIC ROADS. ALL MATERIALS DEPOSITED ONTO PUBLIC ROADS SHALL BE REMOVED IMMEDIATELY.

5. THE CONTRACTOR SHALL INSPECT DAILY AND MAINTAIN CONTINUOUSLY IN AN EFFECTIVE OPERATING CONDITION ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL SUCH TIME AS THEY ARE REMOVED WITH PRIOR PERMISSION FROM THE WMA INSPECTOR AND AGENCY INSPECTOR.

6. ALL SEDIMENT BASINS, TRAP EMBANKMENTS AND SLOPES, PERIMETER DIKES, SWALES AND ALL DISTURBED SLOPES STEEPER OR EQUAL TO 3:1 SHALL BE STABILIZED WITH SOD OR SEED AND ANCHORED STRAW MULCH, OR OTHER APPROVED STABILIZATION MEASURES, AS SOON AS POSSIBLE BUT NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER ESTABLISHMENT. ALL AREAS DISTURBED OUTSIDE OF THE PERIMETER SEDIMENT CONTROL SYSTEM MUST BE MINIMIZED. MAINTENANCE MUST BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT FOR STABILIZATION MAY BE REDUCED TO THREE (3) DAYS FOR SENSITIVE AREAS).

7. THE CONTRACTOR SHALL APPLY SOD OR SEED AND ANCHORED STRAW MULCH, OR APPROVED STABILIZATION MEASURES TO ALL DISTURBED AREAS AND STOCKPILES WITHIN FOURTEEN (14) CALENDAR DAYS AFTER STRIPPING AND GRADING ACTIVITIES HAVE CEASED IN THE AREA. MAINTENANCE SHALL BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT MAY BE REDUCED TO SEVEN (7) DAYS FOR SENSITIVE AREAS).

8. PRIOR TO REMOVAL OF SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL STABILIZE AND HAVE ESTABLISHED PERMANENT STABILIZATION FOR ALL CONTRIBUTORY DISTURBED AREAS USING SOD OR AN APPROVED PERMANENT SEED MIXTURE WITH REQUIRED SOIL AMENDMENTS AND AN APPROVED ANCHORED MULCH. WOOD FIBER MULCH MAY ONLY BE USED IN SEEDING SEASON WHERE THE SLOPE DOES NOT EXCEED 10% AND GRADING HAS BEEN DONE TO PROMOTE SHEET FLOW DRAINAGE. AREAS BROUGHT TO FINISHED GRADE DURING THE SEEDING SEASON SHALL BE PERMANENTLY STABILIZED AS SOON AS POSSIBLE, BUT NO LATER THAN FOURTEEN (14) CALENDAR DAYS AFTER ESTABLISHMENT. WHEN PROPERTY IS BROUGHT TO FINISHED GRADE DURING THE MONTHS OF NOVEMBER THROUGH FEBRUARY, AND PERMANENT STABILIZATION IS FOUND TO BE IMPRACTICAL, TEMPORARY SEED AND ANCHORED STRAW MULCH SHALL BE APPLIED TO DISTURBED AREAS. THE FINAL PERMANENT STABILIZATION OF SUCH PROPERTY SHALL BE APPLIED BY MARCH 15 OR EARLIER IF GROUND AND WEATHER CONDITIONS ALLOW.

9. THE SITE'S APPROVAL LETTER, APPROVED EROSION AND SEDIMENT CONTROL PLANS, DAILY LOG BOOKS AND TEST REPORTS SHALL BE AVAILABLE AT THE SITE FOR INSPECTION BY DULY AUTHORIZED OFFICIALS OF WMA AND AGENCY RESPONSIBLE FOR PROJECT.

10. SURFACE DRAINAGE FLOWS OVER UNSTABILIZED CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER PREVENTING DRAINAGE FLOWS FROM TRAVERSING THE SLOPES OR BY INSTALLING PROTECTIVE DEVICES TO LOWER THE WATER DOWNSLOPE WITHOUT CAUSING EROSION. DIKES SHALL BE INSTALLED AND MAINTAINED AT THE TOP OF CUT OR FILL SLOPES UNTIL THE SLOPES AND DRAINAGE AREAS TO THEM ARE FULLY STABILIZED, AT WHICH TIME THEY MUST BE REMOVED AND FINAL GRADING DONE TO PROMOTE SHEET FLOW DRAINAGE. PROTECTIVE METHODS MUST BE PROVIDED AT POINTS OF CONCENTRATED FLOW WHERE EROSION IS LIKELY TO OCCUR.

11. PERMANENT SWALES OR OTHER POINTS OF CONCENTRATED WATER FLOW SHALL BE STABILIZED WITH SOD OR SEED WITH AN APPROVED EROSION CONTROL MATTING, RIPRAP OR BY OTHER APPROVED STABILIZATION MEASURES.

12. TEMPORARY SEDIMENT CONTROL DEVICES MAY BE REMOVED, WITH PERMISSION OF WMA INSPECTOR AND AGENCY INSPECTORS, WITHIN THIRTY (30) CALENDAR DAYS FOLLOWING ESTABLISHMENT OF PERMANENT STABILIZATION IN ALL CONTRIBUTORY DRAINAGE AREAS. STORMWATER MANAGEMENT STRUCTURE USED TEMPORARILY FOR SEDIMENT CONTROL SHALL BE CONVERTED TO THEIR PERMANENT CONFIGURATION WITHIN THIS TIME PERIOD AS WELL.

13. NO PERMANENT CUT OR FILL SLOPE WITH A GRADIENT STEEPER THAN 3:1 WILL BE PERMITTED IN LAWN MAINTENANCE AREAS. A SLOPE GRADIENT OF UP TO 2:1 WILL BE PERMITTED IN NON-MAINTENANCE AREAS PROVIDED THAT THOSE AREAS ARE INDICATED ON THE EROSION AND SEDIMENT CONTROL PLAN WITH A LOW-MAINTENANCE GROUND COVER SPECIFIED FOR PERMANENT STABILIZATION. SLOPE GRADIENT STEEPER THAN 2:1 WILL NOT PERMITTED WITH VEGETATIVE STABILIZATION.

14. FOR FINISHED GRADING, THE CONTRACTOR SHALL PROVIDE ADEQUATE GRADIENTS SO AS TO PREVENT WATER FROM STANDING ON THE SURFACE MORE THAN TWENTY-FOUR (24) HOURS AFTER THE END OF A RAINFALL EXCEPT IN DESIGNATED DRAINAGE COURSES AND SWALE FLOW AREAS WHICH MAY DRAIN AS LONG AS FORTY-EIGHT (48) HOURS AFTER THE END OF A RAINFALL. AREAS DESIGNED TO HAVE STANDING WATER SHALL NOT BE REQUIRED TO MEET THIS REQUIREMENT.

15. SEDIMENT TRAPS OR BASINS ARE NOT PERMITTED WITHIN 20 FEET OF A FOUNDATION WHICH IS EXISTING OR UNDER CONSTRUCTION. NO STRUCTURE MAY BE CONSTRUCTED WITHIN 20 FEET OF AN ACTIVE SEDIMENT TRAP OR BASIN.

16. THE WMA INSPECTOR HAS THE OPTION OF REQUIRING ADDITIONAL SAFETY OR SEDIMENT CONTROL MEASURES, IF DEEMED NECESSARY.

17. ALL TRAP DEPTH DIMENSIONS ARE RELATIVE TO THE OUTLET ELEVATION. ALL TRAPS MUST HAVE A STABLE OUTFALL. ALL TRAPS AND BASINS SHALL HAVE STABLE INFLOW POINTS.

18. VEGETATIVE STABILIZATION SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. REFER TO APPROPRIATE SPECIFICATIONS FOR TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING, SODDING AND GROUND COVERS.

19. TEMPORARY SEDIMENT TRAP(S) SHALL BE CLEANED OUT AND RESTORED TO THE ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO A POINT ONE HALF (1/2) THE DEPTH BETWEEN THE OUTLET CREST AND THE BOTTOM OF THE TRAP. SEDIMENT BASINS SHALL BE CLEANED OUT AND RESTORED TO THE ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO ONE HALF (1/2) THE DEPTH BETWEEN THE DEWATERING ELEVATION AND THE BOTTOM OF THE BASIN.

20. SEDIMENT REMOVED FROM TRAPS (AND BASINS) SHALL BE PLACED AND STABILIZED IN APPROVED AREAS, BUT NOT WITHIN A FLOODPLAIN, WETLAND OR TREE-SAVE AREA. WHEN PUMPING SEDIMENT LADEN WATER, THE DISCHARGE MUST BE DIRECTED TO A SEDIMENT TRAPPING DEVICE PRIOR TO RELEASE FROM THE SITE. A SUMP PIT MAY BE USED IF SEDIMENT TRAPS THEMSELVES ARE BEING PUMPED OUT.

21. WHERE DEEMED APPROPRIATE BY THE ENGINEER OR INSPECTOR, SEDIMENT BASINS AND TRAPS MAY NEED TO BE SURROUNDED WITH AN APPROVED SAFETY FENCE. THE FENCE MUST CONFORM TO LOCAL ORDINANCES AND REGULATIONS. THE DEVELOPER OR OWNER SHALL CHECK WITH LOCAL BUILDING OFFICIALS ON APPLICABLE SAFETY REQUIREMENTS. WHERE SAFETY FENCE IS DEEMED APPROPRIATE AND LOCAL ORDINANCES DO NOT SPECIFY FENCING SIZES AND TYPES, THE FOLLOWING SHALL BE USED AS A MINIMUM STANDARD. THE SAFETY FENCE MUST BE MADE OF WELDED WIRE AND AT LEAST 42 INCHES HIGH, HAVE POSTS SPACED NO FARTHER APART THAN 8 FEET, HAVE MESH OPENINGS NO GREATER THAN 2 INCHES IN WIDTH AND 4 INCHES IN HEIGHT WITH A MINIMUM OF 14 GAUGE WIRE. SAFETY FENCE MUST BE MAINTAINED AND IN GOOD CONDITION AT ALL TIMES.

22. SEDIMENT CONTROL FOR UTILITY CONSTRUCTION FOR AREAS OUTSIDE OF DESIGNED CONTROLS OR AS DIRECTED BY ENGINEER, WMA INSPECTOR, OR THE ROICC: (NOT APPLICABLE)
    (A) CALL "MISS UTILITY" AT 1-800-257-7777 48 HOURS PRIOR TO THE START OF WORK
    (B) EXCAVATED TRENCH MATERIAL SHALL BE PLACED ON THE HIGH SIDE OF THE TRENCH.
    (C) TRENCHES FOR UTILITY INSTALLATION SHALL BE BACKFILLED, COMPACTED AND STABILIZED AT THE END OF EACH WORK DAY. NO MORE TRENCH SHALL BE OPENED THAN CAN BE COMPLETED THE SAME DAY, UNLESS.
    (D) TEMPORARY SILT FENCE SHALL BE PLACED IMMEDIATELY DOWNSTREAM OF ANY DISTURBED AREA INTENDED TO REMAIN DISTURBED FOR MORE THAN ONE DAY.

23. OFF-SITE SPOIL OR BORROW AREAS ON STATE OR FEDERAL PROPERTY MUST HAVE PRIOR APPROVAL BY WMA AND OTHER APPLICABLE STATE, FEDERAL AND LOCAL AGENCIES. OTHERWISE, APPROVAL MUST BE GRANTED BY THE LOCAL AUTHORITIES. ALL WASTE AND BORROW AREAS OFF SITE MUST BE PROTECTED BY SEDIMENT CONTROL MEASURES AND STABILIZED.

24. FOR SITES WHERE INFILTRATION DEVICES ARE USED FOR THE CONTROL OF STORMWATER, EXTREME CARE MUST BE TAKEN TO PREVENT RUNOFF FROM UNSTABILIZED AREAS FROM ENTERING THE STRUCTURE DURING CONSTRUCTION. SEDIMENT CONTROL DEVICES PLACED IN INFILTRATION AREAS MUST HAVE BOTTOM ELEVATIONS AT LEAST TWO (2) FEET HIGHER THAN THE FINISH GRADE BOTTOM ELEVATION OF THE INFILTRATION PRACTICE. WHEN CONVERTING A SEDIMENT TRAP TO AN INFILTRATION DEVICE, ALL ACCUMULATED SEDIMENT MUST BE REMOVED AND DISPOSED OF PRIOR TO FINAL GRADING OF INFILTRATION DEVICE.

25. WHEN A STORM DRAIN SYSTEM OUTFALL IS DIRECTED TO A SEDIMENT TRAP OR SEDIMENT BASIN AND THE SYSTEM IS TO BE USED FOR TEMPORARILY CONVEYING SEDIMENT LADEN WATER, ALL STORM DRAIN INLETS IN NON-SUMP AREAS SHALL HAVE TEMPORARY ASPHALT BERMS CONSTRUCTED AT THE TIME OF BASE PAVING TO DIRECT GUTTER FLOW INTO THE INLETS TO AVOID SURCHARGING AND OVERFLOW OF INLETS IN SUMP AREAS.

26. SITE INFORMATION:

| | | |
|---|---|---|
| APPROXIMATE AREA OF NAVAL DISTRICT WASHINGTON, INDIAN HEAD | 3,400 | ACRES |
| TOTAL AREA OF IR SITE 57 | 1.079 | ACRES |
| AREA OF CUT/FILL DISTURBANCE | .048 | ACRES |
| AREA TO BE ROOFED OR PAVED | .011 | ACRES |
| TOTAL CUT | 606 | CUBIC YARDS |
| TOTAL FILL | 606 | CUBIC YARDS |
| OFFSITE WASTE/BORROW AREA LOCATION | TO BE DETERMINED | |

## STANDARD STABILIZATION NOTE:

FOLLOWING INITIAL SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN 7 CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN THREE HORIZONTAL TO ONE VERTICAL (3H:1V); AND 14 DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

### DESIGN CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN HAS BEEN DESIGNED IN ACCORDANCE WITH THE 1994 STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, THE 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUMES I & II AND THE MARYLAND DEPARTMENT OF THE ENVIRONMENT EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT REGULATIONS.

5/31/06 — DATE; [signature] — DESIGNER'S SIGNATURE

MD. REGISTRATION NO. 28735 — P.E., R.L.S., R.L.A. OR R.A. (CIRCLE ONE); P. S. Verma — PRINTED NAME

STATE OF MARYLAND · P.S. VERMA · LICENSE NO. 28735 · PROFESSIONAL ENGINEER

### OWNER'S/DEVELOPER'S CERTIFICATION

I/WE HEREBY CERTIFY THAT ALL CLEARING, GRADING, CONSTRUCTION, AND/OR DEVELOPMENT WILL BE DONE PURSUANT TO THIS PLAN AND THAT ANY RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE AT A MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVED TRAINING PROGRAM FOR THE CONTROL OF EROSION AND SEDIMENT BEFORE BEGINNING THE PROJECT. I HEREBY AUTHORIZE THE RIGHT OF ENTRY FOR PERIODIC ON-SITE EVALUATION BY STATE OF MARYLAND, DEPARTMENT OF THE ENVIRONMENT, COMPLIANCE INSPECTORS.

5/30/06 — DATE; [signature] — OWNER/DEVELOPER SIGNATURE

\# 03593 — CARD NO.; Jeffrey C Bussard, Env Prog Dir — PRINTED NAME AND TITLE

# WARNING ! EROSION AND SEDIMENT CONTROL WILL BE STRICTLY ENFORCED ! ! !

OFFICE: Pittsburgh, PA | DRAWING NUMBER: 120359-B4

REVISIONS: 0 — 5/22/08 — ISJ — PMG — PSV — FINAL WORK PLAN ISSUED TO NAVY (REV / DATE / BY / CHK'D / APP'D / DESCRIPTION/ISSUE)

Shaw Environmental, Inc. — DESIGNED BY: -- ; DRAWN BY: G. Jones 3/14/08; CHECKED BY: -- ; APPROVED BY: ... 3/21/08

NAVFAC — NAVAL SUPPORT FACILITY, INDIAN HEAD, INDIAN HEAD, MARYLAND — SITE 57 - EROSION & SEDIMENT CONTROL PLAN — EROSION AND SEDIMENT CONTROL PLAN NOTES

SCALE: AS SHOWN | SIZE: B | DELIVERY ORDER NO.: 025 | CONSTR. CONTRACT NO.: N62470-03-D-4402 | NAVFAC DRAWING NO.: – | SHEET I.D.: FIGURE 2-3

Xref:
Image: NAVFAC Logo.jpg
File: O:\CAD Standards\Shaw\Formats\Shaw Layouts-draft-ps.dwg
Plot Date/Time: May 22, 2008 - 1:09pm
Plotted By: greg.jones

# VEGETATION STABILIZATION METHODS AND MATERIALS

## SECTION 1 – PREPARATIONS FOR SEEDING

A. GENERAL SITE PREPARATION

1. INSTALL EROSION AND SEDIMENT CONTROL STRUCTURES IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.

2. PERFORM GRADING OPERATIONS AT RIGHT ANGLES TO THE SLOPE TO THE EXTENT POSSIBLE. FINAL GRADING AND SHAPING IS NOT USUALLY NECESSARY FOR TEMPORARY SEEDING.

3. SCHEDULE REQUIRED SOIL TESTS TO DETERMINE SOIL AMENDMENT COMPOSITION AND APPLICATION RATES FOR SITES HAVING DISTURBED AREA OVER 5 ACRES.

B. SOIL AMENDMENTS (FERTILIZER AND LIME SPECIFICATIONS)

1. SOIL TESTS MUST BE PERFORMED TO DETERMINE THE EXACT RATIOS AND APPLICATION RATES FOR BOTH LIME AND FERTILIZER ON SITES HAVING DISTURBED AREAS OVER 5 ACRES. SOIL ANALYSIS MAY BE PERFORMED BY THE UNIVERSITY OF MARYLAND OR A RECOGNIZED COMMERCIAL LABORATORY. SOIL SAMPLES TAKEN FOR ENGINEERING PURPOSES MAY ALSO BE USED FOR CHEMICAL ANALYSIS.

2. FERTILIZERS SHALL BE UNIFORM IN COMPOSITION, FREE FLOWING, AND SUITABLE FOR ACCURATE APPLICATION BY APPROVED EQUIPMENT. FERTILIZERS SHALL BE DELIVERED TO THE SITE, FULLY LABELED ACCORDING TO APPLICABLE STATE FERTILIZER LAWS AND SHALL BEAR THE NAME, TRADE NAME OR TRADEMARK, AND WARRANTY OF THE PRODUCER.

3. LIME MATERIALS SHALL BE GROUND LIMESTONE (HYDRATED OR BURNT LIME MAY BE SUBSTITUTED) WHICH CONTAINS AT LEAST 50% TOTAL OXIDES (CALCIUM OXIDE PLUS MAGNESIUM OXIDE). LIMESTONE SHALL BE GROUND TO SUCH FINENESS THAT AT LEAST 50% WILL PASS THROUGH A #100 MESH SIEVE, AND 98 TO 100% WILL PASS THROUGH A #20 MESH SIEVE.

4. INCORPORATE LIME AND FERTILIZER INTO TOP 3-5" OF SOIL BY DISKING OR OTHER SUITABLE MEANS.

C. SEEDBED PREPARATION

1. TEMPORARY SEEDING

a. SEEDBED PREPARATION SHALL CONSIST OF LOOSENING SOIL TO A DEPTH OF 3 INCHES TO 5 INCHES BY MEANS OF SUITABLE AGRICULTURAL OR CONSTRUCTION EQUIPMENT, SUCH AS DISC HARROWS, CHISEL PLOWS, OR RIPPERS MOUNTED ON CONSTRUCTION EQUIPMENT. AFTER THE SOIL IS LOOSENED, IT SHOULD NOT BE ROLLED OR DRAGGED SMOOTH, BUT LEFT IN THE ROUGHENED CONDITION. PLACED TOPSOIL OR SLOPED AREAS (GREATER THAN 3:1) SHOULD BE TRACKED BY A DOZER LEAVING THE SURFACE IN AN IRREGULAR CONDITION WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE.

b. APPLY FERTILIZER AND LIME AS PRESCRIBED IN SECTION 3, AND INCORPORATE INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS.

2. PERMANENT SEEDING

a. MINIMUM TOPSOIL CONDITIONS REQUIRED FOR PERMANENT VEGETATIVE ESTABLISHMENT:

1. SOIL pH SHALL BE BETWEEN 6.0 AND 8.0
2. SOLUBLE SALTS SHALL BE LESS THAN 500 PARTS PER MILLION (PPM).
3. THE SOIL SHALL CONTAIN LESS THAN 40% CLAY, BUT ENOUGH FINE GRAINED MATERIAL (>30% SILT PLUS CLAY) TO PROVIDE THE CAPACITY TO HOLD A MODERATE AMOUNT OF MOISTURE.
4. SOIL SHALL CONTAIN 1.5% MINIMUM ORGANIC MATTER BY WEIGHT.
5. SOIL MUST CONTAIN SUFFICIENT PORE SPACE TO PERMIT ADEQUATE ROOT PENETRATION.
6. IF THESE CONDITIONS CANNOT BE MET BY SOILS ON SITE, ADDING TOPSOIL IS REQUIRED IN ACCORDANCE WITH SECTION 21 "STANDARD AND SPECIFICATION FOR TOPSOIL" OF THE 1994 MD STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL BY THE MARYLAND DEPARTMENT OF THE ENVIRONMENT.

b. AREAS PREVIOUSLY GRADED IN CONFORMANCE WITH THE DESIGN DRAWINGS SHALL BE SCARIFIED OR OTHERWISE LOOSENED TO A DEPTH OF 3 TO 5 INCHES PRIOR TO PLACEMENT OF TOPSOIL.

c. APPLY FERTILIZER AND LIME AS PRESCRIBED IN SECTION 4 AND MIX SOIL AMENDMENTS INTO THE TOP 3-5 INCHES OF TOPSOIL BY DISKING OR OTHER SUITABLE MEANS.

d. REMOVE LARGE OBJECTS LIKE STONES AND BRANCHES, AND READY THE AREA FOR SEED APPLICATION. WHERE SITE CONDITIONS WILL NOT PERMIT NORMAL SEEDBED PREPARATION, LOOSEN SURFACE SOIL BY DRAGGING WITH A HEAVY CHAIN OR OTHER EQUIPMENT TO ROUGHEN THE SURFACE. STEEP SLOPES (STEEPER THAN 3:1) SHOULD BE TRACKED BY A DOZER LEAVING THE SOIL IN AN IRREGULAR CONDITION WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE. THE TOP 1-3 INCHES OF SOIL SHOULD BE LOOSE AND FRIABLE. SEEDBED LOOSENING MAY NOT BE NECESSARY ON NEWLY DISTURBED AREAS.

## SECTION 2 – SEED AND MULCH SPECIFICATIONS

A. SEED SPECIFICATIONS

1. ALL SEED MUST MEET THE REQUIREMENTS OF THE MARYLAND STATE SEED LAW. ALL SEED SHALL BE SUBJECT TO RE-TESTING BY A RECOGNIZED SEED LABORATORY. ALL SEED USED SHALL HAVE BEEN TESTED WITHIN 6 MONTHS IMMEDIATELY PRECEDING THE DATE OF SOWING SUCH MATERIAL ON THIS JOB.

NOTE: SEED TAGS SHALL BE MADE AVAILABLE TO THE INSPECTOR TO VERIFY TYPE AND RATE OF SEED USED.

2. INOCULANT - THE INOCULANT FOR TREATING LEGUME SEED IN THE SEED MIXTURES SHALL BE A PURE CULTURE OF NITROGEN-FIXING BACTERIA PREPARED SPECIFICALLY FOR THE SPECIES. INOCULANTS SHALL NOT BE USED LATER THAN THE DATE INDICATED ON THE CONTAINER. ADD FRESH INOCULANT AS DIRECTED ON PACKAGE. USE FOUR TIMES THE RECOMMENDED RATE WHEN HYDROSEEDING. IT IS VERY IMPORTANT TO KEEP INOCULANT AS COOL AS POSSIBLE UNTIL USED. TEMPERATURES ABOVE 75 - 80 DEGREES FAHRENHEIT CAN WEAKEN BACTERIA AND MAKE INOCULANT LESS EFFECTIVE.

B. METHODS OF SEEDING

1. HYDROSEEDING: APPLY SEED AND FERTILIZER SLURRY UNIFORMLY WITH HYDRO-SEEDER AT THE RATES PRESCRIBED IN SECTION 3 OR 4.

a. IF FERTILIZER IS BEING APPLIED AT THE TIME OF SEEDING, THE APPLICATION RATES WILL NOT EXCEED THE FOLLOWING: NITROGEN - MAXIMUM OF 100 POUNDS PER ACRE TOTAL OF SOLUBLE NITROGEN; P205 (PHOSPHOROUS): 200 POUNDS/ACRE; K20 (POTASSIUM): 200 POUNDS/ACRE

b. LIME - USE ONLY GROUND AGRICULTURAL LIMESTONE (UP TO 3 TONS PER ACRE MAY BE APPLIED BY HYDROSEEDING). NORMALLY, NOT MORE THAN 2 TONS ARE APPLIED BY HYDROSEEDING AT ANY ONE TIME. DO NOT USE BURNT OR HYDRATED LIME WHEN HYDROSEEDING.

c. SEED AND FERTILIZER SHALL BE MIXED ON SITE, AND SEEDING SHALL BE DONE IMMEDIATELY WITHOUT INTERRUPTION.

2. DRY SEEDING: THIS INCLUDES USE OF CONVENTIONAL DROP OR BROADCAST SPREADERS.

a. APPLY SEED TO SOIL AT THE RATES PRESCRIBED IN SECTION 3 OR 4. THE SEEDED AREA SHALL THEN BE ROLLED WITH A WEIGHTED ROLLER TO PROVIDE GOOD SEED TO SOIL CONTACT.

b. WHERE PRACTICAL, SEED SHOULD BE APPLIED IN TWO DIRECTIONS PERPENDICULAR TO EACH OTHER. APPLY HALF THE SEEDING RATE IN EACH DIRECTION.

3. DRILL OR CULTIPACKER SEEDING: THIS INCLUDES THE USE OF MECHANIZED SEEDERS THAT APPLY AND COVER SEED WITH SOIL.

a. CULTIPACKING SEEDERS ARE REQUIRED TO BURY THE SEED IN SUCH A FASHION AS TO PROVIDE AT LEAST 1/4 INCH OF SOIL COVERING. SEEDBED MUST BE FIRM AFTER PLANTING.

b. WHERE PRACTICAL, SEED SHOULD BE APPLIED IN TWO DIRECTIONS PERPENDICULAR TO EACH OTHER. APPLY HALF THE SEEDING RATE IN EACH DIRECTION.

C. MULCH SPECIFICATIONS

1. STRAW SHALL CONSIST OF THOROUGHLY THRESHED WHEAT, RYE OR OAT STRAW, REASONABLY BRIGHT IN COLOR, AND SHALL NOT BE MUSTY, MOLDY, CAKED, DECAYED, OR EXCESSIVELY DUSTY, AND SHALL BE FREE OF NOXIOUS WEED SEEDS AS SPECIFIED IN THE MARYLAND SEED LAW.

NOTE: ONLY STERILE STRAW MULCH SHOULD BE USED IN AREAS WHERE A STAND OF ONE SPECIES OF GRASS IS DESIRED.

2. WOOD CELLULOSE FIBER MULCH (WCFM)

WCFM MUST CONFORM TO THE FOLLOWING PHYSICAL REQUIREMENT: FIBER LENGTH TO APPROXIMATELY 10mm., DIAMETER APPROXIMATELY 1 mm., pH RANGE OF 4.0 TO 8.5, ASH CONTENT OF 1.6% MAXIMUM AND WATER HOLDING CAPACITY OF 90% MINIMUM. WCFM SHALL CONSIST OF SPECIALLY PREPARED WOOD CELLULOSE PROCESSED INTO A UNIFORM FIBROUS PHYSICAL STATE. WCFM SHALL BE DYED GREEN OR CONTAIN A GREEN DYE IN THE PACKAGE THAT WILL PROVIDE AN APPROPRIATE COLOR TO FACILITATE VISUAL INSPECTION OF THE UNIFORMLY SPREAD SLURRY. WCFM, INCLUDING DYE, SHALL CONTAIN NO GERMINATION OR GROWTH INHIBITING FACTORS. WCFM SHALL CONTAIN INHIBITING FACTORS. WCFM SHALL CONTAIN NO ELEMENTS OR COMPOUNDS AT CONCENTRATION LEVELS THAT WILL BE PHYTOTOXIC. WCFM SHALL BE MANUFACTURED AND PROCESSED IN SUCH A MANNER THAT THE WOOD CELLULOSE FIBER MULCH WILL REMAIN IN UNIFORM SUSPENSION IN WATER UNDER AGITATION AND WILL BLEND WITH SEED, FERTILIZER, AND OTHER ADDITIVES TO FORM A HOMOGENOUS SLURRY. THE MULCH MATERIAL SHALL FORM A GROUND COVER, ON APPLICATION, HAVING MOISTURE ABSORPTION AND PERCOLATION PROPERTIES AND SHALL COVER AND HOLD GRASS SEED IN CONTACT WITH THE SOIL WITHOUT INHIBITING THE GROWTH OF THE GRASS SEEDINGS.

D. MULCHING SEEDED AREAS

1. MULCH SHALL BE APPLIED TO ALL SEEDED AREAS AS SOON AS POSSIBLE AFTER SEEDING. STRAW MULCH SHALL ONLY BE USED ON SLOPES OF 6H:1V OR FLATTER. WOOD CELLULOSE FIBER MULCH MAY BE USED ON SLOPES OF 6H:1V OR STEEPER PROVIDED FLOWS ARE NOT CONCENTRATED. EROSION CONTROL BLANKETS MAY BE USED ON SLOPES OF 6H:1V OR STEEPER PROVIDED THE PRODUCT IS APPROPRIATE FOR THE FIELD APPLICATION.

2. IF GRADING IS COMPLETED OUTSIDE OF THE SEEDING SEASON, MULCH ALONE SHALL BE APPLIED AS PRESCRIBED IN THIS SECTION AND MAINTAINED UNTIL THE SEEDING CAN BE PERFORMED IN ACCORDANCE WITH THESE SPECIFICATIONS.

3. WHEN STRAW MULCH IS USED, IT SHALL BE SPREAD OVER ALL SEEDED AREAS AT THE RATE OF 2 TONS/ACRE. MULCH SHALL BE APPLIED TO A UNIFORM LOOSE DEPTH OF BETWEEN 1 AND 2 INCHES. MULCH APPLIED SHALL ACHIEVE A UNIFORM DISTRIBUTION AND DEPTH SO THAT THE SOIL SURFACE IS NOT EXPOSED. IF A MULCH ANCHORING TOOL IS TO BE USED, THE RATE SHOULD BE INCREASED TO 2.5 TONS/ACRE.

4. WHEN WOOD CELLULOSE FIBER MULCH IS USED, IT SHALL BE APPLIED AT A MINIMUM NET DRY WEIGHT OF 1,500 LBS. PER ACRE. THE WOOD CELLULOSE FIBER SHALL BE MIXED WITH WATER, ACCORDING TO THE MANUFACTURER'S RECOMMENDATION.

E. MULCH ANCHORING

1. MULCH ANCHORING SHALL BE PERFORMED IMMEDIATELY FOLLOWING MULCH APPLICATION TO MINIMIZE LOSS BY WIND OR WATER.

2. STRAW MULCH MAY BE ANCHORED WITH A TRACTOR DRAWN IMPLEMENT DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE A MINIMUM OF 2 INCHES. THIS IS MOST EFFECTIVE ON LARGE AREAS, BUT IS LIMITED TO SLOPES WHERE EQUIPMENT CAN OPERATE SAFELY. IF USED ON SLOPING LAND, THIS PRACTICE SHOULD BE USED ON THE CONTOUR, IF POSSIBLE.

3. WOOD CELLULOSE FIBER MAY BE USED FOR ANCHORING STRAW. THE FIBER BINDER SHALL BE APPLIED AT A NET DRY WEIGHT OF 750 LBS./ACRE. THE WOOD CELLULOSE FIBER SHALL BE MIXED WITH WATER, AND THE MIXTURE SHALL CONTAIN A MAXIMUM OF 50 LBS. OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.

4. SYNTHETIC BINDERS - SYNTHETIC BINDERS SUCH AS ACRYLIC DRL (AGRO-TACK), DCA-70, PETROSET, TERRA TAX II, TERRA TACK AR, OR OTHER SIMILAR BINDER MAY BE USED AT RATES RECOMMENDED BY THE MANUFACTURER TO ANCHOR MULCH. APPLICATIONS OF LIQUID BINDERS SHOULD BE APPLIED HEAVIER AT EDGES WHERE WIND CATCHES MULCH, SUCH AS IN VALLEYS AND ON CRESTS OF BANKS. THE REMAINDER OF AREA SHOULD BE UNIFORM AFTER BINDER APPLICATION.

5. LIGHTWEIGHT PLASTIC NETTING MAY BE STAPLED OVER THE MULCH ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

## SECTION 3: TEMPORARY SEEDING

VEGETATION - ANNUAL GRASS OR GRAIN USED TO PROVIDE COVER ON DISTURBED AREAS FOR UP TO TWELVE MONTHS. FOR LONGER DURATION OF VEGETATIVE COVER, PERMANENT SEEDING IS REQUIRED.

### TEMPORARY SEEDING SUMMARY

| SEED MIXTURE (HARDINESS ZONE 7a) | | | | | FERTILIZER* RATE (10–10–10) | LIME RATE* |
|---|---|---|---|---|---|---|
| NO. | SPECIES | APPLICATION ** RATE (lb/ac) | SEEDING DATES | SEEDING DEPTHS | | |
| 1 | CEREAL RYE GRAIN | 75 | 1–FEB TO 30–NOV | 1 INCH | 600 lbs/ac (15 lbs/1000 sf) | 2 Tons/ac (100 lbs/ 1000 sf) |
| 2 | FOXTAIL MILLET | 75 | | | | |

* MAY BE MODIFIED PER SOIL TEST RECOMMENDATIONS OF THE MARYLAND COOPERATIVE EXTENSION SERVICE, NOT TO EXCEED THE MAXIMUMS SET IN SECTION 2 (B) (1) (a) AND (b).

**THE TOTAL SEED APPLICATION WILL BE 150 lbs/acre AT A MINIMUM.

## SECTION 4: PERMANENT SEEDING

SEEDING GRASS AND LEGUMES TO ESTABLISH GROUND COVER FOR A MINIMUM PERIOD OF ONE YEAR ON DISTURBED AREAS GENERALLY RECEIVING LOW MAINTENANCE.

### PERMANENT SEEDING SUMMARY

| SEED MIXTURE (HARDINESS ZONE 7a) | | | | | FERTILIZER RATE* (10–20–20) | | | LIME* RATE |
|---|---|---|---|---|---|---|---|---|
| NO. | SPECIES | APPLICATION RATE (lb/ac) | SEEDING** DATES | SEEDING DEPTHS | N | P205 | K20 | |
| 1 | TALL FESCUE | 110 | 1–MAR TO 15–NOV | 1 INCH | 90 lb/ac (2 lb/ 1000 SF) | 175 lb/ac (4 lb/ 1000 SF) | 175 lb/ac (4 lb/ 1000 SF) | 2 tons/ac (100 lb/ 1000 SF) |
| 2 | WEEPING LOVEGRASS | 3 | | | | | | |
| 3 | SERECIA LESPEDEZA | 20 | | | | | | |

*MAY BE MODIFIED PER SOIL TEST RECOMMENDATIONS OF THE MARYLAND COOPERATIVE EXTENSION SERVICE, NOT TO EXCEED THE MAXIMUMS SET IN SECTION 2 (B) (1) (a) AND (b).

IF **MID–SUMMER PLANTING IS DESIRED, USE 20 lb/ACRE SERECIA LESPEDEZA. IF MIDWINTER PLANTING IS DESIRED, SEEDING MUST BE BY DRILL OR CULTIPACKER. IF LATE FALL/EARLY WINTER PLANTING IS DESIRED, USE 56 lb/ACRE CEREAL RYE GRAIN AS NURSE CROP.

| REVISIONS | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY | |
| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE | |

Shaw Environmental, Inc.

| | | | |
|---|---|---|---|
| DESIGNED BY | -- | CHECKED BY | -- |
| DRAWN BY | G. Jones 3/16/06 | APPROVED BY | P.Gamble 3/21/06 |
| | | | S. Carriere 3/21/06 |

NAVFAC Naval Facilities Engineering Command WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD — INDIAN HEAD, MARYLAND

SITE 57 – EROSION & SEDIMENT CONTROL PLAN

VEGETATION STABLIZATION METHODS AND MATERIALS

SCALE: AS SHOWN — SIZE: B

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470–03–D–4402

NAVFAC DRAWING NO. --

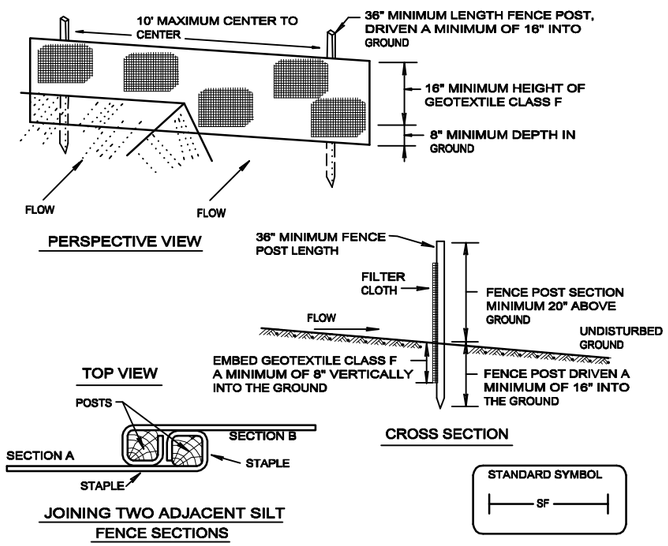
SHEET I.D. FIGURE 2-4

OFFICE: Pittsburgh, PA — DRAWING NUMBER: 120359-B5

Xref: Image: NAVFAC Logo.jpg

File: O:\CAD Standards\Shaw\Formats\Shaw Layouts-draft-ps.dwg
Plot Date/Time: May 22, 2006 – 3:42pm
Plotted By: greg.jones

## DETAIL 22 - SILT FENCE




Construction Specifications

1. Fence posts shall be a minimum of 36" long driven 16" minimum into the ground. Wood posts shall be 11/2" x 11/2" square (minimum) cut, or 13/4" diameter (minimum) round and shall be of sound quality hardwood. Steel posts will be standard T or U section weighting not less than 1.00 pond per linear foot.

2. Geotextile shall be fastened securely to each fence post with wire ties or staples at top and mid-section and shall meet the following requirements for Geotextile Class F:

| | | |
|---|---|---|
| Tensile Strength | 50 lbs/in (min.) | Test: MSMT 509 |
| Tensile Modulus | 20 lbs/in (min.) | Test: MSMT 509 |
| Flow Rate | 0.3 gal ft$^2$/ minute (max.) | Test: MSMT 322 |
| Filtering Efficiency | 75% (min.) | Test: MSMT 322 |

3. Where ends of geotextile fabric come together, they shall be overlapped, folded and stapled to prevent sediment bypass.

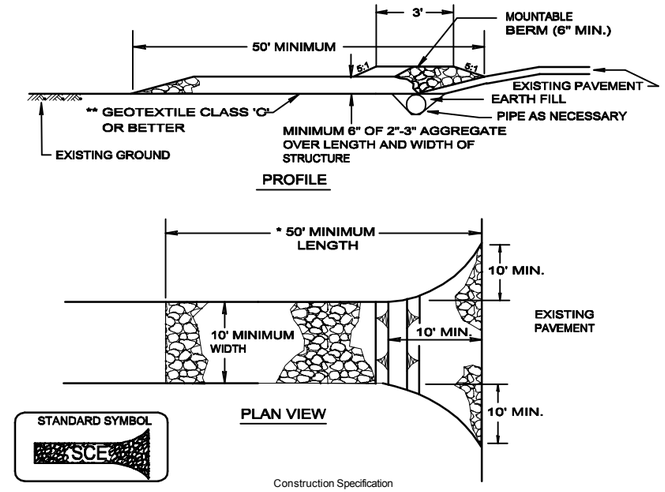
4. Silt Fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reached 50% of the fabric height.

| U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE E - 15 - 3 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION |
|---|---|---|

## SILT FENCE - STANDARD INSTALLATION

SCALE: N.T.S.

## DETAIL 24 - STABILIZED CONSTRUCTION ENTRANCE




Construction Specification

1. Length - minimum of 50' (*30' for single residence lot).

2. Width - 10' minimum, should be flared at the existing road to provide a turning radius.

3. Geotextile fabric (filter cloth) shall be placed over the existing ground prior to placing stone. **The plan approval authority may not require single family residences to use geotextile.

4. Stone - crushed aggregate (2" to 3") or reclaimed or recycled concrete equivalent shall be placed at least 6" deep over the length and width of the entrance.

5. Surface Water - all surface water flowing to or diverted toward construction entrances shall be piped through the entrance, maintaining positive drainage. Pipe installed through the stabilized construction entrance shall be protected with a mountable berm with 5:1 slopes and a minimum of 6" of stone over the pipe. Pipe has to be sized according to the drainage. When the SCE is located at a high spot and has no drainage to convey a pipe will not be necessary. Pipe should be sized according to the amount of runoff to be conveyed. A 6" minimum will be required.

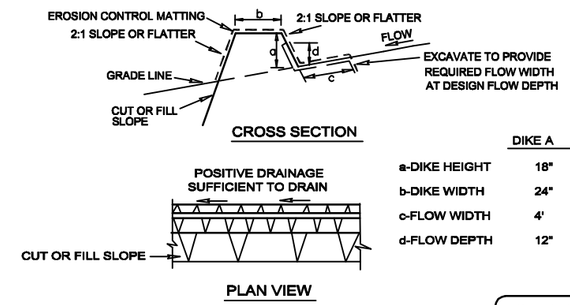
6. Location - A stabilized construction entrance shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance.

| U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE F - 17 - 3 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION |
|---|---|---|

## STABILIZED CONSTRUCTION ENTRANCE

SCALE: N.T.S

## DETAIL 1 - EARTH DIKE




| | DIKE A | DIKE B |
|---|---|---|
| a-DIKE HEIGHT | 18" | 30" |
| b-DIKE WIDTH | 24" | 36" |
| c-FLOW WIDTH | 4' | 6' |
| d-FLOW DEPTH | 12" | 24" |

FLOW CHANNEL STABILIZATION
GRADE 0.5% MIN. 10% MAX.

STANDARD SYMBOL
A-2 B-3

1. Seed and cover with straw mulch.
2. Seed and cover with Erosion Control Matting or line with sod.
3. 4" - 7" stone or recycled concrete equivalent pressed into the soil 7" minimum

Construction Specifications

1. All temporary earth dikes shall have uninterrupted positive grade to an outlet. Spot elevations may be necessary for grades less than 1%.

2. Runoff diverted from a disturbed area shall be conveyed to a sediment trapping device.

3. Runoff diverted from an undisturbed area shall outlet directly into an undisturbed, stabilized area at a non-erosive velocity.

4. All trees, brush, stumps, obstructions, and other objectional material shall be removed and disposed of so as not to interfere with the proper functioning of the dike.

5. The dike shall be excavated or shaped to line, grade and cross section as required to meet the criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.

6. Fill shall be compacted by earth moving equipment.

7. All earth removed and not needed for construction shall be placed so that it will not interfere with the functioning of the dike.

8. Inspection and maintenance must be provided periodically and after each rain event.

| U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE A - 1 - 6 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION |
|---|---|---|

## EARTH DIKE

SCALE: N.T.S

REVISIONS

| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

Shaw Environmental, Inc.

| | | |
|---|---|---|
| DESIGNED BY | G. Jones | 3/16/06 |
| DRAWN BY | S. Carriere | 3/21/06 |
| CHECKED BY | Lin Liu | 3/21/06 |
| APPROVED BY | | |

NAVFAC Naval Facilities Engineering Command WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND
SITE 57 – EROSION & SEDIMENT CONTROL PLAN

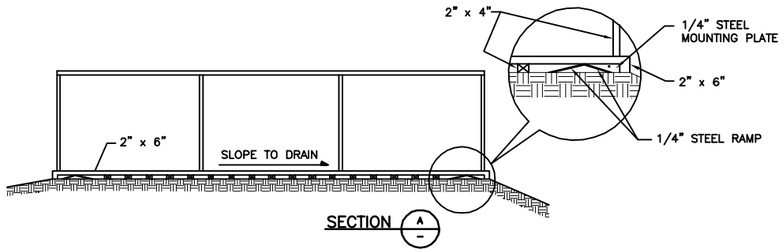
EROSION AND SEDIMENT CONTROL DETAILS (1 OF 2)

SCALE: AS SHOWN
SIZE: B
DELIVERY ORDER NO. 025
CONSTR. CONTRACT NO. N62470-03-D-4402
NAVFAC DRAWING NO. --
SHEET I.D.
FIGURE 2-5

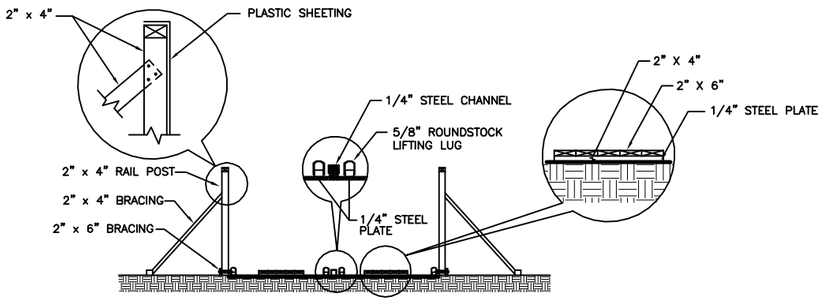
OFFICE Pittsburgh, PA
DRAWING NUMBER 120359-B3

Xref:
Image: NAVFAC Logo.jpg

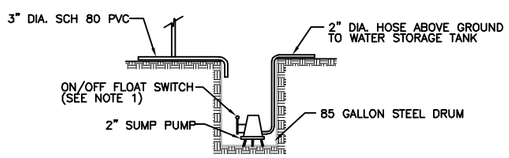
File: O:\CAD Standards\Shaw\Formats\Shaw Layouts-draft-ps.dwg
Plot Date/Time: May 22, 2006 – 3:46pm
Plotted By: greg.jones



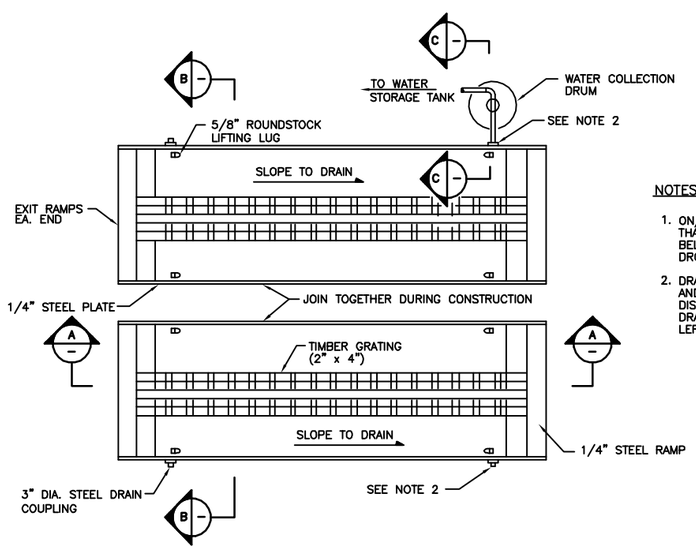

SECTION A




SECTION B




SECTION C



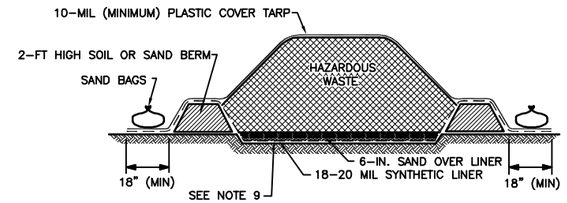

PLAN – DECONTAMINATION PAD

NOTES:

1. ON/OFF OPERATION OF PUMP IS CONTROLLED BY FLOAT SO THAT PUMP STARTS WHEN SUMP WATER LEVEL REACHES 4" BELOW SUMP INLET AND SHUTS OFF WHEN WATER LEVEL DROPS TO PUMP DISCHARGE LEVEL.
2. DRAIN COUPLING IS TO BE FITTED WITH QUICK DISCONNECT AND 3" DIA. SCH 80 PVC (INNER COUPLING) OR 3" DIA. RUBBER DISCHARGE HOSE (OUTER COUPLING) TO SUMP. THE OUTER DRAIN COUPLING IS TO BE USED ONLY AFTER VEHICLE HAS LEFT THE PAD. PLUG ALL DRAINS NOT BEING USED.

## DECONTAMINATION PAD DETAIL

NTS




NOTES:

1. ALL STOCKPILED HAZARDOUS WASTE WILL BE COVERED IN INCLEMENT WEATHER, ENDING OF WORK DAY, OR WHEN NOT IN USE. HAZARDOUS WASTE WILL BE COVERED UNTIL REMOVED FROM SITE. THE COVER TARP WILL BE ROPED DOWN, SAND BAGGED, OR OTHERWISE ANCHORED TO PREVENT WIND UPLIFT.
2. STOCKPILED MATERIAL WILL NOT EXCEED 15 FEET IN HEIGHT.
3. A CONTINUOUS LINER SHALL COVER THE BOTTOM OF THE STORAGE PAD.
4. A SIX-INCH LAYER OF SAND WILL BE PLACED OVER THE LINER FOR PROTECTION.
5. CAUTION WILL BE TAKEN NOT TO RIP OR TEAR THE LINER WHEN HANDLING OR REMOVING WASTE.
6. ALL WASTE WILL BE REMOVED FROM THE SITE AS SOON AS POSSIBLE.

## MATERIAL STORAGE PAD DETAIL

NOT TO SCALE

REVISIONS

| REV | DATE | BY | CHK'D | APR'VD | DESCRIPTION/ISSUE |
|---|---|---|---|---|---|
| 0 | 5/22/06 | GSJ | PMG | PSV | FINAL WORK PLAN ISSUED TO NAVY |

| | | | |
|---|---|---|---|
| DESIGNED BY | G. Jones | 3/16/06 | |
| DRAWN BY | S. Carriere | 3/21/06 | CHECKED BY Lin Liu 3/21/06 |
| | | | APPROVED BY |

Shaw Environmental, Inc.

NAVFAC Naval Facilities Engineering Command WASHINGTON

NAVAL SUPPORT FACILITY, INDIAN HEAD INDIAN HEAD, MARYLAND

SITE 57 – EROSION & SEDIMENT CONTROL PLAN

EROSION AND SEDIMENT CONTROL DETAILS (2 OF 2)

SCALE: AS SHOWN

SIZE: B

DELIVERY ORDER NO. 025

CONSTR. CONTRACT NO. N62470-03-D-4402

NAVFAC DRAWING NO. --

SHEET I.D. FIGURE 2-6

OFFICE Pittsburgh, PA

DRAWING NUMBER 120359-B7

Xref:

Image: NAVFAC Logo.jpg

File: O:\CAD Standards\Shaw\Formats\Shaw Layouts-draft-ps.dwg
Plot Date/Time: May 22, 2006 – 4:01pm
Plotted By: greg.jones

***Attachment 1***

**MARYLAND DEPARTMENT OF THE ENVIRONMENT**
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101

**WATER MANAGEMENT ADMINISTRATION**

***STORMWATER MANAGEMENT WAIVER APPLICATION***

OWNER: JEFFREY BOSSART MDE NO.: 03593

ADDRESS: 101 STRAUSS AVENUE, BUILDING 289 PROJECT NO.: 120359

INDIAN HEAD, MD 20640-5035 LOCATION: NAVAL SUPPORT FACILITY INDIAN HEAD

CONSULTANT: SHAW ENVIRONMENTAL, INC.

DESCRIPTION: REMOVAL ACTION FOR SITE 57 - BUILDING 292 TCE CONTAMINATION

I/We, the Owner/Owners hereby request a stormwater management waiver be granted for the above referenced project in accordance with the following section of the Stormwater Management Guidelines for State and Federal Projects:

X 3.3.A.1. Contract plans and provisions, stormwater management report.
____ 3.3.A.2. Contract plans and provisions, stormwater management report.
____ 3.3.A.3. Contract plans and provisions, stormwater management report.
____ 3.3.B.1. Contract plans and provisions, stormwater management report.
____ 3.3.B.2. Contract plans and provisions, stormwater management report, downstream impact investigation.
____ 3.3.B.3. Contract plans and provisions, stormwater management report.
____ 3.3.B.4. Contract plans and provisions, stormwater management report, downstream impact investigation
____ 3.3.B.5. Contract plans and provisions, stormwater management report, downstream impact investigation.
____ 3.3.B.6 Contract plans and provisions, stormwater management report, downstream impact investigation.

Other evidence submitted: WORK PLAN FOR REMOVAL ACTION

JEFFREY C. BOSSART — 5/23/08
Owner's Name — Signature — Date

✓ Approved ____ Denied/Reason

By — 5/30/06
Water Resources Reviewer — Date

Submit to:
Maryland Department of the Environment
Sediment and Stormwater Plan Review Division
Water Management Administration
1800 Washington Boulevard
Baltimore, MD 21230

If a project involves a waiver request for more than one (1) drainage area, a Stormwater Management Waiver Application is required for each drainage area.

MDE/WMA/PER-032

# *Appendix C*
# *Site-Specific Health and Safety Plan (SSHSP)*

**APPENDIX C**

# SITE SPECIFIC HEALTH AND SAFETY PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

**Prepared by:**

**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
5700 Thurston Avenue, Suite 116
Virginia Beach, Virginia 23455

.

May 2006
Project No. 120359

**Site-Specific Safety and Health Plan Approval for the**
**Site 57 Removal Action**
**Indian Head, Maryland**

I have read and approve this site-specific safety and health plan Attachment 6 for activities at Indian Head with respect to project hazards, regulatory requirements, and Shaw procedures.

_____ May 17, 2006
David Mummert, CIH Date
Program Certified Industrial Hygienist

_____ May 17, 2006
Steve Carriere, PMP Date
Project Manager

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| 2 | Site-Specific Health and Safety Procedures |
| 3 | Activity Hazard Analyses |
| 4 | Route to Hospital and Health Resource Clinic |
| 5 | Health and Safety Plan Amendment Documentation Form |
| 6 | Hurricane Preparedness Plan |
| 7 | Accident Prevention Plan |
| 8 | Safety Plan Acknowledgement |
| 9 | OSHA 300 Log |
| 10 | Blood Borne Pathogens Exposure Control Plan |
| 11 | Incident Reporting Management Procedure |

## *List of Acronyms*

| | |
|---|---|
| AHA | Activity Hazard Analyses |
| ANSI | American National Standards Institute |
| BAC | Blood Alcohol Concentration |
| CIH | LANTDIV Program Certified Industrial Hygienist |
| CFR | Code of Federal Regulations |
| COCs | Chemicals of Concern |
| CPR | Cardiopulmonary Resuscitation |
| CRZ | Contamination Reduction Zone |
| dBA | A-Weighted Decibel |
| DCE | Dichloroethene |
| °C | Degrees Celsius |
| °F | Degrees Fahrenheit |
| EMS | Emergency Medical Services |
| EPA | Environmental Protection Agency |
| ERCP | Emergency Response Contingency Plan |
| eV | Electron Volt |
| EZ | Exclusion Zone |
| f/b | flash/bang |
| $H_2S$ | Hydrogen Sulfide |
| HAZWOPER | Hazardous Waste Operations and Emergency Response Standard |
| HSC | Health and Safety Coordinator |
| HSM | LANTDIV Program Health and Safety Manager |
| JSAs | Job Safety Analyses |
| LEL | Lower Explosive Limit |
| LEPC | Local Emergency Planning Committee |
| MDE | Maryland Department of the Environment |
| $mg/m^3$ | Milligrams per cubic meter |
| MHR | maximum heart rate |
| mph | Miles Per Hour |

| | |
|---|---|
| MSDS | Material Safety Data Sheet |
| Navy | United States Department of the Navy |
| NIOSH | National Institute for Occupational Safety and Health |
| NRR | Noise Reduction Rating |
| $O_2$ | Oxygen |
| OSHA | Occupational Safety and Health Administration |
| PEL | Permissible Exposure Level |
| PID | Photoionization Detector |
| PM | Project Manager |
| PPE | Personal Protective Equipment |
| ppm | parts per million |
| RCRA | Resource Conservation and Recovery Act |
| REL | Recommended Exposure Limit (NIOSH) |
| RI | Remedial Investigation |
| ROICC | Resident Officer In Charge of Construction |
| Shaw | Shaw Environmental, Inc. |
| SS/SSO | Site Superintendent/Site Safety Officer |
| SSHSP | Site-Specific Safety and Health Plan |
| SZ | Support Zone |
| TCE | trichloroethene |
| TLV | Threshold Limit Value |
| TSCA | Toxic Substances Control Act |
| TWA | Time-Weighted Average |
| USACE | Unites States Army Corps of Engineers |
| USCG | United States Coast Guard |
| UXO | Unexploded Ordnance |
| VOCs | Volatile Organic Compounds |

# 1.0 Introduction

## 1.1 Objective

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

## 1.2 Policy Statement

The policy of Shaw is to provide a safe and healthful work environment for all employees. Shaw considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At Shaw, it is believed all accidents and injuries are preventable. Shaw will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Site Specific Health and Safety Plan (SSHSP) prescribes the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel or the community will not be made without the prior approval of the Project Manager and the Health and Safety Manager.

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of the plan.

## 1.3 References

This SSHSP complies with applicable Occupational Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (EPA), and Shaw Health & Safety policies and procedures. This plan follows the guidelines established in the following:

- Standard Operating Safety Guides, EPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), OSHA, U.S. Coast Guard (USCG), EPA (86 116, November 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.

- Title 29 of the Code of Federal Regulations (CFR), Part 1926.
- USACE Safety and Heath Requirements Manual EM 385-1-1.
- Shaw Health and Safety Procedures HS001 through HS999 (current).

### *1.4 Disclaimer*

The enclosed Site Specific Health and Safety Plan has been designed for the methods presently contemplated by Shaw Environmental, Inc. (Shaw) for execution of the proposed work to be conducted at Indian Head Site 57. This Site Specific Health and Safety Plan may not be appropriate if the work is not performed by Shaw or does not employ the methods presently contemplated by Shaw. Additionally, this plan will require amendment if the scope of work is modified by the Navy. This plan applies to Shaw employees and subcontractors under the direct supervision of Shaw.

# 2.0 Site History/Scope of Work

## 2.1 Background

Site 57, Building 292 TCE Contamination Area, encompasses the area located south of Building 292. Previous operations involved the use of trichloroethene (TCE) for vapor degreasing and general cleaning. During the 1970s and 1980s, spent TCE was transferred from a tank inside Building 292 into drums via a pipe that passed through the wall near the southern corner of the building. The drums were reportedly stored on a grass-covered area near manhole MH-1. It is believed that these operations have resulted in the contamination of soil and groundwater. The use of TCE at Building 292 stopped in 1989.

A Remedial Investigation (RI) identified volatile organic compounds (VOCs) in soil and groundwater. Arsenic was detected in surface and subsurface soil samples to a depth of 5 feet at concentrations ranging from 2.3 to 79.9 mg/kg. A baseline human health risk assessment was developed in the RI Report. Unacceptable risks were identified for future construction workers exposed to soil and for hypothetical future residents exposed to soil and groundwater. Chemicals of concern (COCs) are based on protection of human health, protection of the environment, and/or exceedances of regulatory standards. The only soil COC based on protection of human health is arsenic. Soil COCs based on protection of groundwater are cis-1,2-DCE and TCE.

The U.S. Department of the Navy (Navy), in concurrence with the United States Environmental Protection Agency (EPA) and the Maryland Department of the Environment (MDE), agreed to perform soil removal due to potential human health risks from arsenic in soil and protection of groundwater from cis-1,2-dichloroethene (cis-1,2-DCE) and TCE.

## 2.2 Scope of Work

The remedial activities to be performed at Site 57 include:

- Site set-up
- Utility Relocation
- Field Sampling and Analysis
- Installation of Erosion and Sediment Controls
- Material Excavation and Handling
- Transportation and Disposal

- Site Restoration

All site activities have been analyzed for potential hazards for which control measures are provided in Attachment 3, Activity Hazard Analyses.

This plan does not address unexploded ordnance (UXO). In the event UXO are encountered, work shall stop and this plan shall be amended.

# 3.0 Key Personnel and Management

The Project Manager (PM), Site Superintendent/Site Safety Officer (SS/SSO), Program Certified Industrial Hygienist (CIH) and Program Health and Safety Manager (HSM) are responsible for formulating and enforcing health and safety requirements, and for implementing this SSHSP. The following summarizes the health and safety responsibilities of the site management.

## 3.1 Project Safety Responsibilities

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the SSHSP requirements. The PM will coordinate with the SS/SSO to assure that the work is completed in a manner consistent with the SSHSP. The SS/SSO is responsible for field implementation of the SSHSP. The SS will be the main contact in any on site emergency situation and will insure offsite emergency agencies have been contacted prior to the start of work. The PM, CIH, HSM, Health and Safety Coordinator (HSC) and SS/SSO are authorized to administer this SSHSP. All site personnel are authorized to stop work when an imminent health or safety risk exists. The PM and CIH are responsible for reviewing the SSHSP and ensuring that the SSHSP is complete and accurate. The HSC will also provide technical and administrative support for the Health and Safety Program and will be available for consultation when required. Each employee is responsible for personal safety as well as the safety of others in the work area.

## 3.2 Key Safety Personnel

The following individuals share responsibility for health and safety at the site:

| | |
|---|---|
| Project Manager | Steve Carriere<br>(609) 234-6361 (cellular) |
| Site Superintendent | Brian Harris<br>(240) 375-1786 (cellular) |
| Site Safety Officer | Jim Wright<br>(925) 383-7646 (cellular) |
| Resident Officer in Charge of Construction (ROICC) | Cathy Gardner<br>(301) 744-2181 |

| | |
|---|---|
| Program Certified Industrial Hygienist | Dave Mummert, CIH<br>(419) 425-6129 (office)<br>(419) 348-1544 (cellular) |
| Program Health and Safety Manager | Kym Edelman<br>(757) 318-5132 (office)<br>(757) 435-5384 (cellular) |
| Regional Health and Safety Manager | Joe Hoyt, CHST<br>(804) 337- 6982 (cell) |

# 4.0 Activity Hazards

A Remedial Investigation (RI) identified volatile organic compounds (VOCs) in soil and groundwater. Arsenic was detected in surface and subsurface soil samples to a depth of 5 feet bgs at concentrations ranging from 2.3 to 79.9 mg/kg. A baseline human health risk assessment was developed in the RI Report. Unacceptable risks were identified for future construction workers exposed to soil and for hypothetical future residents exposed to soil and groundwater. Chemicals of concern (COCs) are based on protection of human health, protection of the environment, and/or exceedances of regulatory standards. The only soil COC based on protection of human health is arsenic. Soil COCs based on protection of groundwater are cis-1,2-DCE and TCE. Contaminants and their concentrations are listed below.

**Levels of Site Contaminants**

| Contaminant | Maximum Concentration |
|---|---|
| Trichloroethene | 840 ppm |
| cis-1,2-dichloroethene | 37 ppm |
| Arsenic | 2.3-79.9 mg/kg |

## 4.1 Chemical Hazards

A brief summary of contaminants identified during previous sampling activities, in soils, is provided in Table 4.1.

**TABLE 4.1**
**Primary Site Contaminants**

| CHEMICAL | EXPOSURE ROUTES | PEL(1)/REL(2)/TLV(3) | HEALTH HAZARDS/ PHYSICAL HAZARDS |
|---|---|---|---|
| Trichloroethene | Inhalation<br>Absorption<br>Ingestion<br>Contact | PEL: 100 ppm(4);<br>NIOSH Ca. | • Irritation of eyes, skin, headache, vertigo, visual disturbance, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmias, parasthesia, liver damage, (carc)<br>• Avoid strong caustics and alkalis, chemically active metals<br>• IP= 9.5 ev |
| Cis-1,2-dichloroethene<br>(data for 1,1-DCE)<br>(vinylidene | Inhalation<br>Ingestion<br>Absorption<br>Contact | PEL: 1.0 ppm (1989 Vacated Standard)<br><br>NIOSH Ca.<br><br>TLV: 5.0 ppm | • Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]<br>• Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if |

| CHEMICAL | EXPOSURE ROUTES | PEL(1)/REL(2)/TLV(3) | HEALTH HAZARDS/ PHYSICAL HAZARDS |
|---|---|---|---|
| chloride) | | | exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]<br>• IP= 10.0 ev |
| Arsenic | Inhalation<br>Ingestion<br>Contact | PEL: 0.01<br><br>REL/TLV:<br>(15 min)<br>0.002 $mg/m^3$(5) | • Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]<br>• Avoid strong oxidizers, bromine, azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.] |

(1) PEL = Permissible exposure level
(2) REL = Recommended exposure limit
(3) TLV = Threshold limit value
(4) ppm = parts per million
(5) $mg/m^3$ = milligrams per cubic meter

The following general symptoms may indicate exposure to a hazardous chemical. Personnel will be removed from the work site and will be provided immediate medical attention if the following symptoms occur:

- Loss of appetite
- Weakness in wrists or ankles
- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Chest pains and coughing
- Rashes or burns.

## *4.2 Hazard Communication*

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.1200 to all personnel and subcontractors. Hazard communication will include:

### 4.2.1 Container Labeling

Shaw personnel will ensure that all containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations, such as gasoline and diesel safety cans. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

### 4.2.2 Material Safety Data Sheets (MSDS)

There will be an MSDS located on site for all site contaminants and each hazardous chemical known to be used on site. MSDSs are located in Attachment 1 of this SSHSP.

### 4.2.3 Employee Information and Training

Training employees on chemical hazards is accomplished through an ongoing corporate training program. All site employees shall maintain their Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training, in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. Additionally, chemical hazards are communicated to employees through daily safety meetings held at Shaw field projects and by an initial site orientation program.

At a minimum, Shaw and related subcontractor employees will be instructed on the following:

- An in-depth review of the soil and surface contaminants of concern identified and listed in Section 4.1.
- OSHA regulated chemicals and their hazards in the work area.
- How to prevent exposure to these hazardous chemicals.
- What the company has done to prevent workers' exposure to these chemicals.
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on Shaw sites.
- Emergency spill procedures.
- Proper storage and labeling.

Before any new hazardous chemical is introduced on site, each Shaw and related subcontractor employee will be given information in the same manner as during the safety class. The Site Superintendent will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on site employees.

### *4.3 Physical Hazards*

To minimize physical hazards, Shaw has developed standard safety protocols that will be followed at all times. Activity Hazard Analyses, located in Attachment 3, have been developed for each principal activity and for all major hazards to which employees may be exposed.

The SS/SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures. The crew leaders and SS/SSO will inspect the work areas. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this site. Hard hats, safety glasses and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. Failure to follow safety protocols will result in removal of an employee from the site and appropriate disciplinary actions.

### *4.4 Environmental Hazards*

Environmental factors such as weather, wild animals, insects, and irritant plants may pose a hazard when performing outdoor tasks. The SS/SSO will take necessary actions to alleviate these hazards should they arise.

#### *4.4.1 Heat Stress*

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. Heat stress disorders include:

- **Heat Rash** is caused by a hot, humid environment and plugged sweat glands.
    - **Symptoms:** It is a bumpy red rash which itches severely. It is not life-threatening.

- **Treatment:** Dry clothes that help sweat evaporate will reduce the chance of heat rash. Washing regularly and keeping the skin clean and dry will help prevent heat rash.

- **Heat Cramps** are caused by a loss of body salt through excessive sweating.
  - **Symptoms:** Painful muscle cramps.
  - **Treatment:** To help prevent heat cramps, drink plenty of non-alcoholic, caffeine-free fluids while working in a hot environment. Check with your doctor about the use of salt tablets. They may be recommended in some cases. Anyone suffering from heat cramps should be watched carefully for signs of more serious heat stress. If the cramps persist or other symptoms develop, seek medical attention immediately.

- **Heat Exhaustion** results from inadequate salt and water intake and signals that the body's cooling system is not working properly.
  - **Symptoms:** The victim will sweat heavily, their skin will be cool and moist, their pulse weak, and they will seem tired, confused, clumsy, irritable or upset, they may breathe rapidly--even pant--and their vision may be blurred. The victim may strongly argue that they are okay even with these obvious symptoms. If you suspect heat exhaustion, don't let the victim talk you out of seeking immediate medical attention. The heat exhaustion will affect their ability to exercise good judgment.
  - **Treatment:** Until medical help arrives, try to cool the victim and offer sips of cool water as long as the victim is conscious. Immediate medical attention is required. Heat exhaustion can quickly lead to heat stroke.

- **Heat Stroke** is the deadliest of all heat stress conditions. It occurs when the body's cooling mechanism has shut down after extreme loss of salt and fluids.
  - **Symptoms:** The body temperature will rise, the victim's skin is hot, red, and dry, their pulse fast, and they may complain of headache or dizziness. They will probably be weak, confused, and upset. Later stages of heat stroke cause a loss of consciousness and may lead to convulsions.
  - **Treatment:** In the event of heat stroke, seek immediate medical attention. Until help arrives, try to cool the victim and offer sips of cool water if the victim is conscious.

Heat stress prevention is outlined in Shaw Health and Safety procedure HS400, Working in Hot Environments. This procedure will be available on site. This information will be reviewed during safety meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages; e.g., Gatorade. Heat stress can be prevented by assuring an adequate work/rest schedule. Guidelines are presented in Table 4.2 and should be used in conjunction with HS400.

In addition, workers are encouraged to take rests and report symptoms whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the SS/SSO. Heat stress can be prevented by assuring an adequate work/rest schedule and adequate fluid consumption. A guide for work/rest schedules for various protection levels are given below in Table 4.2. The number of hours before a work/rest period is based on experience with similar work. The time periods should be considered maximum. Individual physical variables and differences in physical work activities may require revisions to site plans. This table should be used as a guide. Professional judgment of the SS/SSO is necessary to assure a fully protective plan to prevent heat stress disorders.

**Table 4.2**
**Guidelines For Work-Rest Periods**
**Protection Level**
**Number Of Hours Before Rest Period**

| Temperature | Level D | Level C | Level B | Level A |
|---|---|---|---|---|
| 90+ F* | 2.0 | 1.5 | 1.0 | 0.5 |
| 87.5 F | 2.5 | 2.0 | 1.5 | 1.0 |
| 82.5 F | 3.0 | 2.5 | 2.0 | 1.5 |
| 77.5 F | 3.5 | 3.0 | 2.5 | 1.5 |
| 72.5 | 4.0 | 3.5 | 2.5 | 1.5 |

*Work above 100º F will be reviewed with the Project HSC to determine specific requirements.

Alternately the work/rest schedule can be calculated based on heat stress monitoring results. Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of his/her calculated maximum heart rate.

Body temperature, measured orally or through the ear canal, may also be monitored to assess heat stress. Workers should not be permitted to continue work when their body temperature exceeds 100.4 $^{o}$F (degrees Fahrenheit) or 38 $^{o}$C (degrees Celsius). Monitoring should be conducted at the beginning of each break period as noted above.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 $^{o}$F when wearing chemical protective clothing (Level C, B, A), or 80 $^{o}$F for site activities performed with no chemical protective clothing (Level D). Monitoring will include pulse rate, weight loss, oral/or ear canal temperature, signs and symptoms of heat stress and fluid intake.

### *4.4.2 Noise*

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 A-weighted decibel (dBA) (Time Weighted Average [TWA]) as well as personnel working around heavy equipment. The SS/SSO will determine the need and appropriate testing procedures (i.e., sound level meter and/or dosimeter) for noise measurement in accordance with Shaw HS402 "Hearing Conservation Program."

Noise monitoring should be conducted during the beginning of each activity, as well as any time modifications leading to increased noise levels (e.g., adding additional equipment). A sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter when equipment is operating normally. When used, noise-monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Workers and visitors will be notified that hearing protection is required. Appropriate hearing protection (e.g., ear plugs) will be worn whenever personnel are working or visitors are present in that location. A supply of earplugs will be maintained on site.

Action levels in the following table will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by the EPA. The calculation for a hearing protection device's effectiveness is: noise reading dBA – (NRR – 7dB) < 90 dBA.

| Instrument | Measurement | Action |
|---|---|---|
| Type I or Type II Sound Level Meter or dosimeter | >80 dBA → 85 dBA | Hearing protection recommended. Limit work duration to 8-hour shifts. |
| | >85 dBA → 90 dBA | Hearing protection required. Limit work duration to 8-hour shifts. |
| | >90 dBA → 115 dBA | Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts. |
| | >115 dBA | Stop work. Consult Project HSM |

### *4.4.3 Biological Hazards*

*Poison Ivy (RHUS RADICANS)*. Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of a Tyvek® coverall, to avoid skin contact.

The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

- General symptoms of headache and fever,
- Itching,
- Redness,
- A rash.

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24 to 48 hours.

A barrier cream (e.g., IvyBlock, Stockhousen, Inc., 1-800-334-0242) should be applied to the exposed skin before entering and working in areas with possible poisonous plants.

*Distinguishing Features of Poison Ivy Group Plants.* The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants have greenish-white flowers and berries that grow in clusters.

First Aid

- Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol. A one percent hydrocortisone cream (over-the-counter) will aid in healing and reducing itch.
- Apply calamine or other soothing lotion if rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

**Contaminated Clothing**. The irritating substances emitted by poison ivy group plants will remain on clothing for prolonged periods of time - up to weeks or months, if not washed thoroughly. It may be necessary to wash contaminated clothing separately and more than once before reusing.

## COMMON POISON IVY
(RHUS RADICANS)

- Grows as a small plant, a vine, and a shrub.
- Grows everywhere in the United States except California and parts of adjacent states. Eastern oak leaf poison ivy is one of its varieties.
- Leaves always consist of three glossy leaflets.
- Also known as three-leaf ivy, poison creeper, climbing sumac, poison oak, markweed, picry, and mercury.

## WESTERN POISON OAK
(RHUS DIVERSILOBA)

- Grows in shrub and sometimes vine form.
- Grows in California and parts of adjacent states.
- Sometimes called poison ivy, or yeara.
- Leaves always consist of three leaflets.

## POISON SUMAC
(RHUS VERNIX)

- Grows as a woody shrub or small tree from 5 to 25 feet tall.
- Grows in most of eastern third of United States.
- Also known as swamp sumac, poison elder, poison ash, poison dogwood, and thunderwood.

**Ticks**. Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a minimum of a Tyvek® and latex boot covers. The ticks will stand out against the light colors. A tick repellent or insect containing DEET is also recommended.

Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

First Aid

- Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.
- With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic.

**Lyme Disease**. Lyme disease may cause a number of medical conditions, including arthritis that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. But this flu-like illness is usually out of season, commonly happening between May and November when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint. In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.

Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lyme disease, report it to your Superintendent and seek medical attention.

Lyme disease can cause problems with the nervous system that look like other diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can also cause serious but reversible heart problems, such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defense or immune system responds to the infection.

**West Nile Virus and West Nile Encephalitis**. West Nile Virus/West Nile Encephalitis is rapidly becoming a health concern in the United States. West Nile Virus was first identified in

the U.S. in the New York area in 1999 and is closely related to the St. Louis Encephalitis Virus, which is routinely found in the United States.

"Encephalitis" means an inflammation of the brain and it can be caused by viral and bacterial infections. West Nile Encephalitis can be a serious or even fatal illness although this is rare in humans. This illness develops in approximately one out of every 150 infections and is generally confined to older and physically compromised individuals.

West Nile Encephalitis is a viral infection of the brain transmitted through the bite of a mosquito, which has previously fed on birds and/or horses that were infected with West Nile Virus. Dead birds in an area may mean that West Nile Virus is circulating between the birds and the mosquitoes in that area. West Nile Virus is not transmitted from one person to another. Human illness from West Nile Virus is rare, even in areas where the virus has been reported.

*Symptoms of Exposure.* Most people who become infected with West Nile Virus will have either no symptoms or only mild ones. Symptoms of West Nile Encephalitis include high fever, headache, confusion, muscle aches and weakness, seizures, or paralysis. At its most serious, the infection can result in coma, permanent neurological damage, and death. Symptoms usually occur five to 15 days following the bite of an infected mosquito. Because West Nile Encephalitis is a viral infection, antibiotics are not effective and there is no specific treatment available other than general support therapy.

*Protective Measures at Projects.* There is no vaccine to protect humans against West Nile Virus. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

- Review the hazards of West Nile Virus periodically in morning safety meetings.
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended. Understand that mosquitoes may bite through thin clothing, so personnel should evaluate the actual Level D clothing worn, e.g., heavy long sleeve work shirts and heavy jeans may be indicated. Also, the risk or threat of mosquito bites is reduced for those activities that require the use of disposable coveralls.

- For activities where only Level D Personal Protective Equipment (PPE) is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.
- Use an insect repellent containing approximately 25% DEET (N, N-diethyl-meta-toluamide). DEET in concentrations greater than 25% provides no additional protection but repels insects longer. However, at some point there is no direct correlation between concentration and repellency. For example, 50% DEET provides about four hours of protection against mosquitoes, but increasing the concentration to 100% provides only one additional hour of protection. Use the repellent according to the manufacturer's directions provided on the container. Use just enough repellent to cover exposed skin and clothing. Do not treat unexposed skin. Frequent re-application is unnecessary for effectiveness. Avoid prolonged and excessive use of DEET.
- After returning from outdoor field activities, wash treated skin with soap and water.
- Personnel should report flu-like symptoms to the SS/SSO.

DEET is safe for pregnant and lactating women and is generally safe for children. You should avoid applying it to open wounds and irritated skin as it may further irritate the skin or cause discomfort.

Sweating, perspiration and getting wet may wash away the repellent and may require that DEET containing repellent be re-applied.

To remove the breeding places on a project, the following precautions will be followed as practical:

- Cut tall grass and weeds.
- Drain accumulated water in such items as drums, buckets, pools and plastic containers.
- Repair holes in door and window screens.
- Eliminate stagnate water puddles as practical.
- Limit outdoor activities at dawn, dusk and early evening, when mosquitoes are most active, as practical.

### *4.4.4 Lightning*

The procedures provided below will be used to protect site personnel from lightning related injuries.

**Training.** A tailgate safety meeting will be conducted to increase awareness to the hazards and prevention of lightning related incidents.

**Detection of Lightning.** The SS/SSO will be proactive in monitoring conditions that may produce thunderstorms and lightning. A daily and weekly weather forecast will be tracked and communicated to site personnel. When signs of impending storms (i.e., increasing wind, darkening skies) or lightning appear, local weather monitoring will be increased. The National Weather Service (http://www.nws.noaa.gov) should be consulted frequently. Personnel will be notified when thunderstorms may impact the site.

The "flash/bang" (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each five seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is one mile away.

*Suspension/Resumption of Activities.* All outside activities will be suspended when a lightning flash is immediately in the area or a f/b of 20 seconds (4 miles away) is noted. Personnel may continue indoor work activities. Outdoor activities will resume when 30 minutes has passed since the last observable f/b is 20 seconds or greater.

**Lightning Protection.** When notification is given, all outside work activities will stop and personnel will gather in the support zone for a head count and further instructions. Indoor work will continue, except for the use of electrical equipment, telephones and computers. When a safe location is not present and personnel are caught by a sudden lightning event, employees should seek the lowest possible area, away from large objects which might attract lightning or fall over, e.g., trees, utility poles. The employee should assume a crouching position with their head lowered and hands over their ears. **AVOID: WATER, HIGH GROUNDS, HEAVY EQUIPMENT AND TALL, ISOLATED OBJECTS.**

**First Aid.** An employee that is struck by lightning needs immediate assistance (call 911). The body will not carry an electrical charge, but receives an electrical shock and may be burned. Personnel certified in first-aid/Cardiopulmonary Resuscitation (CPR) should inspect for shock and burns around fingers, toes, buckles and jewelry. Stay with the injured employee until medical help arrives.

## *4.5 Vehicle and Heavy Equipment Safety Management*

### *4.5.1 Vehicle Safety*

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. Fifty percent or more of vehicle safety incidents occur while backing up. Shaw employees involved in the operation and use of Shaw and/or leased or rented vehicles will comply with the Shaw Health and Safety procedures HS800 "Motor Vehicle Operation: General Requirements" and HS810 "Commercial Vehicle Operation and Maintenance." Shaw requires employees to use seat belts at all times when traveling in Shaw owned or leased/rented vehicles. The SS/SSO will develop a parking area plan, including backing vehicles into parking spaces, using spotters for backing vehicles and policy mandated vehicle inspections.

Shaw employees are expected to incorporate safe actions and preparations to avoid vehicle accidents and personal injury during work and off-hours. Breaks should be planned into lengthy job mobilizations and demobilizations, including rotation of drivers at regular intervals. If parking areas are busy or crowded and more than one worker is traveling in the same vehicle, one worker should remain outside the vehicle as it leaves the parking space to assist the driver with traffic observation. Vehicles traveling before dawn and at dusk in rural or wooded areas should be prepared to brake for wildlife (e.g. deer) crossing roadways.

Shaw employees arriving at work areas should park vehicles away from delivery, heavy equipment and vehicle loading/unloading locations to prevent parked vehicles from damage by various deliveries. Heavy equipment operators should inspect areas and request vehicles to be moved or spotters used, if necessary, to maneuver equipment in tight areas. Employees who observe near misses or potential risks to parked or moving vehicles must report these to the SS/SSO immediately.

Shaw employees are expected to use the vehicle inspection form and check/test the safety systems on the vehicle on a daily basis. Check the following: brakes, mirrors, seat belts, tires, leakage from the undercarriage, lights and turn signals. Vehicles with safety deficiencies must be reported immediately and not driven until properly repaired. Vehicles used to run errands from different project sites should have telephone numbers of the job site in the vehicle in case calls for assistance are required.

Because of the different ways alcohol can affect behavior, even in very small amounts, the best and safest course is not to drink before driving. At Shaw, a driver with blood alcohol concentration (BAC) over 0.04 percent is considered to be under the influence and subject to disciplinary action. Personnel involved in motor vehicle incidents are subject to drug and alcohol testing.

Weather conditions can have a profound effect on driving. On slippery roads, drive more slowly. Stop and turn with care. Keep several car lengths from other vehicles. At speeds in excess of 35 mph, the chances of hydroplaning increase with speed. In general, keep back one car length for every 10 miles per hour (mph) to prevent striking the car ahead.

Vehicles will be operated in accordance with the requirements listed below:

- Seatbelt use is mandatory for all passengers.
- Personnel may not ride in the back of cargo vehicles.
- The driver must make a 360 degree walk around the assigned vehicle prior to vehicle movement.
- A ground guide is used to back up any vehicle.
- Vehicle speed is limited to the posted speed limits for developed roadways, 25 mph maximum on dirt roads and 10 mph maximum off-road (based on conditions).
- Vehicle driven in four wheel low and low gear when on dirt roads or off road driving where steep grades dictate.
- All operators must possess a valid drivers license.
- Fuel or gasoline are not to be transported inside the passenger compartment.
- No vehicle is left running when unattended.

- Parking brakes are used when vehicles are parked.

In the event of a vehicle incident, notify your Project Manager immediately and complete all required reports.

### 4.5.2 Heavy Equipment, Crane and Lifting Operations

Forklifts, cranes, excavators, loaders, and other material handling equipment present various physical hazards on remediation sites. The following critical safety practices shall be followed to prevent safety incidents during heavy equipment operation.

- All equipment will be inspected prior to each use.
- All operators will have training or equivalent experience to be permitted to operate heavy equipment.
- Spotters will be used to back-up equipment and direct traffic in all “blind” areas.
- Standard hand signals will be used to communicate between operators and ground crew.
- All heavy equipment will have operable back-up alarms.
- Heavy equipment will be parked in areas where operators will not be exposed to strains or slip/trip/fall hazards during mounting and dismounting of equipment.
- All heavy equipment will be equipped with operable seat belts; belts will be used by all operators.
- Written lifting plans will be developed and reviewed for all critical lifts.

## 4.6 Manual Material Lifting

Many different types of objects may be handled manually during site operations. Care should be taken when lifting and handling heavy or bulky items because they are the cause of many back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 60-pound limit.

- The anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width). **THE FOOTING SHALL BE SOLID.**
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

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

### *4.7 Activity Hazard Analyses*

Attachment 3 contains Activity Hazard Analyses (AHA) for primary site tasks. They contain detailed information on physical and chemical hazards, and provide control measures for these hazards. The AHAs will be field checked by the SS/SSO on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew. In addition to the AHAs, Job Safety Analyses (JSAs) will be completed daily in accordance with Shaw HS045 “Job Safety Analyses” (see Attachment 2).

# 5.0 Work and Support Areas

Work zones will be established prior to the initiation of site activities or whenever air monitoring readings exceed the action levels, outlined in Section 8.1. When necessary, each work area will be clearly identified using signs or physical barriers.

## 5.1 Support Zone

The uncontaminated Support Zone (SZ), or clean zone, will be located upwind, in an area outside the Exclusion Zone (EZ) and Contamination Reduction Zone (CRZ) and within the geographic perimeters of the site. The area is used for material staging, vehicle parking, office facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the EZ. All personnel arriving in the SZ will, upon arrival, report to the SS/SSO and sign the site visitor log.

## 5.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ that is adjacent to the EZ. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination and for the purpose of accountability. Personal protective outer garments and respiratory protection will be removed in the CRZ and properly labeled. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

## 5.3 Exclusion Zone

The EZ will be the area around exposed excavation and associated material, and/or the areas with elevated air monitoring readings. This area has the highest potential for exposure to contamination by contact, ingestion, or inhalation. All employees will use proper PPE when working in these areas. The location of the EZ will be identified by fencing or other appropriate means primarily around the excavation areas and the stockpiles. A daily entry log records the time of entry and exit from the EZ for each person.

A log of all personnel visiting, entering or working on the site shall be maintained by the SS/SSO. Visitors will attend a site orientation given by the SS/SSO and sign the SSHSP.

The following are standard safe work practices that apply to all site personnel and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off site personnel provide emergency assistance.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SS/SSO, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

# 6.0 Protective Equipment

This section specifies the levels of personal protective equipment (PPE), which is required for each principal activity performed at this site. All site personnel must be trained in the use of all PPE utilized. The PPE procedures outlined in Shaw Health and Safety procedures HS600 "Personal Protective Equipment" and HS601 "Respiratory Protection Program" will be applied to project activities.

## 6.1 Anticipated Protection Levels

The following protection levels have been established for the site work activities.

**Table 6.1**
**Anticipated Protection Levels**

| Task | Initial PPE Level | Upgrade PPE Level | Skin Protection | Respiratory Protection | Other PPE |
|---|---|---|---|---|---|
| Site Set-up; Installation of E&S Controls; Transportation and Disposal; Site Restoration | Level D | Not Anticipated | Leather-work gloves. Tyvek® coverall as necessary to protect against biological hazards | Not Anticipated | Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 dBA. |
| Utility Relocation; Field Sampling; Material Excavation and Handling (no direct contact with soil) | Level D | Level C | Leather-work gloves. Tyvek® coverall as necessary to protect against biological hazards | Initial: None<br><br>Upgrade: Full face air purifying respirator equipped with an organic vapor/HEPA cartridge | Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 dBA. |
| Utility Relocation; Field Sampling; Material Excavation and Handling (Direct Contact with Contaminated Soil) | Modified Level D | Level C | Leather-work gloves with inner surgical type nitrile liners; Tyvek® coveralls for dry conditions and poly-coated Tyvek for | Initial: None<br><br>Upgrade: Full face air purifying respirator equipped with an organic vapor/HEPA cartridge | Hard-hat, steel-toe boots, safety glasses and hearing protection >85dBA. |

| Task | Initial PPE Level | Upgrade PPE Level | Skin Protection | Respiratory Protection | Other PPE |
|---|---|---|---|---|---|
| | | | wet conditions; | | |
| General Support Zone Activities | Level D | Not Anticipated | None | None | Hard-hat, steel-toe boots, safety glasses and hearing protection >85dBA. |

## 6.2 Protection Levels Descriptions

This section lists the minimum requirements for each protection level. Modification to these requirements may have been noted above.

### 6.2.1 Level D

Level D consists of the following:

- Safety glasses with side shields,
- Hard hat,
- Steel-toed work boots,
- Work clothing as prescribed by weather,
- Leather work gloves,
- Cut resistant gloves when handling sharp objects,
- Reflective vests for ground personnel working around heavy equipment or roadways,
- Hearing protection in areas >85 dBA.

### 6.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields,
- Hard hat,
- Steel-toed work boots,
- Tyvek® coverall (when handling dry materials),
- Poly-coated Tyvek® coverall or PVC rain suit (when handling wet materials),

- Latex over-boots,
- Inner latex sample gloves,
- Outer nitrile gloves,
- Hearing protection in areas >85 dBA,
- Full-face shield when splash hazards are present,
- Metatarsal and shin guard for pressure sprayer operations.

### 6.2.3 Level C

Level C consists of the following:

- Full-face, air-purifying respirator with organic vapor/HEPA cartridges,
- Hooded Tyvek® or poly-coated Tyvek® coveralls,
- Hard hat,
- Steel-toed work boots,
- Inner latex sample gloves,
- Outer nitrile gloves,
- Latex boot covers,
- Metatarsal and shin guards are required for pressure washing operations.

### 6.2.4 Air Purifying Respirators

A Survivair® Opti-Fit® air purifying full-face respirator with air purifying cartridges will be used for Level C work.

### 6.2.5 Cartridge Change-out Schedule

The contaminants of concern are solid particulate or vapor. Therefore, if respiratory protection is required, workers will change the filter cartridge when breathing resistance is noted or on a daily basis, whichever is shorter.

### 6.2.6 Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

### 6.2.7 Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

### 6.2.8 Facial Hair

Personnel who have facial hair which interferes with the respirator's sealing surface will not be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

### 6.2.9 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided. Contact lenses are permitted to be used with full-face respirators based on a decision by OSHA.

### 6.2.10 Medical Certification

Only workers who have been certified by a physician, as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physician’s opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

### *6.3 Site-Specific Personal Protective Equipment (PPE)*

The primary objective of the PPE program is to ensure employee protection and to prevent employee exposure to site contaminants during site operations. Engineering controls are not feasible for many tasks and, therefore, require the use of PPE.

The SS/SSO will be responsible for monitoring all aspects of the PPE program. This includes donning and doffing, temperature related stress monitoring, inspection, and decontamination. PPE selection is identified in Table 6.1 for each specified task. The SS/SSO, in consultation with the HSC, and the HSM will direct changes in PPE based on changing conditions. The site-specific SSHSP will serve as written certification that the workplace was evaluated concerning PPE requirements.

# 7.0 Decontamination Procedures

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

## 7.1 Personnel Decontamination

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and does not spread to clean areas of the site. This sequence describes the general decontamination procedure. The specific stages will vary depending on the site, the task, the protection level, etc.

### 7.1.1 Modified Level D Decontamination

- Go to end of EZ.
- Remove and discard latex booties.
- Remove outer gloves and discard.
- Remove protective suit.
- Remove inner sample gloves and discard.
- Wash face and hands.

### 7.1.2 Level C Decontamination

- Go to end of EZ.
- Remove and discard latex booties.
- Remove outer gloves and discard.
- Remove outer suit (Poly-coated Tyvek®, Tyvek® or PVC rain suit).
- Cross into CRZ (dirty side of respirator wash area).
- Remove and wash respirator (4 stages).
- Soap and water solution.
- First rinse.
- Disinfect respirator (1 cap full of bleach to 1 gallon of water).

- Final rinse.
- Hang respirator to dry.
- Remove inner sample gloves and discard.
- Wash face and hands.

### 7.1.3 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first aid station. Medical attention will be provided based on the degree of injury.

### 7.1.4 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

## 7.2 Equipment Decontamination

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SS/SSO.

## 7.3 Disposal

All spent decontamination liquids and disposable clothing will be treated as contaminated waste unless determined otherwise by accepted testing methods. Wastes will be containerized, and stored until test results are received. Wastes will then be disposed of according to state and federal regulations.

# 8.0 Air Monitoring

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions from site contaminants. The principle contaminants of concern are trichloroethylene, 1,2-cis-dichloroethylene, and arsenic.

## 8.1 Work Area Air Monitoring

Work area air monitoring at Site 57 will be by direct reading methods. A photoionization detector (PID) and a personal Data Ram particulate monitor will be used to monitor excavation activities. A calculation was conducted to determine potential airborne concentrations of contaminants based on known soil concentrations of contaminants. The limits listed below in Table 8.1 will sufficiently protect site employees. Air monitoring results will be used to determine the effectiveness and/or need for control methods and to trigger action levels as specified in Table 8.1.

**Table 8.1**
**Direct Reading Air Monitoring Requirements**

| Monitoring Device | Monitoring Location/ Personnel | Monitoring Frequency | Action Level | Action |
|---|---|---|---|---|
| PID | Excavation Activities | Continuous during all intrusive activities; | < 0.5<br>≥ 0.5 | Modified Level D<br>Stop Work, Contact Safety Manager |
| Data RAM | Excavation Activities | Continuous during all intrusive activities | <5 mg/m$^3$<br>≥5 – 15 mg/m$^3$<br>>15 mg/m$^3$ | Modified D<br>Initiate dust control measures.<br>Stop work and re-evaluate. Contact Health and Safety Manager |

### 8.1.1 Integrated Air Monitoring

Integrated air sampling for personnel exposure characterization will be performed during excavation activities.

Samples will be collected on the most at risk Recovery Technicians (RT) for the first three days of excavation activities in areas contaminated with Arsenic. The protocols established in NIOSH Method 7300 – Arsenic, shall be followed. The pumps will be pre- and post-calibrated. The samples shall be submitted to a laboratory accredited by the American Industrial Hygiene Association for analysis of Arsenic concentration.

A summary of air monitoring information is given in Table 8-2 below.

**Table 8.2**
**Integrated Personal Air Sampling**

| Monitoring Device | Monitoring Location/ Personnel | Monitoring Frequency | Action Level | Action |
|---|---|---|---|---|
| Air Sampling Pump<br>Lead | Breathing Zone/ Recovery Technician (RT) | Sample a minimum of 2 workers in the EZ for the first three days of intrusive/soil disturbance activities in areas contaminated with Arsenic | 5.0 ug/m$^3$ (TWA)<br><br>$\geq$5.0 ug/m$^3$ (TWA) | Implement dust control measures;<br><br>Upgrade to Level 'C' PPE<br><br>Stop work and contact HSM |

## *8.2 Instrumentation*

The following is a description of the air monitoring equipment to be used at this site.

### *8.2.1 Real Time Aerosol Monitor (Model Pr 100 Data Ram)*

#### *8.2.1.1 Principle of Operation*

- Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume.
- The higher the dust concentration the more back-scattering of light to the sensor, resulting in increased readings.

- Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method.

#### *8.2.1.2 Calibration Methods/Frequencies*

There is no calibration method or procedure for calibrating the mini-ram monitor. However, it is recommended that the mini-ram monitor be re-zeroed once a week. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

#### *8.2.1.3 Preventative Maintenance*

Maintenance of the mini-ram consists of replacement of filters and desiccant; battery replacement; and cleaning of the optical detection assembly.

Prior to entering a confined-space or hot work area involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/$O_2$ (oxygen) measurements will be taken.

### *8.2.2 Photoionization Detector Photovac 2020 or Equivalent*

The PID Photovac 2020 is designed for trace gas analysis in ambient air and is calibrated with certified standards of benzene, vinyl chloride, and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, hydrogen sulfide [$H_2S$], etc.).

The SSO will use a PID with a 10.6 electron volt (eV) lamp. This lamp has been determined to be most responsive to the contaminants on site. Optional probes containing lamps of 9.5 and 11.7 eV are interchangeable in use within individual read-out assemblies for different applications.

The SSO will record and log calibration information into an air monitoring notebook. Maintenance of the Photovac 2020 consists of changing pre-filters, cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or subassemblies.

### 8.3 Air Monitoring Log

The SS/SSO will ensure that all air monitoring data is logged into a notebook. Data will include instrument used, wind direction, work process, etc. The Program CIH will periodically review this data.

### 8.4 Calibration Requirements

The PID and the LEL/$O_2$/$H_2S$ will be calibrated daily before and after use, based on the manufacture's recommendations and standard industrial hygiene practices. The Data Ram will be zeroed daily before use. A separate log will be kept by the HSC and/or SS/SSO detailing date, time, span gas, or other standard, and name of person performing the calibration.

### 8.5 Air Monitoring Results

Air monitoring results will be available for personnel inspection, and will be discussed during morning safety meetings.

# 9.0 Emergency Response

## 9.1 Pre-Emergency Planning

Prior to engaging in remediation activities at the site, Shaw will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition, site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the Emergency Response and Contingency Plan (ERCP):

| | |
|---|---|
| Fire/Explosion | • The potential for human injury exists.<br>• Toxic fumes or vapors are released.<br>• The fire could spread on site or offsite and possibly ignite other flammable materials or cause heat-induced explosions.<br>• The use of water and/or chemical fire suppressants could result in contaminated run-off. |
| Spill or Release of Hazardous Materials | • The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.<br>• The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health. |
| Natural Disaster | • A rainstorm exceeds the flash flood level.<br>• The facility is in a projected tornado path or a tornado has damaged facility property.<br>• Severe wind gusts are forecasted or have occurred and have caused damage to the facility.<br>• Hurricanes |
| Medical Emergency | • Overexposure to hazardous materials.<br>• Trauma injuries (broken bones, severe lacerations/bleeding, burns).<br>• Eye/skin contact with hazardous materials.<br>• Loss of consciousness.<br>• Heat stress (Heat stroke).<br>• Heart attack.<br>• Respiratory failure.<br>• Allergic reaction. |

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.

- On site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on site personnel required to respond, based on their level of response.
- It will be the responsibility of the Site Superintendent to brief the site response team, either on site or Shaw Employees or offsite responders, on anticipated hazards at the site. The Site Superintendent shall assume the role of Emergency Coordinator and shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Planning Committee (LEPC) in compliance with SARA Title III requirements.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be air horns.

### *9.2 Emergency Recognition And Prevention*

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the Site Superintendent and the Site Safety Officer, through daily site inspections and employee feedback (Safety Observation Program, daily safety meetings, and AHA) to recognize and identify all hazards that are found at the site. These may include:

| | |
|---|---|
| Chemical Hazards | • Materials at the site<br>• Materials brought to the site |
| Physical Hazards | • Fire/explosion<br>• Slip/trip/fall<br>• Excessive noise |
| Mechanical Hazards | • Pinch points<br>• Vehicle traffic |
| Environmental Hazards | • Electrical Storms<br>• High winds<br>• Heavy Rain/Snow<br>• Temperature Extremes (Heat Stress)<br>• Poisonous Plants/Animals |

Once a hazard has been recognized, the SS/SSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting,

- Task specific training prior to commencement of activity,
- PPE selection/use,
- Following all Shaw standard operating procedures.

**Table 9.1**
**Emergency Telephone Numbers**

| | |
|---|---|
| **Local Agencies** | |
| Base Fire Protection Division | (301) 744-4333 |
| Ambulance | (301) 744-4333 |
| Fire | (301) 744-4333 |
| Security | (301) 744-4333 |
| **Hospital** | |
| Civista Medical Center<br>701 East St. Charles Street<br>LaPlata, MD 20646 | (301) 609-4000 |
| **Health Resources Clinic**<br>Convenient Health Care<br>12090 Old Line Center Road<br>Waldorf, MD 20602 | (301) 645-8550 |
| *See Attachment 8 for directions to the hospital and clinic.* | |
| National Poison Control Information Center | (800) 222-1212 |
| Federal Agencies | |
| Center for Disease Control | (404) 639-3311 |
| National Response Center | (800) 424-8802 |
| Department of the Navy, Atlantic Division (LANTDIV) | |
| DROICC - LT Michael O'Connell | (301) 744-2177 |
| Contracting Officer – Christine Foskey-Brown | (757) 322-4165 |
| Contracting Officer Technical Representative - Cathy Gardner | (301) 744-2181 |
| Shaw Personnel | |
| Project Manager – Steve Carriere | (609) 234-6361 (cellular) |
| Site Superintendent – William Simpson | |
| Operations Supervisor - Brian Harris | (240) 375-1786 (cellular) |
| Site Safety Officer – Jim Wright | (925) 383-7646 (cellular) |
| LANTDIV Safety Manager- Kym Edelman | (757) 435-5384 (cellular) |
| Program CIH – Dave Mummert | (419) 425-6129 (office) |
| Regional Health and Safety Manager – Joe Hoyt | (804) 337-6982 (cellular) |
| Shaw E & I (24 hour) | 866-299-3445 |

### 9.3 Personnel Roles, Lines of Authority and Communications

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary Emergency Coordinator for this site is the Site Superintendent. In the event an emergency occurs and the Emergency Coordinator is not on site, the SS/SSO or the highest-ranking employee on site will serve as the Emergency Coordinator until he arrives. The Emergency Coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The Emergency Coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the Emergency Coordinator or his designee will evaluate the situation to determine the appropriate action.

#### 9.3.1 Responsibilities and Duties

This section describes the responsibilities and duties assigned to the Emergency Coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. Shaw will follow procedures as directed by the Fire Department, LEPC, State and Federal agencies as required. Shaw will defer to the local Fire Department Chief to assume the role of Incident Commander upon arriving on site. Additional on site personnel may be added to the Site Emergency Response Team as required to respond effectively.

#### 9.3.2 On site Emergency Coordinator Duties

The on site Emergency Coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the Emergency Coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.

- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site.
- Notify the ROICC. The ROICC will contact the local Emergency Response Teams if their help is necessary to control the incident. Table 9.1 provides telephone numbers for emergency assistance.
- Direct on site personnel to control the incident until, if necessary, outside help arrives.
- Ensure that the building or area where the incident occurred and the surrounding areas are evacuated, and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify facility Fire Department.
- Notify Shaw Project Manager.
- Notify ROICC.
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the Emergency Coordinator should immediately determine whether evacuation of area outside of the site maybe necessary and, if so, notify the ROICC. The ROICC will contact the local Police Department and the Office of Emergency Management.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

### *9.3.3 Safe Distances and Places of Refuge*

The Emergency Coordinator for all activities will be the SS/SSO. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies that could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the Emergency Coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The Emergency Coordinator, or his designee, will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 9.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release,
- Fire/explosion,
- Medical emergency, or
- Hazardous weather.

In general, evacuation will be made to the main entrance to the Shaw site, unless the Emergency Coordinator determines otherwise. It is the responsibility of the Emergency Coordinator to determine when it is necessary to evacuate personnel to offsite locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the Emergency Coordinator.

### *9.3.4 Evacuation Routes and Procedures*

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the Emergency Coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The Emergency Coordinator is responsible for determining which situations require site evacuation.

### *9.3.5 Evacuation Signals and Routes*

Two-way radio communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. The crew Superintendent will have a two-way radio. Only the Emergency Coordinator will initiate total site evacuation, however, in his absence, decisions to preserve the health and safety of employees will take precedence.

### *9.3.6 Evacuation Procedures*

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the Emergency Coordinator.

- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the Emergency Coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- The Emergency Coordinator, or designee, will make a final tally of persons. No attempt to find persons not accounted for will involve endangering lives of Shaw or other employees by re entry into emergency areas.

In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Superintendent.

- Personnel will be assigned by the Emergency Coordinator to be available to direct and brief emergency responders.
- Re-entry into the site will be made only after the Emergency Coordinator gives clearance. At his direction, a signal or other notification will be given for re entry into the facility.
- Drills will be held upon mobilization to the site and annually, thereafter, to practice all of these procedures with the same seriousness as an actual emergency.

## *9.4 Emergency Spill Response Procedures And Equipment*

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 9.1 provide a quick reference guide to follow in the event of a major spill.

### 9.4.1 Notification Procedures

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on site Emergency Coordinator.

On site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on site Emergency Coordinator to assess the magnitude and potential seriousness of the spill or release.

### 9.4.2 Procedure for Containing/Collecting Spills

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment and disposal assessment will be the secondary response, and may include:

- Construction of a temporary containment berm utilizing on site clay absorbent earth.
- Digging a sump, installing a polyethylene liner.
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground.
- Transferring the material from its original container to another container.

The Emergency Coordinator will notify the ROICC of the spill and steps taken to institute clean up. Emergency response personnel will clean up all spills following the spill clean-up plan

developed by the Emergency Coordinator. Supplies necessary to clean up a spill will be immediately available on site. Such items may include, but are not limited to:

- Shovel, rake,
- Sorbent materials,
- Personal safety equipment,
- Steel drums, and
- Miscellaneous hand tools.

As specified in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), Shaw practice is to report a spill of one pound or more of any hazardous material for which a reportable quantity has not been established and is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or Toxic Substances Control Act (TSCA). Shaw also follows the same practice for any substances not listed in the Acts noted above but which can be classified as a hazardous waste under Resource Conservation and Recovery Act (RCRA).

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazardous area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery.
- Determine the major components in the waste at the time of the spill. Remove all surrounding materials that could be especially reactive with materials in the waste.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.

- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g., clay, sand, lime, etc.) to absorb discharged liquids.
- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

### *9.4.3 Emergency Response Equipment*

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses:

- ABC type fire extinguisher,
- Industrial Size First Aid Kit,
- Eyewash, and
- Emergency signal horn.

### *9.4.4 Emergency Spill Response Clean-Up Materials and Equipment*

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be inventoried and inspected, visually, on a weekly basis.

The materials listed below may be kept on site for spill control, depending on the types of hazardous materials present on site. The majority of this material will be located in the support zone. Small amounts will be placed on pallets and located in active work areas.

- Appropriate solvents (e.g., CITRIKLEEN, for decontamination of structures or equipment).
- Sand or clay to solidify/absorb liquid spills.

### *9.4.5 Medical Emergency Contingency Measures*

The procedures listed below will be used to respond to medical emergencies. The SS/SSO will contact the local hospital and inform them of the site hazards and potential emergency situations.

A minimum of two first-aid/CPR trained personnel will be maintained on site. In accordance with 29 CFR 1910.1030, first-aid/CPR trained personnel will receive Blood Borne Pathogens training.

### *9.4.6 Response*

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on site Emergency Coordinator to alert him of a medical emergency situation. The supervisor will advise of the following information:

- Location of the victim at the work site.
- Nature of the emergency.
- Whether the victim is conscious.
- Specific conditions contributing to the emergency, if known.

The Emergency Coordinator will notify the Site Safety Officer. The following actions will then be taken depending on the severity of the incident:

**Life-Threatening Incident.** If an apparent life-threatening condition exists, the crew Superintendent will inform the Emergency Coordinator by radio, and the local Emergency Medical Services (EMS) will be immediately called. The EMS will be notified that decontamination procedures will be bypassed, and the EMS responders shall take precaution against site contaminants that may be present on the employee. Information of the site contaminants will be provided to the EMS by the SSO. The Shaw SSO will notify the Hospital Emergency Room of the condition and any site contaminants. An on site person will be appointed to meet the EMS and quickly take him/her to the victim. Any injury within the EZ will be evacuated by Shaw personnel to a clean area for treatment by EMS personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance, and site orientation.

Following any response, an accident/injury/illness report will be completely and properly filled out and submitted to the Program Health and Safety /Project CIH in accordance with Shaw reporting procedures.

A list of emergency telephone numbers is provided in Table 9.1.

**Non Life-Threatening Incident**. All injuries, no matter how small, will be reported to the SS/SSO. If it is determined that no threat to life is present, the SS/SSO will direct the injured person through decontamination procedures appropriate to the nature of the illness or accident. Appropriate first-aid or medical attention will then be administered.

***NOTE:* The area surrounding an accident site must not be disturbed until the scene has been cleared by the Site Superintendent.**

### *9.4.7 Notification*

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS,
- On site Emergency Coordinator,
- Workers in the affected areas,
- Shaw PM,
- ROICC.

### *9.4.8 Fire Contingency Measures*

Shaw personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire cannot be contained and extinguished quickly, personnel will notify the Emergency Coordinator by radio and vacate the structure or area. The Emergency Coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present and throughout the exclusion and contamination reduction zones.
- Fire extinguishers will be located in all Shaw site dedicated vehicles and placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area, the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points will be clearly marked.

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify his/her supervisor who will then contact the Emergency Coordinator via radio. The Emergency Coordinator will activate the emergency air horns and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (a.k.a. buddy system) who join each other immediately after hearing the fire alarm and remaining together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a worker has extinguished a small fire, the Emergency Coordinator will be notified.

## *9.5 Hazardous Weather Contingency Measures*

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning,
- Heavy Rains, or
- High Winds.

### 9.5.1 Response

- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge. The Emergency Coordinator will determine when it is necessary to evacuate personnel to offsite locations and will coordinate efforts with fire, police, and other agencies.

### 9.5.2 Notification

The Emergency Coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- Shaw employees and subcontractors,
- Shaw PM, and
- ROICC.

# 10.0 Training Requirements

As a requirement for work at this site, in any hazardous waste work area, all field personnel will be required to take a 40-hour training class. This training must cover the requirements in 29 CFR 1910.120: personal protective equipment, toxicological effects of various chemicals, hazard communication, blood borne pathogens, handling of unknown tanks and drums, confined-space entry procedures, electrical safety, etc. Subsequent to 40-hour training, each employee will receive an initial three-day on site training by a trained, experienced Superintendent. All personnel must receive annual 8-hour refresher training. Supervisory personnel shall have received an additional 8-hour training in handling hazardous waste operations.

All personnel entering the work areas will be trained in the provisions of this SSHSP and will be required to sign the Site Safety Plan Acknowledgment in Attachment 8.

Site-specific training for activities at the site will include potential site contaminants, hazard communication, as per 29 CFR 1926.59/1910.1200, site physical and environmental hazards, emergency response and evacuation procedures. Emergency telephone numbers will be held at the site location by the SS/SSO before any site work activities begin.

Outlines of the orientation for Shaw personnel and subcontract personnel and visitors are presented below:

| Shaw/Subcontractors | Visitor orientation |
|---|---|
| • SSHSP sign off<br>• Sign in/out procedures<br>• Site background<br>• Chain of command<br>• Rules and regulations<br>• Hours of work<br>• Absences<br>• Equipment<br>• Emergency Information<br>• Emergency signal<br>• Gathering point<br>• Responsibilities/roles<br>• Emergency phone numbers<br>• Work Zones<br>• Contaminants, MSDSs [Hazard Communication Program]<br>• AHAs (Activity Hazard Analyses)<br>• Forms, site-specific Incident Reporting | • SSHSP signoff<br>• Review of Site map<br>• Work Zones in progress<br>• Hazard Communication<br>• Emergency plan/signals<br>• Training/medical requirements<br>• Zones/areas open to visitors |

# 11.0 Medical Surveillance Program

All Shaw personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of Shaw's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and Shaw's occupational health physician. Other medical consultants are retained when additional expertise is required.

All field personnel performing activities in a designated EZ or CRZ shall within the past 12 months have completed a comprehensive medical examination. The annual medical includes the following elements:

- Medical and occupational history questionnaire.
- Physical examination.
- Complete blood count, with differential.
- Liver enzyme profile.
- Chest x-ray, once every 3 years, for non-asbestos workers.
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for persons older than 35 years of age, or if indicated during the physical examination.
- Visual acuity.
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120/1926.65(f).

The following information is provided in the event that medical attention is necessary.

The Shaw Medical Director is:

Dr. Jerry H. Berke, MD, MPH
Health Resources
600 West Cumming Park
Suite 3400
Woburn, MA 01801-6350
781-935-8581 (direct dial)
800-350-4511 (toll free)

The Following Health Resource Clinic will be used for all non life-threatening medical emergencies:

Health Resource Clinic
Convenient Health Care
12090 Old Line Center
Waldorf, MD 20602
301-645-8550

The Shaw Medical Director and the HSM will be immediately notified of any suspected exposures to hazardous materials/wastes.

***Attachment 1***
***Material Safety Data Sheets (MSDSs)***

Site Contaminants:
DCE (1,1-DCE or vinylidene chloride)
TCE
Arsenic

Materials that May be Brought to Site:
Gasoline
Diesel
Lubricating oil

**ACROS ORGANICS**
**VINYLIDENE CHLORIDE, STABILIZED, 99.9%** **Revised: 12/13/1999**

**MSDS Contents**

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS
SECTION 3 - HAZARDS IDENTIFICATION
SECTION 4 - FIRST AID MEASURES
SECTION 5 - FIRE FIGHTING MEASURES
SECTION 6 - ACCIDENTAL RELEASE MEASURES
SECTION 7 - HANDLING and STORAGE
SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION
SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES
SECTION 10 - STABILITY AND REACTIVITY
SECTION 11 - TOXICOLOGICAL INFORMATION
SECTION 12 - ECOLOGICAL INFORMATION
SECTION 13 - DISPOSAL CONSIDERATIONS
SECTION 14 - TRANSPORT INFORMATION
SECTION 15 - REGULATORY INFORMATION
SECTION 16 - ADDITIONAL INFORMATION

**** MATERIAL SAFETY DATA SHEET ****

Vinylidene chloride, stabilized, 99.9%
76910

## SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS Name: Vinylidene chloride, stabilized, 99.9%
Catalog Numbers:
AC172290000, AC172290010, AC172290025, AC172290250
Synonyms:
1,1-Dichloroethylene

Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

## SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

| CAS# | Chemical Name | % | EINECS# | Haz Symbol |
|---|---|---|---|---|
| 75-35-4 | Vinylidene chloride | 99.9% | 200-864-0 | |

+----------+----------+----------+----------+----------

Hazard Symbols: XN F+
Risk Phrases: 12 40 20

## SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance: colorless clear liquid. Flash Point: -25 deg C.
Light sensitive. Air sensitive. Moisture sensitive.
Target Organs: Kidneys, central nervous system, liver, nervous system, nerves.

Potential Health Effects

Eye:
May cause eye irritation. Causes redness and pain.

Skin:
May cause skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Causes redness and pain. May be harmful if absorbed through the skin.

Ingestion:
May cause irritation of the digestive tract. Poison by ingestion. May cause nausea and vomiting.

Inhalation:
Harmful if inhaled. May cause respiratory tract irritation. May cause liver and kidney damage. May cause narcotic effects in high concentration.

Chronic:
Laboratory experiments have resulted in mutagenic effects.

## SECTION 4 - FIRST AID MEASURES

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
Get medical aid immediately. Wash mouth out with water.

Inhalation:
Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:
Treat symptomatically and supportively.

## SECTION 5 - FIRE FIGHTING MEASURES

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Can form explosive mixtures at temperatures above the flashpoint. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:
Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: 520 deg C ( 968.00 deg F)
Flash Point: -25 deg C ( -13.00 deg F)
Explosion Limits, lower: 5.6 vol %
Explosion Limits, upper: 19.5 vol %
NFPA Rating:

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Use a spark-proof tool.

## SECTION 7 - HANDLING and STORAGE

Handling:
Use spark-proof tools and explosion proof equipment. Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes. Take precautionary measures against static discharges. Use only in a chemical fume hood. Avoid mechanical shock and friction.

Storage:
Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Refrigerator/flammables. Store protected from light. Store under nitrogen.

## SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering Controls:
Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

| Chemical Name | ACGIH | NIOSH | OSHA - Final PELs |
|---|---|---|---|
| Vinylidene chloride | 5 ppm | none listed | none listed |

OSHA Vacated PELs:
Vinylidene chloride:
1 ppm TWA; 4 mg/m3 TWA

Personal Protective Equipment

Eyes:
Wear chemical goggles.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

## SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| Physical State: | Clear liquid |
| Color: | colorless |
| Odor: | mild odor - sweetish odor - chloroform-like |
| pH: | Not available. |
| Vapor Pressure: | 665 mbar @ 20 deg C |
| Vapor Density: | 3.4 (air = 1) |
| Evaporation Rate: | Not available. |
| Viscosity: | 0.377mPa.s@15 deg C |
| Boiling Point: | 31.2 - 31.7 deg C @ 760 mmHg |
| Freezing/Melting Point: | -122 deg C |
| Decomposition Temperature: | |
| Solubility in water: | 2.5 g/l water (25¦C) |
| Specific Gravity/Density: | 1.218 g/cm3 |
| Molecular Formula: | C2H2Cl2 |
| Molecular Weight: | 96.94 |

## SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability:
Stable. However, it may undergo explosive polymerization if uninhibited.
Conditions to Avoid:
Incompatible materials, light, ignition sources, exposure to air, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials:
Metals, oxidizing agents, strong bases, aluminum, copper, peroxides, oxygen, metallic salts, metal powders.
Hazardous Decomposition Products:
Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide, peroxides, formaldehyde.
Hazardous Polymerization: May occur.

## SECTION 11 - TOXICOLOGICAL INFORMATION

RTECS#:
CAS# 75-35-4: KV9275000
LD50/LC50:
CAS# 75-35-4: Inhalation, rat: LC50 = 6350 ppm/4H; Inhalation, rat: LC50 = 10000 mg/m3; Oral, mouse: LD50 = 194 mg/kg; Oral, rat: LD50 = 200 mg/kg.
Carcinogenicity:
Vinylidene chloride -
Not listed by ACGIH, IARC, or NTP.
Epidemiology:
No data available.
Teratogenicity:
No data available.
Reproductive Effects:
No data available.
Neurotoxicity:
No data available.
Mutagenicity:
No data available.
Other Studies:
The toxicological properties have not been fully investigated.

## SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity:
Daphnia: EC50 = 79 mg/l; 48 H;
Other
Biodegradable. Do not empty into drains.

## SECTION 13 - DISPOSAL CONSIDERATIONS

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 75-35-4: waste number U078.

## SECTION 14 - TRANSPORT INFORMATION

```
    US DOT
         Shipping Name: VINYLIDENE CHLORIDE, INHIBITED
          Hazard Class: 3
             UN Number: UN1303
         Packing Group: I
    Canadian TDG
         No information available.
USA RQ:CAS# 75-35-4: 100 lb final RQ; 45.4 kg final RQ
```

## SECTION 15 - REGULATORY INFORMATION

```
US FEDERAL
    TSCA
         CAS# 75-35-4 is listed on the TSCA inventory.
       Health & Safety Reporting List
         None of the chemicals are on the Health & Safety Reporting List.
       Chemical Test Rules
         None of the chemicals in this product are under a Chemical Test Rule.
       Section 12b
         None of the chemicals are listed under TSCA Section 12b.
       TSCA Significant New Use Rule
         None of the chemicals in this material have a SNUR under TSCA.
    SARA
       CERCLA Hazardous Substances and corresponding RQs
         CAS# 75-35-4: 100 lb final RQ; 45.4 kg final RQ
       SARA Section 302 Extremely Hazardous Substances
         None of the chemicals in this product have a TPQ.
       Section 313
         This material contains Vinylidene chloride (CAS# 75-35-4, 99
         9%),which is subject to the reporting requirements of Section 313 of
         SARA Title III and 40 CFR Part 372.
    Clean Air Act:
         CAS# 75-35-4 is listed as a hazardous air pollutant (HAP).
         This material does not contain any Class 1 Ozone depletors.
         This material does not contain any Class 2 Ozone depletors.
    Clean Water Act:
```

CAS# 75-35-4 is listed as a Hazardous Substance under the CWA.
CAS# 75-35-4 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 75-35-4 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
Vinylidene chloride can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN F+
Risk Phrases:
R 12 Extremely flammable.
R 20 Harmful by inhalation.
R 40 Limited evidence of a carcinogenic effect.
Safety Phrases:
S 7 Keep container tightly closed.
S 16 Keep away from sources of ignition - No smoking.
S 29 Do not empty into drains.

WGK (Water Danger/Protection)
CAS# 75-35-4: 3

United Kingdom Occupational Exposure Limits

United Kingdom Maximum Exposure Limits
CAS# 75-35-4: MEL-United Kingdom, TWA 10 ppm TWA; 40 mg/m3 TWA

Canada
CAS# 75-35-4 is listed on Canada's DSL List.
This product does not have a WHMIS classification.
CAS# 75-35-4 is listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 75-35-4: OEL-AUSTRALIA:TWA 5 ppm (20 mg/m3);STEL 20 ppm (80 mg/m3)
OEL-AUSTRIA:TWA 2 ppm (8 mg/m3)
OEL-BELGIUM:TWA 5 ppm (20 mg/m3);STEL 20 ppm (79 mg/m3)
OEL-DENMARK:TWA 5 ppm (20 mg/m3)
OEL-FINLAND:TWA 10 ppm (40 mg/m3);STEL 20 ppm (80 mg/m3);CAR
OEL-FRANCE:TWA 5 ppm (20 mg/m3)
OEL-GERMANY:TWA 2 ppm (8 mg/m3);Carcinogen
OEL-THE NETHERLANDS:TWA 5 ppm (20 mg/m3)
OEL-POLAND:TWA 50 mg/m3
OEL-RUSSIA:STEL 50 mg/m3
OEL-SWEDEN:TWA 5 ppm (20 mg/m3);STEL 10 ppm (40 mg/m3)
OEL-SWITZERLAND:TWA 2 ppm (8 mg/m3);STEL 4 ppm (1 mg/m3)
OEL-UNITED KINGDOM:TWA 10 ppm (40 mg/m3)
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

## SECTION 16 - ADDITIONAL INFORMATION

MSDS Creation Date: 12/13/1999 Revision #0 Date: Original.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

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**VAN WATERS & ROGERS**
**TRICHLOROETHYLENE: TRICHLOR: TCE: ETHYLENE TRICHLORIDE: HI-TRI SOLVENT Revised: 12/05/1990**

**MSDS Contents**

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NOTICE

MATERIAL SAFETY DATA SHEET
P1240

EFFECTIVE DATE: 12-05-90

TRICHLOROETHYLENE NEUTRAL GRADE

VAN WATERS & ROGERS INC.
SUBSIDIARY OF UNIVAR
1600 NORTON BLDG.
SEATTLE, WA 98104-1564

(408) 435-8700

## EMERGENCY ASSISTANCE

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL CHEMTREC (800)424-9300

## FOR PRODUCT AND SALES INFORMATION

CONTACT YOUR LOCAL VAN WATERS & ROGERS BRANCH OFFICE

## PRODUCT IDENTIFICATION

PRODUCT NAME: TRICHLOROETHYLENE
CAS NO.: 79-01-6

COMMON NAMES/SYNONYMS: TRICHLOROETHYLENE: TRICHLOR:
TCE: ETHYLENE TRICHLORIDE: HI-TRI (R*) SOLVENT

MSDS #: P1240

FORMULA: C2 H CL3

DATE ISSUED: 12/90

SUPERCEDES: 05/90

MOLECULAR WEIGHT: 181.3

NFPA RATING (49 CRITERIA)
HEALTH: 2
FIRE: 1
REACTIVITY: 0
SPECIAL: NONE

HMIS RATING:
HEALTH: 2
FIRE: 1
REACTIVITY: 1

HAZARD RATING SCALE:
0=MINIMAL 3=SERIOUS
1=SLIGHT 4=SEVERE
2=MODERATE

## HAZARDOUS INGREDIENTS

| COMPONENT | CAS NO. | % | EXPOSURE LIMITS. PPM OSHA PEL | ACGIH TLV | OTHER LIMIT | HAZARD |
|---|---|---|---|---|---|---|
| TRICHLOROETHYLENE | | 99 | 100 | 50 | SEE BELOW | ACGIH/OSHA LIST |

OTHER LIMITS:

OSHA: 200 PPM CEILING
300 PPM PEAK FOR 5 MIN IN ANY 2 HR

ACGIH: 200 PPM SHORT TERM EXPOSURE LIMIT

(R*) - TRADEMARK OF DOW CHEMICAL COMPANY

## PHYSICAL PROPERTIES

BOILING POINT, DEG F: 188

MELTING POINT, DEG F: -99

SPECIFIC GRAVITY (WATER=1): 1.45

VAPOR PRESSURE, MM HG: 58

VAPOR DENSITY (AIR=1): 4.5

PH: NO DATA AVAILABLE

WATER SOLUBILITY, %: NIL

EVAPORATION RATE (BUTYL ACETATE=1): <1

% VOLATILE (BY VOLUME): 100

APPEARANCE AND ODOR: CLEAR, COLORLESS LIQUID; MILDLY SWEET ODOR

## FIRST AID MEASURES

IF INHALED:
REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF EYE CONTACT:
IMMEDIATELY FLUSH EYES WITH LOTS OF RUNNING WATER FOR 15 MINUTES, LIFTING THE UPPER AND LOWER EYELIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF SKIN CONTACT:
IMMEDIATELY WASH SKIN WITH LOTS OF SOAP AND WATER. REMOVE CONTAMINATED CLOTHING AND SHOES; WASH BEFORE REUSE. GET MEDICAL ATTENTION IF IRRITATION PERSISTS AFTER WASHING.

IF SWALLOWED:
DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION. IF VOMITING OCCURS SPONTANEOUSLY, KEEP VICTIM'S HEAD BELOW HIS HIPS TO PREVENT HIS BREATHING THE VOMITUS INTO HIS LUNGS.

NOTE TO PHYSICIAN:
OVEREXPOSURE TO MANY OF THE CHLORINATED SOLVENTS, ESPECIALLY IF ACCOMPANIED BY ANOXIA, MAY TEMPORARILY INCREASE CARDIAC IRRITABILITY. MAINTAIN ADEQUATE OXYGENATION UNTIL RECOVERY. AVOID SYMPATHOMIMETIC AMINES, SUCH AS EPINEPHRINE, WHICH MAY PRECIPITATE ARRHYTHMIAS. CONTAINS PETROLEUM OR PETROLEUM-LIKE SOLVENT. MAY CAUSE CHEMICAL PNEUMONITIS IF ASPIRATED INTO THE LUNGS. IF LAVAGE IS PERFORMED, SUGGEST ENDOTRACHEAL AND/OR ESOPHAGOSCOPIC CONTROL. MECHANICAL SUPPORT OF RESPIRATION MAY BE NEEDED. MAY CAUSE LIVER DAMAGE. ANESTHETIC OR NARCOTIC EFFECT MAY OCCUR. MAY CAUSE ABDOMINAL CRAMPS AND/OR DIARRHEA. ALCOHOL CONSUMED BEFORE OR AFTER EXPOSURE MAY INCREASE INJURY. CONSULT STANDARD LITERATURE. NO SPECIFIC ANTIDOTE.

## HEALTH HAZARD INFORMATION

PRIMARY ROUTES OF EXPOSURE: INHALATION. SKIN OR EYE CONTACT.

SIGNS AND SYMPTOMS OF EXPOSURE

INHALATION:
ACUTE EXPOSURES WILL CAUSE IRRITATION OF THE NOSE AND THROAT, DRYNESS, DRUNKENNESS AND DROWSINESS, NAUSEA, UNCONSCIOUSNESS AND EVEN DEATH IN EXTREME CASES. MAY ALSO SENSITIZE THE MYOCARDIUM TO EPINEPHRINE AND CAUSE CARDIAC ARRHYTHMIA. MINIMAL ANESTHETIC OR IRRITANT EFFECTS MAY SEEN AROUND 200-400 PPM. PROGRESSIVELY HIGHER LEVELS MAY CAUSE DIZZINESS AND DRUNKENNESS AND CONCENTRATIONS AS LOW AS 1,000-2,000 PPM MAY CAUSE UNCONSCIOUSNESS OR DEATH. EXTREMELY HIGH VAPOR CONCENTRATIONS, OVER 6,000 PPM. ARE IMMEDIATELY HAZARDOUS TO LIFE. VAPORS CAN READILY ACCUMULATE IN CONFINED OR POORLY VENTILATED AREAS AND CAN CAUSE UNCONSCIOUSNESS AND DEATH. EXCESSIVE EXPOSURE MAY ALSO CAUSE TEMPORARY VASODILATION OF THE SKIN, CALLED "DEGREASER'S FLUSH". ALCOHOL CONSUMED BEFORE OR AFTER EXPOSURE MAY MAKE SYMPTOMS WORSE.

EYE CONTACT: WILL SEVERELY IRRITATE THE EYES. MAY CAUSE CONJUNCTIVITIS.

SKIN CONTACT:
BRIEF CONTACT MAY DRY THE SKIN. PROLONGED OR REPEATED CONTACT MAY IRRITATE THE SKIN. CAUSING DERMATITIS. MAY CAUSE A MORE SEVERE RESPONSE. SUCH AS A BURN. IF CONFINED TO THE SKIN. A SINGLE PROLONGED EXPOSURE IS NOT LIKELY TO ABSORB HARMFUL AMOUNTS THROUGH THE SKIN. ALTHOUGH IT MAY CAUSE A NUMBNESS OF THE FINGERS IF THEY ARE IMMERSED IN TRICHLOROETHYLENE.

SWALLOWED:
LOW TO MODERATELY TOXIC. MAY CAUSE EFFECTS SIMILAR TO INHALATION. IRRITATES THE DIGESTIVE TRACT AND MAY CAUSE COUGHING, ABDOMINAL PAIN, DIARRHEA AND DIZZINESS. MAY ALSO CAUSE UNCONSCIOUSNESS, LIVER DAMAGE, MYOCARDIAL DAMAGE, AND KIDNEY FAILURE. SEVERE EXPOSURE MAY CAUSE DEATH.

CHRONIC EFFECTS OF EXPOSURE:
MAY CAUSE DAMAGE TO LIVER, KIDNEYS, AND NERVOUS SYSTEM. WORKERS CHRONICALLY EXPOSED TO VAPOR CONCENTRATIONS OF 40-270 PPM OFTEN EXHIBIT SYMPTOMS OF FATIGUE, HEADACHE, IRRITABILITY, VOMITING, FLUSHING OF THE SKIN, INTOLERANCE TO ALCOHOL, AND ELECTROCARDIOGRAPHIC CHANGES.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
PERSONS WITH PRE- EXISTING SKIN DISORDERS, OR IMPAIRED LIVER,KIDNEY,OR RESPIRATORY FUNCTIONS MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF TRICHLOROETHYLENE.

---

## TOXICITY DATA

ORAL: RAT LD50 = 4,920 MG/KG; HUMAN LDLO = 7 G/KG

DERMAL: RABBIT LD50 = 10,000 MG/KG

INHALATION:
HUMAN TCLO = 160 PPM/83 MIN (CNS EFFECTS): RAT LD50 = 12,500 PPM/4 HR

CARCINOGENICITY:
THIS MATERIAL IS NOT CONSIDERED TO BE A CARCINOGEN BY THE NATIONAL TOXICOLOGY PROGRAM, THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, OR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. ALTHOUGH THE IARC CARCINOGENIC DETERMINATION IS ANIMAL POSITIVE AND HUMAN INDEFINITE.

OTHER DATA:
TRICHLOROETHYLENE HAS BEEN SHOWN TO INCREASE THE RATE OF SPONTANEOUSLY OCCURRING MALIGNANT TUMORS IN ONE STRAIN OF LABORATORY MOUSE GIVEN HIGH

DOSES. THE DATA SUGGEST A NON-MUTAGENIC MECHANISM FOR TUMOR FORMATION WHICH IMPLIES THAT NON-TOXIC DOSES SHOULD POSE LITTLE OR NO CARCINOGENIC HAZARD FOR MAN. BIRTH DEFECTS ARE UNLIKELY AND EXPOSURES HAVING NO EFFECT ON THE MOTHER SHOULD HAVE NO EFFECT ON THE FETUS. RESULTS OF IN VITRO AND ANIMAL MUTAGENICITY TESTS HAVE BEEN INCONCLUSIVE.

## ECOLOGICAL INFORMATION

NO DATA AVAILABLE

## PERSONAL PROTECTION

VENTILATION:
LOCAL MECHANICAL EXHAUST VENTILATION CAPABLE OF MAINTAINING EMISSIONS AT THE POINT OF USE BELOW THE PEL.

RESPIRATORY PROTECTION:
WEAR A NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE, OR A SUPPLIED-AIR RESPIRATOR IF USE CONDITIONS GENERATE VAPORS OR MISTS. CANNISTER RESPIRATORS MAY BE INEFFECTIVE BECAUSE TRICHLOROETHYLENE HAS POOR WARNING PROPERTIES.

EYE PROTECTION:
CHEMICAL GOGGLES UNLESS A FULL FACEPIECE RESPIRATOR IS ALSO WORN. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH CHEMICALS BECAUSE CONTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

PROTECTIVE CLOTHING:
LONG-SLEEVED SHIRT, TROUSERS, SAFETY SHOES,VITON GLOVES, AND A VITON APRON.

OTHER PROTECTIVE MEASURES:
AN EYEWASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

## FIRE AND EXPLOSION INFORMATION

FLASH POINT, DEG F: NONE
METHOD USED: TCC

FLAMMABLE LIMITS IN AIR, %
LOWER: 8.0
UPPER: 44.8

AUTOIGNITION TEMPERATURE, DEG F.: 788

EXTINGUISHING MEDIA:
THIS MATERIAL IS NOT COMBUSTIBLE. USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE FIGHTING PROCEDURES:
FIRE FIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE

CLOTHING. USE WATER SPRAY TO COOL NEARBY CONTAINERS AND STRUCTURES EXPOSED TO FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
EXTINGUISH ALL NEARBY SOURCES OF IGNITION SINCE VAPORS DECOMPOSE TO HAZARDOUS PRODUCTS AT HIGH TEMPERATURES. MIXTURES OF TRICHLOROETHYLENE AND OXYGEN WILL IGNITE AT TEMPERATURES ABOVE 77 DEG F WHEN THE TRICHLOROETHYLENE CONCENTRATION IS 10.3 - 64.5%.

## HAZARDOUS REACTIVITY

STABILITY: STABLE

POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID:
OPEN FLAMES, WELDING ARCS, OR OTHER HIGH TEMPERATURE SOURCES WHICH MAY INDUCE THERMAL DECOMPOSITION.

MATERIALS TO AVOID:
ALKALIS, OXIDIZING MATERIALS, WATER, MOIST AIR, ALUMINUM, ALKALI METALS, AND ZINC.

HAZARDOUS DECOMPOSITION PRODUCTS:
MAY LIBERATE CARBON MONOXIDE, CARBON DIOXIDE, HYDROGEN CHLORIDE, CHLORINE, OR PHOSGENE.

## SPILL, LEAK, AND DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILLS OR LEAKS. WEAR PROTECTIVE EQUIPMENT INCLUDING VITON BOOTS, VITON GLOVES, A VITON APRON, AND A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE OR A SUPPLIED-AIR RESPIRATOR. IF THE SPILL OR LEAK IS SMALL, A FULL FACEPIECE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ORGANIC VAPORS MAY BE SATISFACTORY. IN ANY EVENT, ALWAYS WEAR EYE PROTECTION. EXTINGUISH ALL IGNITION SOURCES. FOR SMALL SPILLS OR DRIPS, MOP OR WIPE UP AND DISPOSE OF IN DOT-APPROVED WASTE CONTAINERS. FOR LARGE SPILLS, CONTAIN BY DIKING WITH SOIL OR OTHER NON-COMBUSTIBLE SORBENT MATERIAL AND THEN PUMP INTO DOT-APPROVED WASTE CONTAINERS; OR ABSORB WITH NON-COMBUSTIBLE SORBENT MATERIAL, AND PLACE RESIDUE IN DOT-APPROVED WASTE CONTAINERS. KEEP OUT OF SEWERS, STORM DRAINS, SURFACE WATERS, AND SOIL. COMPLY WITH ALL APPLICABLE GOVERNMENTAL REGULATIONS ON SPILL REPORTING, AND HANDLING AND DISPOSAL OF WASTE.

DISPOSAL METHODS:
DISPOSE OF CONTAMINATED PRODUCT AND MATERIALS USED IN CLEANING UP SPILLS OR LEAKS IN A MANNER APPROVED FOR THIS MATERIAL. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.

NOTE:
EMPTY CONTAINERS CAN HAVE RESIDUES, GASES AND MISTS AND ARE SUBJECT TO PROPER WASTE DISPOSAL, AS ABOVE.

## SPECIAL PRECAUTIONS

STORAGE AND HANDLING PRECAUTIONS:
STORE IN A COOL, DRY, WELL-VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. VENT CONTAINER FREQUENTLY, AND MORE OFTEN IN WARM WEATHER, TO RELIEVE PRESSURE. KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE. DO NOT USE PRESSURE TO EMPTY CONTAINER. WASH THOROUGHLY AFTER HANDLING. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

REPAIR AND MAINTENANCE PRECAUTIONS:
DO NOT CUT, GRIND, WELD, OR DRILL ON OR NEAR THIS CONTAINER.

OTHER PRECAUTIONS:
VAPORS OF THIS PRODUCT ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW PLACES, SUCH AS PITS OR DEGREASERS, OR OTHER POORLY VENTILATED AREAS. DO NOT ENTER PLACES WHERE VAPORS ARE SUSPECTED UNLESS SPECIAL RESPIRATORY PROTECTION IS WORN AND AN OBSERVER IS PRESENT.

OTHER PRECAUTIONS:
CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, WILL RETAIN PRODUCT RESIDUE AND VAPORS. ALWAYS OBEY HAZARD WARNINGS AND HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL.

## OTHER REGULATORY INFORMATION

SECTION 313: SEE BELOW

PROPOSITION 65: NONE

SECTION 313 & PROP. 65: SEE BELOW

SECTION 313 (WITH CHEMICALS LISTED):
THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICAL(S) SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 AND 40 CFR PART 372:

| CHEMICAL(S) | CAS NO. | %WT. |
|---|---|---|
| TRICHLOROETHYLENE | 79-01-6 | 99.9 |

PROPOSITION 65 (WITH CHEMICALS LISTED):
THIS PRODUCT CONTAINS THE FOLLOWING CHEMICAL(S) CONSIDERED BY THE STATE OF CALIFORNIA'S SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) AS CAUSING CANCER OR REPRODUCTIVE TOXICITY AND FOR WHICH WARNINGS ARE NOW REQUIRED:

| CHEMICALS | CAS NO. | %WT. |
|---|---|---|
| TRICHLOROETHYLENE | 79-01-6 | >99 |

MASSACHUSETTS:
UNDER THE MASSACHUSETTS RIGHT-TO-KNOW LAW. HAZARDOUS SUBSTANCE AND EXTRAORDINARILY HAZARDOUS SUBSTANCES COMPONENTS PRESENT IN THIS PRODUCT WHICH

REQUIRES REPORTING ARE:

EXTRAORDINARILY HAZARDOUS SUBSTANCES

| CHEMICAL(S) | CAS NO. | CONCENTRATION (>0.0001%) |
|---|---|---|
| TRICHLOROETHYLENE | 79-01-6 | 99.9 |

PENNSYLVANIA:
UNDER THE PENNSYLVANIA RIGHT-TO-KNOW LAW. HAZARDOUS SUBSTANCES AND SPECIAL HAZARDOUS SUBSTANCES COMPONENTS PRESENT IN THIS PRODUCT WHICH REQUIRE REPORTING ARE:

HAZARDOUS SUBSTANCES

| CHEMICAL(S) | CAS NO. | CONCENTRATION (>1%) |
|---|---|---|
| TRICHLOROETHYLENE | 79-01-6 | 99.9 |

CALIFORNIA SCAQMD: RULE 443.1 VOC: S

VOL: NO DATA AVAILABLE

VAPOR PRESSURE: NO DATA AVAILABLE

TSCA: THE INGREDIENTS OF THIS PRODUCT ARE ON THE TSCA INVENTORY.

## REVISION

12/89:
REVISED: UPPER
ADDED: ORINFO4.
CORRECTED: TYPING ERROR.

5/90:
ADDED: SYNONYM, MOLECULAR WEIGHT, HMIS RATING, NOTES TO PHYSICIAN, AUTOIGNITION TEMPERATURE, PH., % VOLATILE, ECOLOGICAL INFORMATION, MASSACHUSETTS, PENNSYLVANIA, CALIFORNIA, SCAQMD, TSCA.

12/90:
REVISED: OTHER REGULATORY INFORMATION 5 - PROP. 65

## FOR ADDITIONAL INFORMATION

CONTACT MSDS COORDINATOR. VAN WATERS & ROGERS INC.
DURING BUSINESS HOURS, PACIFIC TIME (408) 435-8700

## NOTICE

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END OF MSDS

PROD: 04059661

10:13:19
14 AUG 1991

**ALDRICH CHEMICAL**
**ARSENIC, POWDER, 99.999+%** **Revised: 01/31/2002**

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Valid 11/01 - 1/02

Sigma-Aldrich
3050 Spruce Street
St. Louis, MO 63103, US
Technical Phone: 314 771 5765
Emergency Phone: 314 771 5765
Fax: 800 325 5052

## SECTION 1 - CHEMICAL IDENTIFICATION

| | |
|---|---|
| CATALOG #: | 267961 |
| NAME: | ARSENIC, POWDER, 99.999+% |

## SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

CAS #:NONE
MF: AS
EC NO: 231-148-6

SYNONYMS

ARSEN (GERMAN,POLISH) * ARSENIC (ACGIH:OSHA) * ARSENICALS * ARSENIC BLACK * ARSENIC-75 * COLLOIDAL ARSENIC * GREY ARSENIC * METALLIC ARSENIC *

## SECTION 3 - HAZARDS IDENTIFICATION

LABEL PRECAUTIONARY STATEMENTS

HIGHLY TOXIC (USA)

TOXIC (EU)
MAY CAUSE CANCER.
TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
OSHA CARCINOGEN.
TARGET ORGAN(S):
SKIN
LUNGS
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF WATER.
DO NOT BREATHE DUST.
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.

## SECTION 4 - FIRST-AID MEASURES

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF SKIN CONTACT, FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. REMOVE CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN.
IN CASE OF CONTACT WITH EYES, FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. ASSURE ADEQUATE FLUSHING BY SEPARATING THE EYELIDS WITH FINGERS. CALL A PHYSICIAN.

## SECTION 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
AVOID RAISING DUST.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
WEAR DISPOSABLE COVERALLS AND DISCARD THEM AFTER USE.

## SECTION 7 - HANDLING AND STORAGE

REFER TO SECTION 8.

## SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
WASH THOROUGHLY AFTER HANDLING.
DO NOT BREATHE DUST.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
NIOSH/MSHA-APPROVED RESPIRATOR.
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
CHEMICAL SAFETY GOGGLES.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.
FOR PROTECTION AND HANDLING REQUIREMENTS CONSULT CFR TITLE 29 PART 1910.

## SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR
GREY POWDER

## SECTION 10 - STABILITY AND REACTIVITY

STABILITY
STABLE.
INCOMPATIBILITIES
AIR SENSITIVE
HEAT
OXIDIZING AGENTS
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
ARSENIC OXIDES
HAZARDOUS POLYMERIZATION
WILL NOT OCCUR.

## SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE EFFECTS
MAY CAUSE SKIN IRRITATION.
MAY BE FATAL IF ABSORBED THROUGH SKIN.
MAY CAUSE EYE IRRITATION.
MAY BE FATAL IF INHALED.
MATERIAL MAY BE IRRITATING TO MUCOUS MEMBRANES AND UPPER

RESPIRATORY TRACT.
MAY BE FATAL IF SWALLOWED.
PROLONGED EXPOSURE TO ARSENIC COMPOUNDS CAN CAUSE EXFOLIATION AND PIGMENTATION OF SKIN, HERPES, INFLAMMATION OF NERVES AND NASAL SEPTUM ULCERATION.
ABSORPTION INTO THE BODY LEADS TO THE FORMATION OF METHEMOGLOBIN WHICH IN SUFFICIENT CONCENTRATION CAUSES CYANOSIS. ONSET MAY BE DELAYED 2 TO 4 HOURS OR LONGER.

CHRONIC EFFECTS

THIS IS OR CONTAINS A COMPONENT THAT HAS BEEN REPORTED TO BE CARCINOGENIC BASED ON ITS IARC, OSHA, ACGIH, NTP OR EPA CLASSIFICATION.
TARGET ORGAN(S):
SKIN
LUNGS

RTECS #: CG0525000

ARSENIC

TOXICITY DATA

| | |
|---|---|
| ORL-RAT LD50:763 MG/KG | GTPZAB 31(12),53,1987 |
| IPR-RAT LD50:13390 UG/KG | TXCYAC 64,191,1990 |
| ORL-MUS LD50:145 MG/KG | GTPZAB 31(12),53,1987 |
| IPR-MUS LD50:46200 UG/KG | GTPZAB 31(12),53,1987 |

TARGET ORGAN DATA

BEHAVIORAL (ATAXIA)
CARDIAC (EKG CHANGES NOT DIAGNOSTIC OF ABOVE)
LUNGS, THORAX OR RESPIRATION (TUMORS)
GASTROINTESTINAL (HYPERMOTILITY, DIARRHEA)
LIVER (FATTY LIVER DEGENERATION)
LIVER (TUMORS)
KIDNEY, URETER, BLADDER (OTHER CHANGES)
BLOOD (HEMORRHAGE)
EFFECTS ON FERTILITY (PRE-IMPLANTATION MORTALITY)
EFFECTS ON FERTILITY (POST-IMPLANTATION MORTALITY)
SPECIFIC DEVELOPMENTAL ABNORMALITIES (MUSCULOSKELETAL SYSTEM)
TUMORIGENIC (CARCINOGENIC BY RTECS CRITERIA)
TUMORIGENIC (EQUIVOCAL TUMORIGENIC AGENT BY RTECS CRITERIA)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

## SECTION 12 - ECOLOGICAL INFORMATION

DATA NOT YET AVAILABLE.

## SECTION 13 - DISPOSAL CONSIDERATIONS

MATERIAL IN THE ELEMENTAL STATE SHOULD BE RECOVERED FOR REUSE OR RECYCLING.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

## SECTION 14 - TRANSPORT INFORMATION

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

## SECTION 15 - REGULATORY INFORMATION

```
EUROPEAN INFORMATION
  EC INDEX NO:     033-001-00-X
  TOXIC
  R 23/25
  TOXIC BY INHALATION AND IF SWALLOWED.
  S 20/21
  WHEN USING DO NOT EAT, DRINK OR SMOKE.
  S 28
  AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF SOAP SUDS.
  S 45
  IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE
  IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
REVIEWS, STANDARDS, AND REGULATIONS
  OEL=MAK
  ACGIH TLV-CONFIRMED HUMAN CARCINOGEN          DTLVS* TLV/BEI,1999
  ACGIH TLV-TWA 0.01 MG(AS)/M3                  DTLVS* TLV/BEI,1999
  IARC CANCER REVIEW:HUMAN SUFFICIENT EVIDENCE  IMEMDT 23,39,1980
  IARC CANCER REVIEW:ANIMAL LIMITED EVIDENCE    IMSUDL 7,100,1987
  IARC CANCER REVIEW:HUMAN INADEQUATE EVIDENCE  IMEMDT 2,48,1973
  IARC CANCER REVIEW:GROUP 1                    IMSUDL 7,100,1987
  MSHA STANDARD-AIR:TWA 0.5 MG/M3
   DTLVS* 3,16,1971
  OSHA PEL (GEN INDU):8H TWA 0.5 MG(AS)/M3
   CFRGBR 29,1910.1000,1994
  OSHA PEL (CONSTRUC):8H TWA 0.5 MG(AS)/M3
   CFRGBR 29,1926.55,1994
  OSHA PEL (FED CONT):8H TWA 0.5 MG(AS)/M3
   CFRGBR 41,50-204.50,1994
  OSHA-CANCER HAZARD
   CFRGBR 29,1910.1018,1987
  OEL-ARAB REPUBLIC OF EGYPT: TWA 0.2 MG/M3, JAN1993
  OEL-AUSTRALIA: TWA 0.05 MG/M3, CARCINOGEN, JAN1993
  OEL-BELGIUM: TWA 0.2 MG/M3, JAN1993
  OEL-DENMARK: TWA 0.05 MG/M3, JAN1999
  OEL-FINLAND: CARCINOGEN, JAN1993
  OEL-FRANCE: VME 0.2 MG/M3, JAN1993
  OEL-HUNGARY: STEL 0.5 MG/M3, CARCINOGEN, JAN1993
  OEL-INDIA: TWA 0.2 MG/M3, JAN1993
  OEL-NORWAY: TWA 0.02 MG/M3, JAN1999
  OEL-THE PHILIPPINES: TWA 0.5 MG/M3, JAN1993
  OEL-POLAND: MAC(TWA) 0.01 MG/M3, JAN1999
  OEL-SWEDEN: NGV 0.03 MG/M3, CARCINOGEN, JAN1999
  OEL-SWITZERLAND: TWA 0.1 MG/M3, CARCINOGEN, JAN1999
  OEL-THAILAND: TWA 0.5 MG/M3, JAN1993
  OEL-TURKEY: TWA 0.5 MG(AS)/M3, JAN1993
  OEL-TURKEY: TWA 0.5 MG/M3, JAN1993
  OEL-UNITED KINGDOM: TWA 0.1 MG/M3, CARCINOGEN, SEP2000
  OEL IN ARGENTINA, BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV;
  OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV
  NIOSH REL TO ARSENIC, INORGANIC-AIR:CA CL 0.002 MG(AS)/M3/15M
   NIOSH* DHHS #92-100,1992
  NOHS 1974: HZD 07545; NIS 8; TNF 328; NOS 18; TNE 5929
  NOES 1983: HZD 07545; NIS 19; TNF 1100; NOS 29; TNE 27275; TFE 2128
```

ATSDR TOXICOLOGY PROFILE (NTIS** PB/89/185706/AS)
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES
ON EPA IRIS DATABASE
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JANUARY 2001
NIOSH CURRENT INTELLIGENCE BULLETIN 14, 1976
NIOSH ANALYTICAL METHOD, 1994: ARSENIC AND COMPOUNDS, AS AS EXCEPT
ASH3/AS2O3, 7900
NIOSH ANALYTICAL METHOD, 1994: ELEMENTS BY ICP, 7300
OSHA ANALYTICAL METHOD #ID-105

U.S. INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

## SECTION 16 - OTHER INFORMATION

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

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# CITGO Gasolines, All Grades Unleaded

## Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

| | |
|---|---|
| **MSDS No.** | UNLEAD |
| **Revision Date** | 05/23/2005 |

**IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.**

### Hazard Rankings

| | HMIS | NFPA |
|---|---|---|
| Health Hazard | * 2 | 1 |
| Fire Hazard | 3 | 3 |
| Reactivity | 0 | 0 |

* = Chronic Health Hazard

### Emergency Overview

**Physical State** Liquid.

**Color** Transparent, clear to amber or red. **Odor** Pungent, characteristic gasoline.

**DANGER:**
**Extremely flammable liquid; vapor may cause flash fire or explosion.**
**Vapor may travel considerable distance to source of ignition and flash back.**
**Use Only as a Motor Fuel. Do Not Siphon by Mouth.**
**Harmful or fatal if swallowed - Can enter lungs and cause damage.**
**High concentrations of vapor reduce oxygen available for breathing and may cause suffocation.**
**May be harmful if inhaled or absorbed through the skin.**
**Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract.**
**Liquid contact may cause eye and skin irritation.**
**Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3).**
**Harmful or fatal if swallowed - Can enter lung and cause damage.**
**Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats).**
**Contains Benzene - Cancer Hazard.**
**Long term exposure to gasoline vapor has caused cancer in laboratory animals.**
**Avoid Spills. Spills may present both a physical and an environmental hazard.**

### Protective Equipment

**Minimum Recommended**
**See Section 8 for Details**

## SECTION 1. PRODUCT IDENTIFICATION

| | | | |
|---|---|---|---|
| **Trade Name** | CITGO Gasolines, All Grades Unleaded | **Technical Contact** | (800) 248-4684 |
| **Product Number** | Various | **Medical Emergency** | (832) 486-4700 |
| **CAS Number** | Mixture. | **CHEMTREC Emergency (United States Only)** | (800) 424-9300 |

 Continued on Next Page 

**Product Family** Motor fuels.

**Synonyms** Unleaded Gasolines; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated.

## SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

| Component Name(s) | CAS Registry No. | Concentration (%) |
|---|---|---|
| Methyl tertiary-Butyl Ether (MTBE) | 1634-04-4 | 0 - 15 |
| Tertiary-Amyl Methyl Ether (TAME) | 994-05-8 | 0 - 15 |
| Ethyl tertiary Butyl Ether (ETBE) | 637-92-3 | 0 - 15 |
| Tertiary-Amyl Ethyl Ether (TAEE) | 919-94-8 | 0 - 15 |
| Diisopropyl Ether (DIPE) | 108-20-3 | 0 - 15 |
| Ethanol | 64-17-5 | 0 - 10 |
| Toluene | 108-88-3 | <20 |
| Xylene, all isomers | 1330-20-7 | <18 |
| n-Hexane | 110-54-3 | <8 |
| Trimethylbenzenes, all isomers | 25551-13-7 | <5 |
| Benzene | 71-43-2 | <5 |
| Cumene | 98-82-8 | <4 |
| Ethylbenzene | 100-41-4 | <4 |
| Cyclohexane | 110-82-7 | <3 |
| Naphthalene | 91-20-3 | <2 |
| Styrene | 100-42-5 | <1 |

## SECTION 3. HAZARDS IDENTIFICATION

**Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.**

**Major Route(s) of Entry** Skin contact. Eye contact. Inhalation. Ingestion.

**Signs and Symptoms of Acute Exposure**

**Inhalation** Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death.

**Eye Contact** This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.

**Skin Contact** This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases.

**Ingestion**

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If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

**Chronic Health Effects Summary**

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

**Conditions Aggravated by Exposure**

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

**Target Organs**

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

**Carcinogenic Potential**

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

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**OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).**

| OSHA Health Hazard Classification | | | | OSHA Physical Hazard Classification | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Irritant | X | Sensitizer | | Combustible | | Explosive | | Pyrophoric | |
| Toxic | | Highly Toxic | | Flammable | X | Oxidizer | | Water-reactive | |
| Corrosive | | Carcinogenic | X | Compressed Gas | | Organic Peroxide | | Unstable | |

## SECTION 4. FIRST AID MEASURES

**Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.**

**Inhalation**

Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.

**Eye Contact**

Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.

**Skin Contact**

Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

**Ingestion**

Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

**Notes to Physician**

INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administion of sympathomimetic drugs should be avoided.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

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## SECTION 5. FIRE FIGHTING MEASURES

| | |
|---|---|
| **NFPA Flammability Classification** | NFPA Class-IB flammable liquid. |
| **Flash Point** | Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56]) |
| **Lower Flammable Limit** | AP 1.4 % **Upper Flammable Limit** AP 7.6 % |
| **Autoignition Temperature** | 280°C (536°F) |
| **Hazardous Combustion Products** | Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion. |
| **Special Properties** | Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire. |
| **Extinguishing Media** | SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces.<br>LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area. |
| **Protection of Fire Fighters** | Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways. |

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.**

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a

liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

## SECTION 7. HANDLING AND STORAGE

**Handling**

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxillary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

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**Storage**

Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

## SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Engineering Controls**

Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

**Personal Protective Equipment**

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

**Eye Protection**

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

**Hand Protection**

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

**Body Protection**

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

**Respiratory Protection**

For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

**General Comments**

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

**Occupational Exposure Guidelines**

| Substance | Applicable Workplace Exposure Levels |
|---|---|

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| | |
|---|---|
| Gasoline | **ACGIH (United States).**<br>TWA: 300 ppm 8 hour(s).<br>STEL: 500 ppm 15 minute(s). |
| Toluene | **ACGIH (United States). Skin**<br>TWA: 50 ppm 8 hour(s).<br>**OSHA (United States).**<br>TWA: 200 ppm 8 hour(s).<br>CEIL: 300 ppm<br>PEAK: 500 ppm |
| Xylene, all isomers | **ACGIH (United States).**<br>TWA: 100 ppm 8 hour(s).<br>STEL: 150 ppm 15 minute(s).<br>**OSHA (United States).**<br>TWA: 100 ppm 8 hour(s). |
| Tertiary-Amyl Methyl Ether (TAME) | **ACGIH TLV (United States).**<br>TWA: 20 ppm 8 hour(s). |
| Methyl tertiary-Butyl Ether (MTBE) | **ACGIH (United States).**<br>TWA: 50 ppm 8 hour(s). |
| Ethyl tertiary Butyl Ether (ETBE) | **ACGIH TLV (United States).**<br>TWA: 5 ppm 8 hour(s). |
| n-Hexane | **ACGIH (United States). Skin**<br>TWA: 50 ppm 8 hour(s).<br>**OSHA (United States).**<br>TWA: 500 ppm 8 hour(s). |
| Cumene | **ACGIH (United States).**<br>TWA: 50 ppm 8 hour(s).<br>**OSHA (United States). Skin**<br>TWA: 50 ppm 8 hour(s). |
| Trimethylbenzenes, all isomers | **ACGIH (United States).**<br>TWA: 25 ppm 8 hour(s). |
| Benzene | **ACGIH (United States). Skin**<br>TWA: 0.5 ppm 8 hour(s).<br>STEL: 2.5 ppm 15 minute(s).<br>**OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL.**<br>TWA: 1 ppm 8 hour(s).<br>STEL: 5 ppm 15 minute(s). |
| Ethylbenzene | **ACGIH (United States).**<br>TWA: 100 ppm 8 hour(s).<br>STEL: 125 ppm 15 minute(s).<br>**OSHA (United States).**<br>TWA: 100 ppm 8 hour(s). |
| Cyclohexane | **ACGIH (United States).**<br>TWA: 100 ppm 8 hour(s).<br>**OSHA (United States).**<br>TWA: 300 ppm 8 hour(s). |
| Naphthalene | **ACGIH (United States). Skin**<br>TWA: 10 ppm 8 hour(s).<br>STEL: 15 ppm 15 minute(s).<br>**OSHA (United States).**<br>TWA: 10 ppm 8 hour(s). |
| Styrene | **ACGIH (United States).**<br>TWA: 20 ppm 8 hour(s).<br>STEL: 40 ppm 15 minute(s).<br>**OSHA (United States).**<br>TWA: 100 ppm 8 hour(s).<br>STEL: 200 ppm 15 minute(s).<br>PEAK: 600 ppm |

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

| | | | | | |
|---|---|---|---|---|---|
| **Physical State** | Liquid. | **Color** | Transparent, clear to amber or red. | **Odor** | Pungent, characteristic gasoline. |
| **Specific Gravity** | 0.72 - 0.77 (Water = 1) | **pH** | Not applicable | **Vapor Density** | 3 to 4 (Air = 1) |

| | | | |
|---|---|---|---|
| **Boiling Range** | 38 to 204°C (100 to 400°F) | **Melting/Freezing Point** | Not available. |
| **Vapor Pressure** | 220 to 450 mm Hg at 20°C (68°F ) or 6 to 15 Reid-psia at 37.8°C (100°F). | **Volatility** | 720 to 770 g/l VOC (w/v) |
| **Solubility in Water** | Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components. | **Viscosity (cSt @ 40°C)** | <1 |

| | |
|---|---|
| **Flash Point** | Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56]) |
| **Additional Properties** | Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161) |

## SECTION 10. STABILITY AND REACTIVITY

| | | | |
|---|---|---|---|
| **Chemical Stability** | Stable. | **Hazardous Polymerization** | Not expected to occur. |

| | |
|---|---|
| **Conditions to Avoid** | Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents. |
| **Materials Incompatibility** | Strong acids, alkalies and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen. |
| **Hazardous Decomposition Products** | No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS. |

## SECTION 11. TOXICOLOGICAL INFORMATION

**For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.**

**Toxicity Data**

**Gasoline**:
VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant.
VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant.
INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects.
DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects.
INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).

**Gasoline Containing 15% MTBE:**
ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level).
DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level).
INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours).
DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

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DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

**Pentanes, all isomers**:
Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

**Toluene**:
Effects from Acute Exposure:
Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:
Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

**Heptane, all isomers**:
n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

**Xylene, all isomers**:
Effects from Acute Exposure:
ORAL ($LD_{50}$), Acute: 4,300 mg/kg [Rat].
INHALATION ($LC_{50}$), Acute: 4,550 ppm for four hours [Rat].
DERMAL ($LD_{50}$), Acute: 14,100 uL/kg [Rabbit].
Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:
Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

**Ethyl tertiary Butyl Ether (ETBE)**:
ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2μ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant ($p<0.05$) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

**Tertiary-Amyl Methyl Ether (TAME)**:
TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

**Methyl tertiary-Butyl Ether (MTBE)**:
Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

exposures to MTBE.

**Diisopropyl Ether (DIPE)**:
Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

**Ethanol**:
Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

**Butane, all isomers**:
Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

**n-Hexane**:
This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

**Cumene**:
Effects from Acute Exposure:
Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:
Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

**Trimethylbenzenes, all isomers**:
Studies of Workers:
Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:
In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

 Continued on Next Page 

for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

**Benzene**:

| | |
|---|---|
| ORAL (LD50): | Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. |
| INHALATION (LC50): | |
| (VAPOR): | Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse]. |

Studies of Workers Over-Exposed to Benzene:
Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:
Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

**Ethylbenzene**:
Effects from Acute Exposure:
ORAL (LD50), Acute: 3,500 mg/kg [Rat].
DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:
Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

**Cyclohexane**:
Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane

was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

**Naphthalene**:
Studies in Humans Overexposed to Naphthalene:
Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:
Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro*.

**Styrene**:
Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

## SECTION 12. ECOLOGICAL INFORMATION

**Ecotoxicity**

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity ($LC_{100}$) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TLm (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden ( *Brevoortia patronus*), gasoline exhibited a 96-hour $LC_{50}$ of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitrocra spinipes*), MTBE exhibited an $LC_{50}$ (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish ( *Alburnus alburnus*), MTBE exhibited an $LC_{50}$ ( 24-hour) of 1,700 PPM and an $LC_{50}$ (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an $LC_{50}$ (48-hour) of 1,000 PPM and an $LC_{100}$ of 2,000 PPM.

**Environmental Fate**

Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.

## SECTION 13. DISPOSAL CONSIDERATIONS

**Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.**

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specfic disposal issues.

## SECTION 14. TRANSPORT INFORMATION

**The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.**

**US DOT Status** A U.S. Department of Transportation regulated material.

**Proper Shipping Name** Gasoline, 3, UN 1203, PG II
Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol)

**Hazard Class** 3 DOT Class: Flammable liquid.

**Packing Group(s)** II

**UN/NA Number** UN1203 or NA1203

**Reportable Quantity** A Reportable Quantity (RQ) has not been established for this material.

**Placard(s)**

**Emergency Response Guide No.** 128

**MARPOL III Status** Not a DOT "Marine Pollutant" per 49 CFR 171.8.

## SECTION 15. REGULATORY INFORMATION

**TSCA Inventory**

This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.

**SARA 302/304 Emergency Planning and Notification**

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.

**SARA 311/312 Hazard Identification**

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:

fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard

**SARA 313 Toxic Chemical Notification and Release Reporting**

This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA:
Toluene [CAS No.: 108-88-3] Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15%
n-Hexane [CAS No.: 110-54-3] Concentration: <8%
Cumene [CAS No.: 98-82-8] Concentration: <4%
Benzene [CAS No.: 71-43-2] Concentration: <5%
Ethylbenzene [CAS No.: 100-41-4] Concentration: <4%
1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] Concentration: <3%
Naphthalene [CAS No.: 91-20-3] Concentration: <2%
Styrene [CAS No.: 100-42-5] Concentration: <1%

**CERCLA**

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are:
Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15%
n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8%
2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5%
Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5%
Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4%
Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3%
Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2%
Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1%

**Clean Water Act (CWA)**

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

**California Proposition 65**

This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]

**New Jersey Right-to-Know Label**

Gasoline [NJDEP CAS No. 8006-61-9]

**Additional Regulatory Remarks**

As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth."

WHMIS Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
WHMIS Class D-2B: Material causing other toxic effects (TOXIC).

## SECTION 16. OTHER INFORMATION

**Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.**

**REVISION INFORMATION**

| | |
|---|---|
| **Version Number** | 7.0 |
| **Revision Date** | 05/23/2005 |
| **Print Date** | Printed on 05/23/2005. |

**ABBREVIATIONS**

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association
HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association
EPA: US Environmental Protection Agency

**DISCLAIMER OF LIABILITY**

**THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.**

**THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.**

***** END OF MSDS *****

# CITGO No. 1 Diesel Fuel, All Grades

## Material Safety Data Sheet

**CITGO Petroleum Corporation**
**P.O. Box 3758**
**Tulsa, OK 74102-3758**

**MSDS No.** AG1DF

**Revision Date** 03/20/2003

**IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.**

### Hazard Rankings

| | HMIS | NFPA |
|---|---|---|
| Health Hazard | * 1 | 0 |
| Fire Hazard | 2 | 2 |
| Reactivity | 0 | 0 |

* = Chronic Health Hazard

### Protective Equipment

**Minimum Recommended**
**See Section 8 for Details**

### Emergency Overview

**Physical State** Liquid.

**Color** Clear to light amber. **Odor** Characteristic, kerosene-like.

**WARNING!**
**Combustible liquid; vapor may cause flash fire.**
**Harmful or fatal if swallowed - can enter lungs and cause damage.**
**Mist or vapor can irritate the respiratory tract.**
**Liquid contact can cause eye or skin irritation.**
**May be harmful if inhaled or absorbed through the skin.**
**Overexposure can cause central nervous system (CNS) depression and/or other target organ effects.**
**Diesel engine exhaust can cause upper respiratory tract irritation and reversible pulmonary effects.**
**Spills may create a slipping hazard.**

## SECTION 1: IDENTIFICATION

| | | | |
|---|---|---|---|
| **Trade Name** | CITGO No. 1 Diesel Fuel, All Grades | **Technical Contact** | (918) 495-5940 or (918) 495-5933 |
| **Product Number** | Various | **Medical Emergency** | (918) 495-4700 |
| **CAS Number** | 8008-20-6 | **CHEMTREC Emergency (United States Only)** | (800) 424-9300 |
| **Product Family** | Fuels. | | |
| **Synonyms** | | | |

## SECTION 2: COMPOSITION

This product may be composed, in whole or in part, of any of the following refinery streams:

Kerosene [CAS No.: 8008-20-6]
Hydrodesulfurized Kerosine (Petroleum) [CAS No.: 64742-81-0]
Hydrodesulfurized Middle Distillate (petroleum) [CAS No.: 64742-80-9]
Straight-run Middle Distillate (Petroleum) [CAS No.: 64741-44-2]
Hydrodesulfurized Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 68333-25-5]
Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 64741-59-9]

This product contains the following chemical components:

| Component Name(s) | CAS Registry No. | Concentration (%) |
|---|---|---|

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| | | |
|---|---|---|
| 1) Nonane, all isomers | Mixture. | 20 - 30 |
| 2) Ethylmethylbenzenes (Ethyltoluenes) | 25550-14-5 | 1 - 3 |
| 3) Naphthalene | 91-20-3 | 0 - 3 |
| 4) Trimethylbenzenes, all isomers | 25551-13-7 | 0 - 2 |
| 5) Biphenyl (Diphenyl) | 92-52-4 | 0 - 2 |
| 6) Ethylbenzene | 100-41-4 | 0 - 1 |
| 7) Xylene, all isomers | 1330-20-7 | 0 - 1 |
| 8) 1, 2, 4 Trimethylbenzene | 95-63-6 | 0 - 1 |
| 9) Cumene | 98-82-8 | 0 - 1 |

## SECTION 3: HAZARDS IDENTIFICATION

**Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.**

**Major Route(s) of Entry** Skin contact. Eye contact. Inhalation.

**Signs and Symptoms of Acute Exposure**

**Inhalation** Breathing mist or vapors concentrations well above occupational exposure levels can irritate the mucous membranes of the nose, throat, bronchi, and lungs, and may cause transient central nervous system (CNS) depression. CNS symptoms include headache, dizziness, nausea, intoxication, blurred vision, slurred speech, flushed face, confusion, weakness, fatigue, loss of consciousness, convulsions, coma, and death, depending on the concentration and/or duration of exposure.

**Eye Contact** This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.

**Skin Contact** Animal test results on similar materials suggest that this product can cause moderate to severe skin irritation. Short-term contact symptoms include redness, itching, and burning of the skin. Also, certain components of this material may be absorbed through the skin and produce CNS depression effects (see "Inhalation" above). If the skin is damaged, absorption increases. Prolonged and/or repeated contact may cause severe dermatitis and/or more serious skin disorders. Chronic symptoms may include drying, swelling, scaling, blistering, cracking, and/or severe tissue damage.

**Ingestion** If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggering gait, drowsiness, loss of consciousness, and delirium, as well as additional central nervous system (CNS) effects (see "Inhalation" above).

Due to its light viscosity, there is a danger of aspiration into the lungs during vomiting. Aspiration of a small amount of liquid can cause severe pulmonary edema and lipoid or chemical pneumonia which can result in death. Progressive CNS depression, respiratory insufficiency, and ventricular fibrillation may also result in death.

**Chronic Health Effects Summary** Secondary effects of ingestion and subsequent aspiration into the lungs may cause pneumatocele (lung cavity) formation and chronic lung dysfunction.

This product contains petroleum middle distillates similar to those shown to produce skin tumors on laboratory rodents following repeated application. All tumors appeared during the latter portion of the typical 2-year lifespan of the animals. Certain studies have shown that washing the animal's exposed skin with soap and water between treatments greatly reduces the potential tumorigenic effects. These effects are unlikely to occur if good personal hygiene is practiced.

This material and/or its components have been associated with developmental and/or reproductive toxicity, genotoxicity, immunotoxicity, and carcinogenicity. Refer to Section 11 of this MSDS for additional health-related information.

**Conditions Aggravated by Exposure** Medical conditions aggravated by exposure to this material may include skin disorders, chronic respiratory diseases, neurological conditions, liver or kidney dysfunction.

**Target Organs** This material may cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Carcinogenic Potential** This material contains ethylbenzene and naphthalene at concentrations at or above 0.1%. Ethylbenzene is considered possibly carcinogenic to humans by IARC. (See Section 11.) NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen.

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OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

| OSHA Health Hazard Classification | | | | OSHA Physical Hazard Classification | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Irritant | X | Toxic | | Combustible | X | Explosive | | Pyrophoric | |
| Sensitizer | | Highly Toxic | | Flammable | | Oxidizer | | Water-reactive | |
| Corrosive | | Carcinogenic | | Compressed Gas | | Organic Peroxide | | Unstable | |

## SECTION 4: FIRST AID MEASURES

**Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.**

**Inhalation**

Move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. Keep the affected individual warm and at rest.

**Eye Contact**

Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water for at least 15 minutes while occasionally lifting and lowering eyelids. Do not use eye ointment unless directed to by a physician. Seek medical attention if excessive tearing, irritation, or pain persists.

**Skin Contact**

Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

**Ingestion**

Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

**Notes to Physician**

Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Vigorous anti-inflammatory/steroid treatment may be required at first evidence of upper airway or pulmonary edema. Administer 100 percent humidified supplemental oxygen with assisted ventilation, as required.

If ingested, this material presents a significant aspiration/lipoid or chemical pneumonitis hazard. As a result, induction of emesis is not recommended. Consider administration of an aqueous slurry of activated charcoal followed by a cathartic such as magnesium citrate or sorbitol. Also, treatment may involve careful gastric lavage if performed soon after ingestion or in patients who are comatose or at risk of convulsing. Protect the airway by placement in Trendelenburg and left lateral decubitus position or by cuffed endotracheal intubation. If vital signs become abnormal or symptoms develop, obtain a chest x-ray and liver function tests. Antibiotics are indicated if pulmonary bacterial infection occurs. Monitor for cardiac function and arterial blood gases in severe exposure cases.

## SECTION 5: FIRE FIGHTING MEASURES

**NFPA Flammability Classification** NFPA Class-II combustible liquid.

**Flash Point Method** CLOSED CUP: 38°C (100°F). (Pensky-Martens. (Minimum))

**Lower Flammable Limit** AP 0.7 % **Upper Flammable Limit** AP 5 %

**Autoignition Temperature** >254°C (489.2°F)

**Hazardous Combustion Products** Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and trace oxides of sulfur and/or nitrogen.

**Special Properties**

Combustible Liquid! This material releases vapors when heated above ambient temperatures. Vapors can cause a flash fire. Vapors can travel to a source of ignition and flashback. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. Use only with adequate ventilation. If container is not properly cooled, it can rupture in the heat of a fire.

**Extinguishing Media**

SMALL FIRE: Use dry chemicals, carbon dioxide, foam, water fog, or inert gas (nitrogen).
LARGE FIRE: Use foam, water fog, or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.

**Protection of Fire Fighters**

Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities if liquid enter sewers or waterways.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.**

Combustible Liquid! Release can result in a fire hazard. Evacuate all non-essential personnel from release area. Establish a regulated zone with site control and security. Eliminate all ignition sources. Stop the leak if it can done without risk. A vapor-suppressing foam may be used to reduce vapors. Properly bond or ground all equipment used when handling this material. Avoid skin contact. Do not walk through spilled material. Verify that responders are properly trained and wearing appropriate personnel protective equipment. Dike far ahead of a liquid spills. Do not allow released material to entry waterways, sewers, basements, or confined areas. This material will float on water. Absorb or cover with dry earth, sand or other non-combustible material. Use clean, non-sparking tools to collect absorbed material. Place spent sorbent materials, free liquids and other clean-up debris into proper waste containers for appropriate disposal. Certain releases must be reported to the National Response Center (800/424-8802) and state or regulatory authorities. Comply with all laws and regulations.

## SECTION 7: HANDLING AND STORAGE

**Handling**

**Combustible Liquid!**
A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously containing gasoline or similar low flash point products).

Fire hazard increases as product temperature approaches its flash point. Use non-sparking tools. Keep container closed and drum bungs in place. Remove spillage immediately from walking areas. Do not handle or store near heat, sparks or other potential ignition sources. Do not handle or store with oxidizing agents. Avoid breathing mist or vapor. Never siphon by mouth. Do not taste or swallow. Avoid contact with eyes, skin and clothing. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure levels. Avoid water contamination. Wash thoroughly after handling. Prevent contact with food or tobacco products.

Cutting or welding of empty containers can ignite residues with explosive force. Do not pressurize or expose empty containers to flames, sparks or heat. Observe all label warnings and precautions. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers and/or waste residues of this product. Return empty drums to a qualified reconditioner. When performing repairs and maintenance on contaminated equipment, keep unnecessary persons from hazard area. Eliminate heat, flame and other potential ignition

sources. Drain and purge equipment, as necessary, to remove material residues. Remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

**Storage**

Store in a cool, dry, well-ventilated place. Keep containers tightly closed. Do not store this product near heat, flame or other potential ignition sources. Do not store with oxidizers. Do not store this product in unlabeled containers. Do not puncture or incinerate containers. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers or waste residues of this product. Ground all equipment containing this material. All electrical equipment in areas where this material is stored or handled must meet all applicable requirements of the NFPA's National Electrical Code (NEC). Store and transport in accordance with all applicable laws.

## SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Engineering Controls**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

**Personal Protective Equipment**

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

**Eye Protection**

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. Suitable eye wash water should be readily available.

**Hand Protection**

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners.

**Body Protection**

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discarded contaminated leather goods.

**Respiratory Protection**

Airborne concentration will determine the level of respiratiory protection required. Respiratory protection is normally not required unless the product is heated or misted. For known or anticipated vapor or mist concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter if adequate protection is provided. For unknown vapor concentrations or concentrations exceeding respirator protection factors, use a positive-pressure, pressure-demand, self-contained breathing apparatus (SCBA). Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 20% of the lower flammable limit under any circumstances. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

**General Comments**

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

**Occupational Exposure Guidelines**

| Substance | Applicable Workplace Exposure Levels |
|---|---|

| | |
|---|---|
| 1) Diesel Fuel | **ACGIH TLV (United States).**<br>TWA: 100 mg/m³ |
| 2) Kerosene | **NIOSH**<br>TWA: 100 mg/m³ |
| 3) Nonane, all isomers | **ACGIH (United States).**<br>TWA: 200 ppm |
| 4) Trimethylbenzenes, all isomers | **ACGIH (United States).**<br>TWA: 25 ppm |
| 5) Naphthalene | **ACGIH (United States). Skin**<br>TWA: 10 ppm<br>STEL: 15 ppm<br>**OSHA (United States).**<br>TWA: 10 ppm |
| 6) Biphenyl (Diphenyl) | **ACGIH (United States**<br>TWA: 0.2 ppm<br>**OSHA (United States**<br>TWA: 0.2 ppm |

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

| | | | | | |
|---|---|---|---|---|---|
| **Physical State** | Liquid. | **Color** | Clear to light amber. | **Odor** | Characteristic, kerosene-like. |
| **Specific Gravity** | 0.82 (Water = 1) | **pH** | Not Applicable. | **Vapor Density** | 4 (Air = 1) |
| **Boiling Range** | AP 150° C (AP 302° F) | | | **Melting/Freezing Point** | Not available. |
| **Vapor Pressure** | <0.3 kPa (<2 mmHg) (at 20°C) | | | **Viscosity (cSt @ 40°C)** | AP 3 |
| **Solubility in Water** | Very slightly soluble in cold water. | | | **Volatile Characteristics** | AP 825 g/l VOC (W/V) |
| **Additional Properties** | Density = AP 6.8 lbs/gal.;<br>Viscosity (ASTM D2161) = 30 - 40 SUS @ 100° F | | | | |

## SECTION 10: STABILITY AND REACTIVITY

| | | | |
|---|---|---|---|
| **Chemical Stability** | Stable. | **Hazardous Polymerization** | Not expected to occur. |
| **Conditions to Avoid** | Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents. | | |
| **Materials Incompatibility** | Strong acids, alkalies, and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen. | | |
| **Hazardous Decomposition Products** | No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS. | | |

## SECTION 11: TOXICOLOGICAL INFORMATION

**For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.**

**Toxicity Data**

**Middle distillates, petroleum**:
The products represented by this MSDS contain a mixture of petroleum hydrocarbons commonly referred to as "middle distillates." Laboratory data have associated some middle distillates with skin cancer when the material is applied repeatedly over the lifetime of the test animal. Middle distillates similar to the products represented by this MSDS have been associated with liver and kidney damage in subchronic (90-day) inhalation studies of male rats. The relevance of these findings to human health is unclear.

**Naphthalene**:
ORAL (LD50): Acute: 1800 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig].

DERMAL (LD50): Acute: 969 mg/kg [Mouse].
INHALATION (LC50): Acute: >340 mg/m$^3$ 1 hour(s) [Rat].

Naphthalene is a potential irritant to eyes, skin and lungs. Ingestion of naphthalene has been associated with severe red blood cell and liver damage leading to death. Following prolonged or repeated exposures, naphthalene has been shown to cause cataracts, optical neuritis, hemolytic and aplastic anemia, jaundice and possibly neurotoxicity. In animal studies, naphthalene caused fetal effects and decreased spleen weights in pregnant female mice. In an NTP sponsored study, naphthalene produced a dose related increase in tumors at the 30 and 60 ppm exposure level in both male and female rats. Higher incidences of respiratory epithelial adenomas, olfactory epithelial neuroblastomas and non-neoplastic lesions of the nose were observed as compared to controls. Cytogenic studies with Chinese hamster ovary cells have demonstrated sister chromatid exchanges and chromosomal aberrations. The relevance of these studies to human health is unclear.

**Trimethylbenzenes, all isomers**:
The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted. In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

**Biphenyl (Diphenyl)**:
INHALATION, TCLo, Acute: 4,400 ug/m$^3$ for 4 hours [Human] - Flaccid paralysis of peripheral nerves without anesthesia and nausea or vomiting.
ORAL, LD50, Acute: >2,600 mg/kg [Cat screening level].
ORAL, LD50, Acute: 2,400 mg/kg [Rat and Rabbit].
ORAL, LD50, Acute: 1,900 mg/kg [Mouse] - Somnolence, hypermotility and diarrhea.
DERMAL, LD50, Acute: >5,010 mg/kg [Rabbit screening level].

**Ethylbenzene**:
ORAL ($LD_{50}$): Acute: 3,500 mg/kg [Rat].
DERMAL ($LD_{50}$): Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL ($LD_{50}$): Acute: 2,624 mg/kg [Rat].
NTP completed a 2-year inhalation bioassay of ethylbenzene in rodents. The study was conducted in rats and mice at exposure concentrations of 0, 75, 200 and 750 ppm. No significant effects were observed at the 75 and 200 ppm levels. However, compared to chamber controls, the severity of nephropathy was increased in rats at the 750 ppm level; and male rats had higher incidences of renal tubule carcinomas. Step section analyses of the kidneys found a significant increase hyperplasia and renal tubule adenomas in both male and female rats. Also at this 750 ppm level, male mice had a higher incidence of alveolar/bronchiolar adenomas and carcinomas and female mice had increased hepatocellular adenomas and carcinomas when compared to chamber controls. Also, hyperplasia was observed in the thyroid gland of both sexes of mice and in the pituitary gland of female mice. The relevance of these findings to human health is unclear. However, based upon this data, the IARC has designated ethylbenzene as possibly carcinogenic to humans (Group 2B).

**Diesel exhaust particulate**:
Lung tumor and lymphomas were identified in rats and mice exposed to unfiltered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

## SECTION 12: ECOLOGICAL INFORMATION

**Ecotoxicity**

**Freshwater Toxicity:**
Concentration: 2400 ppm Exposure: 48 hrs. Species: Juven. Am. Shad (*Squalius cephalus*) Effect: TLM
Concentration: >127 ppm Exposure: 96 hrs. Species: Bluegill (*Lepomis macrochirus*) Effect: LC50

**Saltwater Toxicity**
Concentration: 10 ppm Exposure: 96 hrs. Species: Menhaden (*Brevoortia patronus*) Effect: LC50
Concentration: 10 ppm Exposure: 96 hrs. Species: Grass Shrimp Effect: LC50

**Environmental Fate**

If spilled, this material will normally evaporate. Hydrocarbon components may contribute to atmospheric smog. If released to the subsoils, petroleum middle distillate fuels will strongly adsorb to soils. Groundwater should be considered as an exposure pathway. Liquid and vapor can migrate through the subsurface and preferential pathways (such as utility line backfill) to downgradient receptors.

Middle distillates are potentially toxic to freshwater and saltwater ecosystems. Distillate fuels will normally float on water. In stagnant or slow-flowing waterways, a hydrocarbon layer can cover a large surface area. As a result, this oil layer can limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can cause a fish kill or create an anaerobic environment. Also, this coating action can also kill plankton, algae, and water birds.

## SECTION 13: DISPOSAL CONSIDERATIONS

**Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.**

Maximize material recovery for reuse or recycling. If spilled material is introduced into a wastewater treatment system, chemical and biological oxygen demand (COD and BOD) will likely increase. Vapor emissions from a bio-oxidation process contaminated with this material might be a potential health hazard.

Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001). In addition, conditions of use may cause this material to become a hazardous waste, as defined by Federal or State regulations. It is the responsibility of the user to determine if the material is a hazardous waste at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR Parts 260 through 271). State and/or local regulations might be even more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specific disposal issues.

## SECTION 14: TRANSPORT INFORMATION

**The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.**

**US DOT Status**

A U.S. Department of Transportation (DOT) regulated material. The following U. S. DOT hazardous materials shipping description applies to bulk packaged material that is transported by highway or rail. Alternate shipping descriptions may be required for product transported by marine vessel, air or other method and for non-bulk packaged material.

**Proper Shipping Name**

Diesel Fuel, No. 1, Combustible liquid, NA1993, PG III

**Hazard Class**

DOT Class: Combustible liquid with a flash point greater than 37.8°C (100°F).

**Packing Group(s)** III

**UN/NA ID** NA 1993 or UN 1202

**Reportable Quantity**

A Reportable Quantity (RQ) has not been established for this material.

**Placards**

| | |
|---|---|
| **Emergency Response Guide No.** | 128 |
| **HAZMAT STCC No.** | 49 122 12 |
| **MARPOL III Status** | Not a DOT "Marine Pollutant" per 49 CFR 171.8. |

## SECTION 15: REGULATORY INFORMATION

| | |
|---|---|
| **TSCA Inventory** | This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory. |
| **SARA 302/304** | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified. |
| **SARA 311/312** | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:<br>Fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard |
| **SARA 313** | This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA:<br>Naphthalene [CAS No.: 91-20-3] Concentration: 0 - 2%<br>1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: 0 - 1% |
| **CERCLA** | The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are:<br>Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: 0 - 3%<br>Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: 0.5%<br>Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: 0.5%<br>Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: 0.5%<br>Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <0.05% |
| **CWA** | This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802. |
| **California Proposition 65** | This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):<br>Naphthalene: 0 - 3%<br>Toluene: <0.05%<br>Benzene: <0.05%<br>Diesel exhaust particulate |
| **New Jersey Right-to-Know Label** | Diesel Fuel |
| **Additional Regulatory Remarks** | Federal Hazardous Substances Act, related statutes, and Consumer Product Safety Commission regulations, as defined by 16 CFR 1500.14(b)(3) and 1500.83(a)(13): This product contains "Petroleum Distillates" which may require special labeling if distributed in a manner intended or packaged in a form suitable for use in the household or by children. Precautionary label dialogue should display the following: **DANGER: Contains Petroleum Distillates! Harmful or fatal if swallowed! Call Physician Immediately. KEEP OUT OF REACH OF CHILDREN!** |

## SECTION 16: OTHER INFORMATION

**Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.**

**REVISION INFORMATION**

| | |
|---|---|
| **Version Number** | 1.0 |
| **Revision Date** | 03/20/2003 |
| **Print Date** | Printed on 03/20/2003. |

**ABBREVIATIONS**

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association
HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association
EPA: US Environmental Protection Agency

**DISCLAIMER OF LIABILITY**

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**THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.**

***** END OF MSDS *****

# CITGO CITGARD® 500 Motor Oil, SAE 10W-30

## Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 3758
Tulsa, OK 74102-3758

**MSDS No.** 622310001

**Revision Date** 04/08/2002

**IMPORTANT:** Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

### Hazard Rankings

| | HMIS | NFPA |
|---|---|---|
| Health Hazard | 1 | 0 |
| Fire Hazard | 1 | 1 |
| Reactivity | 0 | 0 |

* = Chronic Health Hazard

### Emergency Overview

**Physical State** Liquid.

**Color** Light amber to amber **Odor** Mild petroleum odor

**CAUTION:**
**Hot oil can cause thermal burns on contact.**
**"Used" motor oil has been associated with skin cancer in laboratory animals following extended contact.**
**Spills may create a slipping hazard.**

### Protective Equipment

Minimum Requirements
See Section 8 for Details

## SECTION 1: IDENTIFICATION

| | | | |
|---|---|---|---|
| **Trade Name** | CITGO CITGARD® 500 Motor Oil, SAE 10W-30 | **Technical Contact** | (800) 248-4684 |
| **Product Number** | 622310001 | **Medical Emergency** | (918) 495-4700 |
| **CAS Number** | Mixture. | **CHEMTREC Emergency (United States Only)** | (800) 424-9300 |
| **Product Family** | Motor oil | | |
| **Synonyms** | Diesel engine oil;<br>Heavy duty motor oil;<br>Motor oil;<br>CITGO SAP Product Code No.: 622310001 | | |

## SECTION 2: COMPOSITION

| Component Name(s) | CAS Registry No. | Concentration (%) |
|---|---|---|
| 1) Distillates, petroleum, hydrotreated heavy paraffinic | 64742-54-7 | 20 - 100 |
| 2) Distillates, petroleum, solvent-refined heavy paraffinic | 64741-88-4 | 0 - 60 |
| 3) Distillates, petroleum, solvent-refined light paraffinic | 64741-89-5 | 0 - 10 |
| 4) Proprietary Ingredients | Proprietary Mixture | 0 - 10 |
| 5) Zinc alkyldithiophosphate | 68649-42-3 | 0 - 2 |

 Continued on Next Page 

## SECTION 3: HAZARDS IDENTIFICATION

**Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.**

**Major Route(s) of Entry** Skin contact.

**Signs and Symptoms of Acute Exposure**

| | |
|---|---|
| **Inhalation** | No significant adverse health effects are expected to occur upon short-term exposure. |
| **Eye Contact** | This product can cause transient mild eye irritation with short-term contact with liquid sprays or mists. |
| **Skin Contact** | This product can cause mild, transient skin irritation with short-term exposure. |
| **Ingestion** | If swallowed in quantities greater than one teaspoon, this material can cause a laxative effect. |
| **Chronic Health Effects Summary** | Contains a petroleum-based mineral oil. Prolonged or repeated skin contact can cause mild irritation and inflammation characterized by drying, cracking, (dermatitis) or oil acne. Repeated or prolonged inhalation of petroleum-based mineral oil mists at concentrations above applicable workplace exposure levels can cause respiratory irritation or other pulmonary effects. |
| **Conditions Aggravated by Exposure** | Medical conditions aggravated by exposure to this material may include pre-existing skin disorders. |
| **Target Organs** | This material may cause damage to the following organs: skin. |
| **Carcinogenic Potential** | This product does not contain any components at concentrations above 0.1% which are considered carcinogenic by OSHA, IARC or NTP. |

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

| OSHA Health Hazard Classification | | | | OSHA Physical Hazard Classification | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Irritant** | ☐ | **Toxic** | ☐ | **Combustible** | ☐ | **Explosive** | ☐ | **Pyrophoric** | ☐ |
| **Sensitizer** | ☐ | **Highly Toxic** | ☐ | **Flammable** | ☐ | **Oxidizer** | ☐ | **Water-reactive** | ☐ |
| **Corrosive** | ☐ | **Carcinogenic** | ☐ | **Compressed Gas** | ☐ | **Organic Peroxide** | ☐ | **Unstable** | ☐ |

## SECTION 4: FIRST AID MEASURES

**Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.**

| | |
|---|---|
| **Inhalation** | Vaporization is not expected at ambient temperatures. This material is not expected to cause inhalation-related disorders under anticipated conditions of use. In case of overexposure, move the person to fresh air. |
| **Eye Contact** | Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water while occasionally lifting and lowering eyelids. Seek medical attention if excessive tearing, redness, or pain persists. |
| **Skin Contact** | Remove contaminated shoes and clothing. Wipe off excess material. Wash exposed skin with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Thoroughly clean contaminated clothing before reuse. Discard contaminated leather goods. If material is injected under the skin, seek medical attention immediately. |
| **Ingestion** | Do not induce vomiting unless directed to by a physician. Do not give anything to drink unless directed to by a physician. Never give anything by mouth to a person who is not fully conscious. Seek medical attention immediately. |

**Notes to Physician** The viscosity range of the product represented by this MSDS is 100 to 400 SUS at 100° F. Accordingly, upon ingestion there is a low to moderate risk of aspiration. Careful gastric lavage may be considered to evacuate large quantities of material. Subcutaneous or intramuscular injection requires prompt surgical debridement.

## SECTION 5: FIRE FIGHTING MEASURES

**NFPA Flammability Classification** NFPA Class-IIIB combustible material. Slightly combustible!

**Flash Point Method** CLOSED CUP: 194°C (381°F). (Pensky-Martens (ASTM D-93)) OPEN CUP: 221°C (430°F) (Cleveland.).

**Lower Flammable Limit** No data. **Upper Flammable Limit** No data.

**Autoignition Temperature** Not available.

**Hazardous Combustion Products** Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and trace oxides of sulfur, phosphorus, zinc and/or nitrogen.

**Special Properties** This material can burn but will not readily ignite. This material will release vapors when heated above the flash point temperature that can ignite when exposed to a source of ignition. In enclosed spaces, heated vapor can ignite with explosive force. Mists or sprays may burn at temperatures below the flash point.

**Extinguishing Media** Use dry chemical, foam, Carbon Dioxide or water fog.

**Protection of Fire Fighters** Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.**

Do not touch damaged containers or spilled material unless wearing appropriate protective equipment. Slipping hazard; do not walk through spilled material. Stop leak if you can do so without risk. For small spills, absorb or cover with dry earth, sand, or other inert non-combustible absorbent material and place into waste containers for later disposal. Contain large spills to maximize product recovery or disposal. Prevent entry into waterways or sewers. In urban area, cleanup spill as soon as possible. In natural environments, seek cleanup advice from specialists to minimize physical habitat damage. This material will float on water. Absorbent pads and similar materials can be used. Comply with all laws and regulations.

## SECTION 7: HANDLING AND STORAGE

**Handling** Avoid water contamination and extreme temperatures to minimize product degradation. Empty containers may contain product residues that can ignite with explosive force. Do not pressurize, cut, weld, braze solder, drill, grind or expose containers to flames, sparks, heat or other potential ignition sources. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers and/or waste residues of this product.

**Storage** Keep container closed. Do not store with strong oxidizing agents. Do not store at temperatures above 120° F or in direct sunlight for extended periods of time. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers or waste residues of this product.

## SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Engineering Controls**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of mists and/or vapors below the recommended exposure limits (see below). An eye wash station and safety shower should be located near the work-station.

**Personal Protective Equipment**

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

**Eye Protection**

Safety glasses equipped with side shields should be adequate protection under most conditions of use. Wear goggles and/or face shield if splashing or spraying is anticipated. Wear goggles and face shield if material is heated above 125°F (51°C). Have suitable eye wash water available.

**Hand Protection**

Use gloves constructed of chemical resistant materials such as neoprene or heavy nitrile rubber if frequent or prolonged contact is expected. Use heat-protective gloves when handling product at elevated temperatures.

**Body Protection**

Avoid prolonged and/or repeated skin contact. Use clean and impervious protective clothing (e.g., neoprene or Tyvek®) if splashing or spraying conditions are present. Protective clothing should include long-sleeves, apron, boots and additional facial protection. Remove oil contaminated clothing. Launder oil contaminated clothing before reusing. Contaminated leather goods should be removed promptly and discarded.

**Respiratory Protection**

Vaporization is not expected at ambient temperatures. Therefore, the need for respiratory protection is not anticipated under normal use conditions and with adequate ventilation. If elevated airborne concentrations above applicable workplace exposure levels are anticipated, a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter should be used. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

**General Comments**

Use good personal hygiene practices. Wash hands and other exposed skin areas with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities, or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners. Since specific exposure standards/control limits have not been established for this product, the "Oil Mist, Mineral" exposure limits shown below are suggested as minimum control guidelines.

**Occupational Exposure Guidelines**

| Substance | Applicable Workplace Exposure Levels |
|---|---|
| 1) Oil Mist, Mineral | **ACGIH (United States).**<br>TWA: 5 mg/m$^3$<br>STEL: 10 mg/m$^3$<br>**OSHA (United States).**<br>TWA: 5 mg/m$^3$ |

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

| | | | | | |
|---|---|---|---|---|---|
| **Physical State** | Liquid. | **Color** | Light amber to amber | **Odor** | Mild petroleum odor |
| **Specific Gravity** | 0.87 (Water = 1) | **pH** | Not Applicable. | **Vapor Density** | >1 (Air = 1) |
| **Boiling Point/Range** | Not available. | | | **Melting/Freezing Point** | Not available. |
| **Vapor Pressure** | <0.001 kPa (<0.01 mmHg) (at 20°C) | | | **Viscosity (cSt @ 40°C)** | 78 |

 Continued on Next Page 

| | | | |
|---|---|---|---|
| **Solubility in Water** | Insoluble in cold water. | **Volatile Characteristics** | Negligible volatility |

**Additional Properties** Gravity, °API (ASTM D287) = 31.0 @ 60° F
Density = 7.25 Lbs/gal.
Viscosity (ASTM D2161) = AP 390 SUS @ 100° F

## SECTION 10: STABILITY AND REACTIVITY

**Chemical Stability** Stable. **Hazardous Polymerization** Not expected to occur.

**Conditions to Avoid** Keep away from extreme heat, sparks, open flame, and strongly oxidizing conditions.

**Materials Incompatibility** Strong oxidizers.

**Hazardous Decomposition Products** No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.

## SECTION 11: TOXICOLOGICAL INFORMATION

**For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.**

**Toxicity Data**

**Distillates, petroleum, hydrotreated heavy paraffinic**:
ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].
**Distillates, petroleum, solvent-refined heavy paraffinic**:
ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].
**Distillates, petroleum, solvent-refined light paraffinic**:
ORAL (LD50): Acute: >5000 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].
**Zinc and Zinc Compounds**:
ORAL (LD50): Acute: >5000 mg/kg [Rabbit]. >2890 mg/kg [Rat].
DERMAL (LD50): Acute: >10000 mg/kg [Rabbit].

**Distillates, petroleum, hydrotreated heavy paraffinic**:
Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

**Distillates, petroleum, solvent-refined heavy paraffinic**:
Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

**Distillates, petroleum, solvent-refined light paraffinic**:
Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

**Zinc and Zinc Compounds**:
INHALATION (LC50), Acute: > 1310 mg/L (Rat screen level)(4 hours).
DRAIZE EYE, Acute: Moderate to severe eye irritant. (Rabbit).

DRAIZE DERMAL, Acute: Mild to moderate skin irritant. (Rabbit).
BUEHLER DERMAL, Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL, Sub-Chronic: Severe skin irritant. (Rabbit). Reported reduced food consumption resulting in weight loss and testicular atrophy.

**Motor Oils**:
Used motor oil was associated with cancer in lifetime skin painting studies with laboratory animals. Avoid prolonged or repeated contact with used motor oil. Use of good hygiene practices will reduce the liklihood of potential health effects.

## SECTION 12: ECOLOGICAL INFORMATION

**Ecotoxicity**

Analysis for ecological effects has not been conducted on this product. However, if spilled, this product, its storage tank water bottoms and sludge, and any contaminated soil or water may be hazardous to human, animal, and aquatic life. Also, the coating action associated with this product can be harmful or fatal to aquatic life and waterfowl.

**Environmental Fate**

An environmental fate analysis has not been conducted on this specific product. Plants and animals may experience harmful or fatal effects when coated with petroleum-based products. Petroleum-based (mineral) lube oils will normally float on water. In stagnant or slow-flowing waterways, an oil layer can cover a large surface area. As a result, this oil layer might limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can result in a loss of marine life or create an anaerobic environment. This material contains phosphorus which is a controlled element for disposal in effluent waters in most sections of North America. Phosphorus is known to enhance the formation of algae. Severe algae growth can reduce oxygen content in the water possibly below levels necessary to support marine life.

## SECTION 13: DISPOSAL CONSIDERATIONS

**Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.**

Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specfic disposal issues.

## SECTION 14: TRANSPORT INFORMATION

**DOT Status** Not a U.S. Department of Transportation regulated material.

**Proper Shipping Name** Not regulated.

**Hazard Class** Not regulated.

**Packing Group(s)** Not applicable.

**UN/NA ID** Not regulated.

**Reportable Quantity** A Reportable Quantity (RQ) has not been established for this material.

**Placards**

**Emergency Response Guide No.** Not applicable.

**HAZMAT STCC No.** Not assigned.

**MARPOL III Status** Not a DOT "Marine Pollutant" per 49 CFR 171.8.

## SECTION 15: REGULATORY INFORMATION

| | |
|---|---|
| **TSCA Inventory** | This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory. |
| **SARA 302/304** | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified. |
| **SARA 311/312** | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:<br>No SARA 311/312 hazard categories identified. |
| **SARA 313** | This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Zinc and Zinc Compounds, Concentration: 0 - 2% |
| **CERCLA** | The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Zinc and Zinc Compounds, Concentration: 0 - 2% |
| **CWA** | This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802. |
| **California Proposition 65** | This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): None identified. |
| **New Jersey Right-to-Know Label** | Motor oil |
| **Additional Regulatory Remarks** | No additional regulatory remarks. |

## SECTION 16: OTHER INFORMATION

**Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.**

**REVISION INFORMATION**

| | |
|---|---|
| **Version Number** | 3.0 |
| **Revision Date** | 04/08/2002 |
| **Print Date** | Printed on 04/08/2002. |

**ABBREVIATIONS**

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association
HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association
EPA: US Environmental Protection Agency

**DISCLAIMER OF LIABILITY**

## CITGO CITGARD® 500 Motor Oil, SAE 10W-30

**THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.**

**THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.**

***** END OF MSDS *****

***Attachment 2***
***Site-Specific Health and Safety Procedures***

**NOTE: Health and safety procedures that will be utilized during the project are listed below. Health and Safety Procedures (HS001-999) are available on the Intranet (ShawNet). Printed versions are available onsite for site personnel.**

| | |
|---|---|
| HS010 | Employee Health and Safety Manual |
| HS020 | Accident Prevention Program: Reporting, Investigation, and Review |
| HS021 | Accident Prevention Program: Management Safety Inspections |
| HS045 | Job Safety Analysis (JSA) |
| HS051 | Tailgate Safety Meetings |
| HS060 | Hazard Communication Program |
| HS100 | Medical Policies and Procedures |
| HS101 | Drug and Alcohol Testing |
| HS302 | Ladder Safety |
| HS307 | Excavation and Trenching |
| HS308 | Underground/Overhead Utility Contact Prevention |
| HS315 | Control of Hazardous Energy and Hazardous Material Sources (Lockout/Tagout) |
| HS400 | Heat Stress |
| HS401 | Cold Stress |
| HS402 | Hearing Conservation Program |
| HS512 | Handling of Blood or Other Potentially Infectious Material |
| HS600 | Personal Protective Equipment |
| HS601 | Respiratory Protection Program |
| HS800 | Motor Vehicle Operation: General Requirements |
| HS810 | Commercial Vehicle Operation and Maintenance |

# PROCEDURE

Subject: EMPLOYEE HEALTH AND SAFETY MANUAL

## 1.0 PURPOSE AND SUMMARY

This procedure establishes the method of distribution for the employee health and safety manual. This manual is not intended to be an all-inclusive document, but rather an outline of general health and safety guidelines applicable to all employees. These guidelines have been developed to communicate some basic health and safety practices expected of all employees.

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  3.2 Action/Approval Responsibilities
4.0 Definitions
5.0 Text
6.0 Exception Provisions
7.0 Cross References
8.0 Attachments


## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

## 5.0 TEXT

Project and office managers are to ensure that each employee at his/her location is provided with a copy of the health and safety manual. All newly hired employees will be provided with a copy of this manual as part of their new hire orientation package. All employees are encouraged to read, ask questions of their manager or health and safety representative, and retain this manual for future reference.

A completed copy of the signature card found at the end of the manual will be collected from all employees by their manager and forwarded to the employee's respective Human Resources Department. Additional copies of this manual can be obtained through various storerooms and Human Resources Departments throughout the company.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Health and Safety Manual

## ATTACHMENT 1

## EMPLOYEE HEALTH AND SAFETY MANUAL RESPONSIBILITY MATRIX

| Action | Procedure Section | *Responsible Party* | | | |
|---|---|---|---|---|---|
| | | Human Resources Representative | Project/ Office Manager | Health and Safety Representative | Vice President, Health and Safety |
| Issue, Revise, and Maintain Procedure | 3.1 | | | | X |
| Ensure Current Employees are Provided a Copy of the Manual | 5.0 | | X | | |
| Provide New Hires With a Copy of the Manual | 5.0 | X | | | |
| Answer Employee Questions Pertaining to Manual | 5.0 | | X | X | |
| Forward Completed Signature Cards to Human Resources Department | 5.0 | | X | | |

## ATTACHMENT 2

## EMPLOYEE HEALTH AND SAFETY MANUAL

# PROCEDURE

**Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW**

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**

- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Baton Rouge Corporate Safety Department, for production to and retention on behalf of the Legal Department.

- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; Business Line Vice President and the Legal Department.

- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for & on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product.

- All business line Health & Safety Managers are required to prepare a Monthly Loss Report summarizing all current month, and year-to date, chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals and restricted work day totals. This report shall then be forwarded, by the 10th day of the following month, to the Baton Rouge Corporate Safety Office.

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5.2 Supervisor's Employee Injury Report
5.3 Vehicle Accident Report
5.4 Equipment, General Liability, Property Damage, and Loss Report
5.5 Incident Investigation Report
5.6 Witness Statement Form
5.7 Accident Review Board
5.8 Monthly Loss Report
6.0 Exception Provisions
7.0 Cross References
8.0 Attachments

## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Chargeable Vehicle Accident** - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds $2,500.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds $2,500.00.

**Company** - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Days Away From Work** - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

**Job Safety Analysis (JSA)** – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. (See HS045: Job Safety Analysis)

**Restricted Work** – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

**Near Miss Incident** - Any incident where no injury occurred, but where the potential for injury existed.

**OSHA Recordable Case** – See Attachment 8

**Vehicle** - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. (See HS800 Motor Vehicle Operation: General Requirements)

## 5.0 TEXT

### 5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Business Line Managers or Supervisors (supervisor directly responsible for the employee involved in the incident) with first-hand knowledge of an incident is required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.

- **As soon as practical, but not longer than one hour after gaining knowledge of the occurrence**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 (Attachment 10) of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding $2,500 in value (Shaw or third party).

- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:

  - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
  - Employee Name
  - Name of anticipated, treating medical facility and phone number
  - Brief description of incident.

  Health Resource's role is to interface with the treating physician, to ensure that appropriate care is provided to the injured employee.

- Complete the *Authorization for Treatment, Release of Medical Information*, and *Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.

- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an incident.

  NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.

- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he should work in concert with the supervisor)

  - OSHA Recordable Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement Form (Attachment 6)
    d. Accident Review Board (Attachment 7)

  - First Aid Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement Form (Attachment 6)

  - Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)
    d. Accident Review Board (Attachment 7)
    e. Driving Record Certification (Procedure HS800)

  - Non-Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)

- Equipment, Property Damage and General Liability Incidents
  a. Incident Investigation Report (Attachment 5)
  b. Witness Statement Form (Attachment 6)
  c. Equipment, Property Damage and General Liability Loss Report (Attachment 4).

- Near Miss
  a. Incident Investigation Report (Attachment 5)

**5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)**

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded, **within 24 Hours,** to the Shaw Corporate Claims department in Baton Rouge, via the corporate claims fax number (225.932.2636).

**5.3 Vehicle Accident Report (Attachment 3)**

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge (fax number 225.932.2636).

**5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)**

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of $2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project/location manager. The Corporate Claims Department and the respective Business Line Safety Manager must receive a copy of the report within one business day of the incident.

**5.5 Incident Investigation Report (Attachment 5)**

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

- Collect the facts;

- Describe and document (include sketch, photos, etc.) how the incident occurred;

- Collect support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.);
- List witnesses and collect written statements;
- If applicable, contact the employee's Functional Manager in an effort to gain relevant information
- Identify the causative factors;
- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- Identify potential curative action; and
- List the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Business Line Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Business Line Safety Manager to the Corporate Claims department in Baton Rouge.

**5.6 Injured Employee Statement & Witness Statement Forms (Attachment 6a & 6b)**

The Injured Employee and Witness Statement Forms allow for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

**5.7 Accident Review Board (ARB) (Attachment 7)**

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Legal Department and take appropriate curative action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify curative actions as it relates to the incident / injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.

In order to assist the Legal Department in evaluating the risk to, or liability of, the company, associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project / Location Manager is required to coordinate with all parties and set up the ARB such that

it occurs **within 10 days of the accident**. The respective Business Line Health and Safety Manager, whose project/location experiences accident is then required to conduct the subject ARB.

The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor (at time of incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced, in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, are to be performed for and on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product. If the ARB is initiated under a Confidential Attorney-Client / Attorney Work Product status, all documents and other work product arising out of, or associated with, the investigation process, including the ARB, shall be prepared in anticipation of litigation. The Accident Review Board report, and associated documents, is submitted to the Corporate Safety Department, for production to and retention on behalf of the Legal Department.

The ARB report, and all associated documents, shall be completed as soon as practicable, but not more than 5 business days following the ARB meeting, and forwarded by the Business Line Safety Manager to the Corporate Safety Department, via the Corporate Claims fax number. The original documents shall then be mailed to the Corporate Safety Department. These documents shall then be filed in a lockable cabinet, separate from files not meeting the subject criteria, by the Corporate Safety Department, for production to and retention on behalf of the Legal Department. In the event that copies of these files are maintained by Business Line Safety Managers and / or the respective location in which the injury occurred, the same filing criteria shall be followed. The criteria shall be that these documents are filed in lockable cabinets, separate from files not meeting the subject Attorney-Client / Attorney Work Product criteria.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the Accident Review Board, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system (see Human Resources Procedure HR207).

### 5.8 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month**.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6. a. Injured Employee Statement
   b. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
   a. Authorization for Treatment of Occupational Injury/Illness
   b. Authorization for Release of Medical Information
   c. Return to Work Examination Form.
10. Help Desk / Hotline Notification Guidelines

## ATTACHMENT 1

## ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

| Action | Procedure Section | *Responsible Party* | | | | | |
|---|---|---|---|---|---|---|---|
| | | Employee | Supervisor | Project/ Location Manager | Site Health and Safety Rep. / Officer | Business Line Health and Safety Manager | Corporate Health & Safety Manager |
| Issue, Revise, and Maintain Procedure | 3.1 | | | | | | X |
| Report All Incidents to Supervisor | 5.1 | X | | | | | |
| Notify Health and Safety Representative | 5.1 | | X | | | | |
| Arrange Medical Care | 5.1 | | X | | X | | |
| Notify Health Resources or Gates McDonald of Incident | 5.1 | | X | | X | | |
| Initiate/Complete Company Forms | 5.1 | | X | | X | | |
| Complete Investigation of incident | 5.5 | | X | X | X | X | |
| Complete Equipment, Property Damage and General Liability Loss Report Incident | 5.4 | X | | | | | |
| Coordinate and Set up Accident Review Board | 5.7 | | | X | | | |
| Conduct Accident Review Board | 5.7 | | | | | X | |
| Participate in Accident Review Board | 5.7 | X | X | X | X | X | |
| Complete Monthly Loss Report | 5.8 | | | | | X | |

## Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
**Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk**
**1-866-299-3445**

# Supervisor's Employee Injury/Illness Report Form

### EMPLOYEE INFORMATION

| | | | |
|---|---|---|---|
| Employee's Social Security Number: | | Claim Number: | |
| Employee's Name: | | Home Phone Number: | |
| Home Address: | | | Business Line Code: |
| Male Female | Date of Birth: | Hire Date: | |
| Dependents: | Dependents Under 18: | Marital Status: | |
| Occupation: | | Department Name: | |
| State Hired: | Currently Weekly Wage: | Hourly Wage: | |
| Hours/Days Worked Per Week: | Days Per Week | Hours Worked Per Day: | |
| Employment Status: | Employee Report No.: N/A | | Employee ID No.: N/A |
| Salaried Continued: | Paid For Date of Injury: | | Education No. of Years: |
| Ever Injured on the Job: | Supervisor Name & Phone: | | |

### EMPLOYER INFORMATION

| | | | |
|---|---|---|---|
| Employer Name: | **The Shaw Group, Inc.** | | |
| Work Location: | | | |
| Contact Name: | **John Mollere** | Telephone Number: | **(800)747-3322, Ext. 572** |
| Employer SIC: | | Employer Location Code: | |
| Employer FED ID: | | Employer Code: | N/A |
| Nature of Business: | | | |
| Policy Number: | | | |

### ACCIDENT INFORMATION

| | | | |
|---|---|---|---|
| Date and Time of Injury: | | | |
| Did the Accident Occur at the Work Location: | | If no, where did the accident occur? | N/A |
| Accident Address: | | | |
| Nature of Accident: | | | |

Give a Full Description of the Accident: (Be as Factually Complete As Possible)

| | | | |
|---|---|---|---|
| Are Other WC Claims Involved? | No | Date and Time Reported to Employer: | |
| Person Reported To: | | | |

## WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

## INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)

Part of Body Location: (e.g. Left, Right, Upper, Lower)

Injury Description:

Source of Injury: | Is Employee Hospitalized?

Lost Time: | If Yes, What was First Full Day Out:

Date Last Day Worked: | Date Disability Began: N/A

Date Returned to Work: | Estimated Return Date: N/A

## MEDICAL INFORMATION

ER Treated & Released: | Hospitalized: | Phy./Clinic:

Hospital - Name, Address, Phone Number: | Was Employee Transported via Ambulance: Yes No

N/A

Clinic - Name, Address, Phone Number:

## ADDITIONAL COMMENTS & INFORMATION

## REPORT PREPARED BY

Name: | Title:

Signature: | Phone:

# ATTACHMENT 3
## VEHICLE ACCIDENT REPORT
Page 1 of 2

**ACCIDENT DESCRIPTION**

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.

LOCATION OF ACCIDENT (CITY, STATE) _____

DESCRIPTION OF ACCIDENT _____

_____

_____

WITNESS _____ PHONE NO. _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

**COMPANY VEHICLE**

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

WORK PHONE NO. _(____)_____ S.S. NO. _____ PROJECT NAME/NO. _____

VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____

STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE

VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL

IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

VEHICLE DAMAGE _____

NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____

WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____

_____

**OTHER VEHICLE**

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

PHONE NO. _(____)_____ S.S. NO. _____

OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

INSURANCE COMPANY _____ POLICY NO. _____

AGENT'S NAME _____ PHONE NO. _(____)_____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____

VEHICLE I.D. NO. _____

VEHICLE DAMAGE _____

PASSENGERS: ☐ NO ☐ YES INJURIES: ☐ NO ☐ YES (If Yes, list names and telephone numbers below)

_____

_____

_____

# VEHICLE ACCIDENT REPORT



WEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow Other _____

PAVEMENT: ☐ Asphalt ☐ Steel ☐ Concrete ☐ Wood ☐ Gravel/Dirt ☐ Brick/Stone Other _____

CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____

TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control

ROADWAY: Number of Lanes Each Direction: _____ ☐ Residential ☐ Divided Highway ☐ Undivided Highway

***Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.***

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ② ③

Pedestrian

Stop Sign

Yield

Railroad

ADDITIONAL INFORMATION: _____

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)

HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

## ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

**REPORT MUST BE FAXED TO:**
**CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)**
**WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.**

**REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK (PHONE: 1-866-299-3445)**

## ATTACHMENT 4

# EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____
   Home Address _____ City _____
   Employer and Address _____
2. Name _____ Home Phone (____) _____
   Home Address _____ City _____
   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

**COMPLETED BY:** _____ (Print) _____ (Signature) _____ (Date)

**PROJECT/LOCATION MANAGER: :** _____ (Print) _____ (Signature) _____ (Date)

**REPORT MUST BE FAXED TO:**
**CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)**
**WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY**

# ATTACHMENT 5
# INCIDENT INVESTIGATION REPORT

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached / Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____ / _____

Location of Incident _____

- Incident Classification

| | | | | | |
|---|---|---|---|---|---|
| Injury | ☐ First Aid | Vehicle | ☐ Chargeable | DOT | ☐ DOT Vehicle |
| | ☐ OSHA Recordable | | ☐ Non-chargeable | | ☐ DOT Reportable |
| | ☐ Lost Workday | | | | |
| | ☐ Restricted Workday | Near Miss | ☐ | General Liability | ☐ |

- Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

- Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

_____

- Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

- Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

_____

| | | | |
|---|---|---|---|
| Investigated By | _____ Print Name | _____ Signature | _____ Date |
| Project/Location Mgr. | _____ Print Name | _____ Signature | _____ Date |

## ATTACHMENT 6a
## Injured Employee Statement
## *MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT*

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Time your shift ends? Time _____ am pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ Signature/Date

_____ Print Name

## ATTACHMENT 6b
## Employee Witness Statement
## *MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT*

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

## ATTACHMENT 7

## ACCIDENT REVIEW BOARD

| | |
|---|---|
| DATE: | LOCATION: |
| BOARD MEMBERS: | |
| ACCIDENT DATE: | EMPLOYEE(S) INVOLVED IN INCIDENT: |
| INVESTIGATION COMPLETE: YES ☐ NO ☐ | ACCIDENT CLASSIFICATION: |

**THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):**

**SUPERVISOR:** _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.

| | |
|---|---|
| ACCEPTED: _____ (Employee Signature) | _____ (Supervisor Signature) |
| APPROVED: _____ (Project/Location Manager) | REJECTED FOR: _____ |
| APPROVED: _____ (Business Line Health and Safety Manager or Designee) | REJECTED FOR: _____ |
| APPROVED: _____ (Business Line Vice President) | REJECTED FOR: _____ |

## ATTACHMENT 8

## INJURY/ILLNESS CLASSIFICATION GUIDELINES

**First Aid Treatment** – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

**Medical Treatment** – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

**OSHA Recordable Injuries and Illnesses**

**Work related** injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer

- Medical treatment beyond first aid.

You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

**Additional Recordable Criteria**

You must also record the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10dB or more in either ear)
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.

## ATTACHMENT 9B
## MEDICAL FORMS

### AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____ Injury: ☐ Illness: ☐
Job Title: _____ Incident Date: _____
Project/Location _____ Location of Accident/Exposure:
Telephone #: _____ _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____
_____

---

**TO TREATING PHYSICIAN:**

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:
It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:
It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

**Health Resources**: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To Both of the Following:
**Health Resources**
600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801

***AND***

**The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

Please Send Bills To:
**The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

---

**DOCTOR, Please provide:**
Medical Diagnosis: _____
Treatment Provided: _____
_____
Recommended Work Limitation/Restriction: _____
Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

---

**YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.**

**FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.**

Send Bills to Shaw Corporate Claims Department

# ATTACHMENT 9B
# MEDICAL FORMS
## AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

**Authority to Release Protected Health Information**

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

**HEALTH RESOURCES**
600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

**AND**

**The Shaw Group Inc.**
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

**The Information To Be Released includes the following:**

| | | |
|---|---|---|
| Complete health record | Discharge summary | Progress notes |
| History and physical exam | Consultation reports | X-ray films / images |
| Laboratory test results | X-ray & Image reports | Itemized bill |
| Diagnosis & treatment codes | Complete billing record | |

Other, (specify) _____

**Purpose of the Requested Disclosure of Protected Health Information**

I am authorizing the release of my Protected Health Information.

**Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release**

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

**Right to Revoke Authorization**

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

**Re-disclosure**

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

**Signature of Patient or Personal Representative Who May Request Disclosure**

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge** ***The Shaw Group Inc*** **of any liability and the undersigned will hold** ***The Shaw Group Inc*** **harmless for complying with this Authorization.**

**Signature:** _____ **Date:** _____

Description of relationship if not patient: _____

# ATTACHMENT 9C
# MEDICAL FORMS

## RETURN-TO-WORK EXAMINATION FORM

**Exam Date:** _____ / _____ / _____ **Employee Name:** _____

**Birth Date:** _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

**Job Title:** _____ **Sex:** ❑ Male ❑ Female

*Examining Provider:* **Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.**

**DIAGNOSIS:** _____

**TREATMENT PLAN:** _____

**MEDICATIONS:** _____

**PHYSICAL THERAPY:** _____

**OTHER:** _____

❑ May return to full duty work effective ___/___/

❑ May return to limited duty from ___/___/___ to ___/___/

❑ Unable to return to work from ___/___/___ to ___/___/

**WORK LIMITATIONS:**

❑ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).

❑ Work only with right/left hand.

❑ Restricted repetitive motion right/left hand.

❑ Sitting job only.

❑ Restricted operation of moving equipment.

❑ Other: _____

**FOLLOW-UP PLAN:**

❑ Release from care.

❑ Schedule for follow-up appointment on ___/___/___.
Time _____ AM/PM

❑ Referral to _____
Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

| _____ | _____ | _____ |
|---|---|---|
| Examiner's Name (*print*) | Examiner's Signature | Date |

## ATTACHMENT 10

## HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: 1-866-299-3445

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than $2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater then $2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.

- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. . Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.

# PROCEDURE

**Subject:** **ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS**

## 1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for management safety inspections of project and office locations. These inspections are an integral part of the overall accident prevention program and help to demonstrate management's commitment to safety. Key requirements of this procedure include:

- Project managers are required to conduct one inspection per month and ensure that at least one other inspection is conducted during the month;
- Office managers are required to conduct an office safety inspection once every six months.
- Completed inspection reports are given to the project/office health and safety representative for review. A copy of the completed report will then be forwarded to the respective business line health and safety manager.

## 2.0 TABLE OF CONTENTS

1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
  3.1 Procedure Responsibility
  3.2 Action/Approval Responsibilities
4.0 Text
  4.1 Safety Inspections and Documentation
    4.1.1 Management Site Visits
    4.1.2 Project Managers
    4.1.3 Office Managers
    4.1.4 Project Supervisors
    4.1.5 Health and Safety Representative
  4.2 Workshops
5.0 Exception Provisions
6.0 Cross References
7.0 Attachments

## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 TEXT

Inspections of project and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Management safety inspections help demonstrate management's commitment to safety and verify that proper work practices are in use. These inspections are also used to verify the existence of safe work conditions and regulatory compliance. All employees are afforded the opportunity to participate in the inspection process via the safety interview process.

### 4.1 Safety Inspections and Documentation

Safety inspections are required by various tiers of the management structure. The objective is for operation managers to visibly demonstrate their concern for safety in the workplace by direct contact with employees while in the workplace. Each inspection is to be documented on the appropriate Safety Inspection Report (Attachment 2 or 3).

The primary responsibilities of the inspector include:

- Interviewing employees with regard to health and safety issues and how they might be corrected;
- Observing and correcting unsafe conditions and acts; and
- Verifying that corrective actions have been assigned to a responsible employee and implemented.

Positive safety observations and safety issues not specifically addressed in the Safety Inspection Report can be documented on the last page of the report. A list of all corrective action items will be maintained showing the corrective action, responsible person, and the date action is to be completed. Completed reports are to be given to the project/office health and safety representative, then forwarded to the respective business line health and safety manager.

#### 4.1.1 Management Site Visits

Each senior manager is encouraged to make an informal safety inspection and review previously conducted inspection reports, during each site visit, to demonstrate their commitment to safety and reinforce the responsibilities of project management. Findings during this informal inspection are to be brought to the attention of the project manager so that corrective action can be initiated.

#### 4.1.2 Project Managers

All project managers are required to complete at least one safety inspection per month and ensure that at least one other safety inspection per month is conducted. In the event that the project manager is not present at the project site during the month, this responsibility may be delegated to the project supervisor.

#### 4.1.3 Office Managers

Office managers are required to conduct an office safety inspection once every six months. Managers are encouraged to conduct more frequent inspections if the office location is being remodeled or if new space is being occupied that was not previously inspected.

#### 4.1.4 Project Supervisors

Project supervisors are expected to inspect their projects monthly and ensure that corrective actions are implemented. Dependent upon project manager participation, project supervisors may also be required to conduct an additional monthly inspection. The requirement to conduct these inspections cannot be delegated.

#### 4.1.5 Health and Safety Representative

Health and safety representatives must continually observe activities and correct unsafe acts/conditions as soon as reasonably possible. They are also required to review each Safety Inspection Report completed at their location to ensure that corrective actions are implemented. Once this review is complete, they will forward the reports to the appropriate business line health and safety manager.

### 4.2 Workshops

Health and safety representatives will present workshops and/or conduct joint inspections to help managers and supervisors develop their inspection skills.

## 5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

## 7.0 ATTACHMENTS

1. Responsibility Matrix
2. Project Safety Inspection Report
3. Office Safety Inspection Report
4. Laboratory Inspection Report

## ATTACHMENT 1

## ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS RESPONSIBILITY MATRIX

| Action | Procedure Section | *Responsible Party* | | | | |
|---|---|---|---|---|---|---|
| | | **Senior Managers** | **Project/ Office Manager** | **Project Supervisors** | **Health and Safety Representative** | **Director of Health and Safety** |
| Issue, Revise, and Maintain Procedure | 3.1 | | | | | X |
| Conduct Informal Safety Inspections and Review Previously Completed Reports | 4.1.1 | X | | | | |
| Conduct Safety Inspections | 4.1.2<br>4.1.3<br>4.1.4 | | X | X | | |
| Give Completed Reports to Health and Safety Representative | 4.1.2<br>4.1.3<br>4.1.4 | | X | X | | |
| Review Reports and Forward to Health and Safety Manager | 4.1.5 | | | | X | |
| Conduct Inspection Workshops | 4.2 | | | | X | |

## ATTACHMENT 2

## PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

BUSINESS LINE: _____ PROJECT NAME/NUMBER:
PROGRAM MANAGER: _____ PROJECT MANAGER:
GENERAL PROJECT DESCRIPTION:
SITE ACTIVITIES AT TIME OF INSPECTION:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| **FIRST AID** | | | |
| 1. Are first aid kit locations identified and accessible? | | | |
| 2. Are emergency eye wash/safety showers available and inspected monthly? | | | |
| 3. Are first aid kits inspected weekly? | | | |
| 4. Is a qualified first aid/CPR provider on site? | | | |
| **PERSONAL PROTECTIVE EQUIPMENT** | | | |
| 1. Have levels of personnel protection been established? | | | |
| 2. Are respirators decontaminated, inspected, and stored according to standard procedures? | | | |
| 3. Have employees been fit-tested? | | | |
| 4. Is defective personal protective equipment tagged and taken out of service? | | | |
| 5. Does compressed breathing air meet CGA Grade "D" minimum? | | | |
| 6. Are there sufficient sizes and quantities of protective equipment? | | | |
| 7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots? | | | |
| **FIRE PREVENTION** | | | |
| 1. Are employees smoking only in designated outdoor areas? | | | |
| 2. Are fire lanes established and maintained? | | | |
| 3. Are flammable liquid dispensing systems bonded? | | | |
| 4. Are approved safety cans available for storage of flammable liquids? | | | |
| 5. Has the local fire department been contacted? | | | |
| 6. Are fire extinguishers available and inspected monthly? | | | |
| 7. Are flammables and combustibles properly stored? | | | |
| 8. Are flammable storage cabinets available and used when needed? | | | |
| **AIR MONITORING** | | | |
| 1. Is required air monitoring being conducted? | | | |
| 2. Are air monitoring instruments calibrated daily? | | | |
| 3. Are air monitoring logs up to date? | | | |
| 4. Are instrument user manuals available? | | | |
| 5. Are instruments being maintained? | | | |
| 6. Are employees notified of personal sampling results within 5 days of receipt? | | | |
| **WELDING AND CUTTING** | | | |
| 1. Are fire extinguishers present at welding and cutting operations? | | | |
| 2. Are confined spaces evaluated prior to and during cutting and welding operations? | | | |
| 3. Have Hot Work Permits been completed? | | | |
| 4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations? | | | |
| 5. Are welding machines properly grounded? | | | |
| 6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart? | | | |
| 7. Are only trained personnel permitted to operate welding and cutting equipment? | | | |
| 8. Are gas cylinders transported in a secured vertical position with caps in place? | | | |
| **HAND AND POWER TOOLS** | | | |
| 1. Are defective hand and power tools tagged and taken out of service? | | | |
| 2. Is eye protection available and used when operating power tools? | | | |

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| 3. Are guards and safety devices in place on power tools? | | | |
| 4. Are power tools inspected before each use? | | | |
| 5. Are nonsparking tools available when necessary? | | | |
| 6. Is the correct tool being used for the job? | | | |
| **MOTOR VEHICLES** | | | |
| 1. Are vehicles regularly inspected? | | | |
| 2. Are personnel licensed for the vehicles they operate? | | | |
| 3. Are unsafe vehicles tagged and reported to supervision? | | | |
| 4. Is vehicles safety equipment operating properly? | | | |
| 5. Are loads secure? | | | |
| 6. Are vehicle occupants using safety belts? | | | |
| 7. Are current insurance cards and blank accident report forms located in vehicles? | | | |
| **EMERGENCY PLANS** | | | |
| 1. Are emergency telephone numbers posted? | | | |
| 2. Have emergency escape routes been designated? | | | |
| 3. Are employees familiar with the emergency signal? | | | |
| 4. Has the emergency route to the hospital been established and posted? | | | |
| 5. Is a vehicle on site that can transport injured employees to the hospital? | | | |
| **MATERIALS HANDLING** | | | |
| 1. Are materials stacked and stored to prevent sliding or collapsing? | | | |
| 2. Are tripping hazards identified? | | | |
| 3. Are semi-trailers chocked? | | | |
| 4. Are fixed jacks used under semi-trailers? | | | |
| 5. Are riders prohibited on materials handling equipment? | | | |
| 6. Are approved manlifts provided for the lifting of personnel? | | | |
| 7. Are personnel in manlifts wearing approved fall protection devices? | | | |
| **FIRE PROTECTION** | | | |
| 1. Has a fire alarm system been established? | | | |
| 2. Do employees know the location and use of all fire extinguishers? | | | |
| 3. Are fire extinguisher locations posted? | | | |
| 4. Are combustible materials segregated from open flames? | | | |
| 5. Have fire extinguishers been professionally inspected during the last year? | | | |
| 6. Are fire extinguishers visually inspected monthly? | | | |
| **ELECTRICAL** | | | |
| 1. Is electrical equipment and wiring properly guarded and maintained in good condition? | | | |
| 2. Are extension cords kept out of wet areas? | | | |
| 3. Is damaged electrical equipment tagged and taken out of service? | | | |
| 4. Have underground electrical lines been identified by proper authorities? | | | |
| 5. Has a lockout/tagout system been established? | | | |
| 6. Are GFCIs being used on all temporary electrical systems and as needed? | | | |
| 7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)? | | | |
| 8. Are warning signs exhibited on high voltage equipment (250V or greater)? | | | |

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| 9. Is adequate distance maintained from overhead electrical lines? | | | |
| 10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures? | | | |
| **CRANES AND RIGGING** | | | |
| 1. Are cranes inspected daily prior to use? | | | |
| 2. Are crane swing areas barricaded or demarked? | | | |
| 3. Is all rigging equipment tagged with an identification number and rated capacity? | | | |
| 4. Is rigging equipment inspection documented? | | | |
| 5. Are slings, chains, and rigging inspected before each use? | | | |
| 6. Are damaged slings, chains, and rigging tagged and taken out of service? | | | |
| 7. Are slings padded or protected from sharp corners? | | | |
| 8. Do employees keep clear of suspended loads? | | | |
| 9. Are rated load capacities and special hazard warnings posted on crane? | | | |
| 10. Are the records of annual crane inspection available? | | | |
| 11. Has accessible areas within the swing radius of the rear of the crane been barricaded? | | | |
| 12. Do crane operators have required training/certification? | | | |
| **COMPRESSED GAS CYLINDERS** | | | |
| 1. Are breathing air cylinders charged only to prescribed pressures? | | | |
| 2. Are like cylinders segregated and stored in well ventilated areas? | | | |
| 3. Is smoking prohibited in cylinder storage areas? | | | |
| 4. Are cylinders stored secure and upright? | | | |
| 5. Are cylinders protected from snow, rain, etc.? | | | |
| 6. Are cylinder caps in place before cylinders are moved? | | | |
| 7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart? | | | |
| 8. Are propane cylinders stored and used only outside of buildings? | | | |
| **SCAFFOLDING** | | | |
| 1. Is scaffolding placed on a flat, firm surface? | | | |
| 2. Are scaffold planks free of mud, ice, grease, etc.? | | | |
| 3. Is scaffolding inspected before each use? | | | |
| 4. Are defective scaffold parts taken out of service? | | | |
| 5. Have employees completed scaffold user training? | | | |
| 6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches? | | | |
| 7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)? | | | |
| 8. Are employees restricted from working on scaffolds during storms and high winds? | | | |
| 9. Are all pins in place and wheels locked? | | | |
| 10. Is required perimeter guarding (top rail, mid rail, and toe board) present? | | | |
| 11. Has a competent person been designated to oversee scaffold construction? | | | |
| 12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them? | | | |
| 13. Are all scaffold components manufactured by the same company? | | | |
| **WALKING AND WORKING SURFACES** | | | |
| 1. Are ladders regularly inspected? | | | |
| 2. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? | | | |

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| 3. Are ladders being used in a safe manner? | | | |
| 4. Are ladders kept out of passageways, doors, or driveways? | | | |
| 5. Are broken or damaged ladders tagged and taken out of service? | | | |
| 6. Are metal ladders prohibited in electrical service? | | | |
| 7. Are stairways and floor openings guarded? | | | |
| 8. Are safety feet installed on straight and extension ladders? | | | |
| 9. Is general housekeeping being maintained? | | | |
| 10. Are ladders tied off? | | | |
| 11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches? | | | |
| **SITE SAFETY PLAN** | | | |
| 1. Is a site safety plan available on site or accessible to all employees? | | | |
| 2. Does the safety plan accurately reflect site conditions and tasks? | | | |
| 3. Have potential hazards been described to employees on site? | | | |
| 4. Is there a designated safety official on site? | | | |
| 5. Have all employees signed the safety plan acknowledgment form? | | | |
| **SITE POSTERS** | | | |
| 1. Are the following posters displayed in a prominent and accessible area? | | | |
| A. Minimum Wage | | | |
| B. OSHA Job Protection | | | |
| C. Equal Employment Opportunity | | | |
| 2. Are all required state-specific posters displayed? | | | |
| **SITE CONTROL** | | | |
| 1. Are work zones clearly marked? | | | |
| 2. Are support trailers located to minimize exposure from a potential release? | | | |
| 3. Are support trailers accessible for approach by emergency vehicles? | | | |
| 4. Is the site properly secured during and after work hours? | | | |
| 5. Is an exclusion zone sign-in/sign-out log maintained? | | | |
| 6. Are only employees with current training and physicals permitted in exclusion zone? | | | |
| **HEAVY EQUIPMENT** | | | |
| 1. Is heavy equipment inspected as prescribed by the manufacturer? | | | |
| 2. Is defective heavy equipment tagged and taken out of service? | | | |
| 3. Are project roads and structures inspected for load capacities and proper clearances? | | | |
| 4. Is heavy equipment shut down for fueling and maintenance? | | | |
| 5. Are backup alarms installed and working on mobile equipment? | | | |
| 6. Have qualified equipment operators been designated? | | | |
| 7. Are riders prohibited on heavy equipment? | | | |
| 8. Are guards and safety appliances in place and used? | | | |
| 9. Are operators using the "three point" system when mounting/dismounting equipment? | | | |
| **EXCAVATION** | | | |

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| | | YES | NO | N/A |
|---|---|---|---|---|
| 1. | Has a "competent person" been designated to oversee excavation activities? | | | |
| 2. | Prior to opening excavations, are utilities located and marked? | | | |
| 3. | Has a professional engineer evaluated all excavations greater than 20 feet deep? | | | |
| 4. | Is there rescue equipment on site and accessible to the excavation area? | | | |
| 5. | Is excavated material placed a minimum of 24 inches from the excavation? | | | |
| 6. | Are the sides of excavations sloped or shored to prevent cave ins? | | | |
| 7. | Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/$O_2$ deficiency)? | | | |
| 8. | Are ladders or ramps used in excavations over 4 feet deep? | | | |
| 9. | Are means of egress available so as to require no more than 25 feet of lateral travel? | | | |
| 10. | Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares? | | | |
| 11. | Is excavation inspected daily by competent persons and documented? | | | |
| | **CONFINED SPACES** | | | |
| 1. | Have employees been trained in the hazards of confined spaces? | | | |
| 2. | Are confined space permits posted at entrance to confined space? | | | |
| 3. | Is a copy of the confined space entry procedure available? | | | |
| 4. | Has a rescue plan been established? | | | |
| 5. | Is an entry supervisor present at each permit-required entry? | | | |
| 6. | Are required extraction/fall protection devices being used? | | | |
| | **DECONTAMINATION** | | | |
| 1. | Are decontamination stations set up on site? | | | |
| 2. | Is decontamination water properly contained and disposed of? | | | |
| 3. | Are all pieces of equipment inspected for proper decontamination before leaving the site? | | | |
| 4. | Are shin/metatarsal guards being used during power washing activities? | | | |
| | **HAZARD COMMUNICATION** | | | |
| 1. | Is there a copy of the HAZCOM procedure on site? | | | |
| 2. | Are there MSDSs for required materials/chemicals present on site? | | | |
| 3. | Are all containers properly labeled, as to content, hazard? | | | |
| 4. | Have employees been trained in accordance with the HAZCOM procedure? | | | |
| 5. | Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site? | | | |
| 6. | Have all personnel signed the HAZCOM acknowledgment form? | | | |
| 7. | Is there an updated list of chemicals maintained on site? | | | |
| | **TRAINING** | | | |
| 1. | Are tailgate safety meetings being conducted daily? | | | |
| 2. | Are current training/medical records maintained on site? | | | |
| | **DOCUMENTATION** | | | |
| 1. | Is an OSHA 300 Log maintained on site and posted during February 1, to April 30,? | | | |
| 2. | Are accident report forms available? | | | |
| 3. | Is a copy of health and safety policy and procedures available on site? | | | |

# PROJECT SAFETY INSPECTION REPORT

**PROJECT** _____ **DATE** _____

| ALL NEGATIVE RESPONSES | CORRECTIVE ACTION | ASSIGNED TO | DATE ASSIGNED | DATE COMPLETED | VERIFIED BY |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| DESCRIBE POSITIVE SAFETY OBSERVATIONS |
|---|
| |

## ATTACHMENT 3

## OFFICE SAFETY INSPECTION REPORT

**OFFICE** _____ **DATE** _____

DATE: _____ OFFICE NAME:
OFFICE MANAGER:
AREA(S) OF OFFICE INSPECTED:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:

# OFFICE SAFETY INSPECTION REPORT

**OFFICE** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| **FIRST AID** | | | |
| 1. Are first aid kits accessible and identified? | | | |
| 2. Are emergency eye wash/safety showers available where needed and inspected? | | | |
| 3. Are first aid kits inspected weekly? | | | |
| **FIRE PREVENTION** | | | |
| 1. Are employees smoking only in designated outdoor areas? | | | |
| 2. Are fire lanes/evacuation routes established and maintained? | | | |
| 3. Are approved safety cans/cabinets available for storage of flammable liquids? | | | |
| 4. Are fire exits clearly identified and unobstructed? | | | |
| **FURNITURE AND EQUIPMENT** | | | |
| 1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways? | | | |
| 2. Are desk and file drawers closed after use? | | | |
| 3. Is weight distributed in file cabinets so that upper drawer contents does not create a top-heavy condition? | | | |
| 4. Are cabinets, bookcases, and shelves secured to prevent their falling over? | | | |
| 5. Are faulty desks, chairs, or other office equipment repaired or taken out of service? | | | |
| 6. Is adequate and sufficient lighting provided in all work areas? | | | |
| 7. Are paper cutter blades in fully down and locked position when not in use? | | | |
| 8. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.? | | | |
| 9. Do machines with exposed moving parts have appropriate guards? | | | |
| **AISLES AND FLOORS** | | | |
| 1. Is aisle clearance adequate for two-way traffic and for unobstructed access to all parts of the office and building? | | | |
| 2. Does office arrangement allow easy egress under emergency conditions? | | | |
| 3. Are wastebaskets, briefcases, or other objects placed where they are not a tripping hazard? | | | |
| 4. Are floors clear of pencils, bottles, and other loose objects? | | | |
| 5. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or other means? | | | |
| 6. Are floors free of loose tiles and projections that can create a tripping hazard? | | | |
| 7. Is carpeting in good condition and not badly worn or torn? | | | |
| **HAND AND POWER TOOLS** | | | |
| 1. Are defective hand and power tools tagged and taken out of service? | | | |
| 2. Is eye protection available and used when operating power tools? | | | |
| 3. Are guards and safety devices in place on power tools? | | | |
| 4. Are power tools inspected before each use? | | | |
| 5. Is the correct tool being used for the job? | | | |
| 6. Do knife blades have guards when not in use? | | | |
| **MOTOR VEHICLES** | | | |
| 1. Are vehicles regularly inspected? | | | |
| 2. Are personnel licensed for the vehicles they operate? | | | |
| 3. Are unsafe vehicles reported to supervision? | | | |

# OFFICE SAFETY INSPECTION REPORT

**OFFICE** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| 4. Is safety equipment on vehicles? | | | |
| 5. Are loads secure on vehicles? | | | |
| 6. Are vehicle occupants using safety belts? | | | |
| 7. Are current insurance cards and blank accident report forms located in vehicles? | | | |
| **EMERGENCY PLANS** | | | |
| 1. Are emergency telephone numbers posted? | | | |
| 2. Have emergency escape routes been designated? | | | |
| 3. Are employees familiar with the emergency signal? | | | |
| 4. Has an emergency route to the hospital been established and posted? | | | |
| **MATERIALS HANDLING** | | | |
| 1. Are materials stacked and stored to prevent sliding or collapsing? | | | |
| 2. Are flammables and combustibles stored in approved containers? | | | |
| 3. Are tripping hazards identified? | | | |
| 4. Are riders prohibited on material handling equipment? | | | |
| **FIRE PROTECTION** | | | |
| 1. Has a fire alarm system been established? | | | |
| 2. Do employees know the location and use of all fire extinguishers? | | | |
| 3. Are fire extinguisher locations marked? | | | |
| 4. Have fire extinguishers been professionally inspected during the last year? | | | |
| 5. Are fire extinguishers visually inspected monthly? | | | |
| 6. Is there an operating fire detection system? | | | |
| **ELECTRICAL** | | | |
| 1. Are extension cords kept out of wet areas? | | | |
| 2. Are certified electricians used for electrical work? | | | |
| 3. Are GFCIs being used as needed? | | | |
| 4. Are extension cords not being used in lieu of permanent wiring? | | | |
| 5. Are warning signs exhibited on high voltage equipment (250V or greater)? | | | |
| 6. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures? | | | |
| 7. Are electric fans protected with guards of not over one-half inch mesh, which prevents fingers getting inside guard? | | | |
| 8. Are cords, panels, receptacles, and plugs in good condition? | | | |
| 9. Are multi-outlet strips not plugged into other multi-outlet strips? | | | |
| 10. Are extension cords not plugged into other extension cords? | | | |
| 11. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible? | | | |
| 12. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets? | | | |
| 13. Do space heaters have automatic shut-offs that will actuate if the heater tips over? | | | |
| 14. Are space heaters UL listed and plugged directly into a wall receptacle? | | | |
| 15. Are space heaters located at least 3 feet from combustible material? | | | |
| **WALKING AND WORKING SURFACES** | | | |
| 1. Are cords, cables, and other items not placed in walkways? | | | |
| 2. Are ladders regularly inspected? | | | |
| 3. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? | | | |

# OFFICE SAFETY INSPECTION REPORT

**OFFICE** _____ **DATE** _____

| | YES | NO | N/A |
|---|---|---|---|
| 4. Are ladders being used in a safe manner? | | | |
| 5. Are ladders kept out of passageways, doors, or driveways? | | | |
| 6. Are broken or damaged ladders tagged and taken out of service? | | | |
| 7. Are metal ladders prohibited in electrical service? | | | |
| 8. Are stairways and floor openings guarded? | | | |
| 9. Are safety feet installed on straight and extension ladders? | | | |
| 10. Are employees walking instead of running? | | | |
| 11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches? | | | |
| 12. Are there torn, loose, or curled carpets? | | | |
| **HOUSEKEEPING** | | | |
| 1. Is good housekeeping maintained? | | | |
| 2. Are paper and materials stored properly? | | | |
| 3. Are cleaning fluids used only in small quantities and stored in closed containers that are kept in well-ventilated areas? | | | |
| 4. If cleaning fluids are flammable, are they not used near a flame or an open heating element? | | | |
| 5. Are wastebaskets emptied on a daily basis? | | | |
| **SITE POSTERS** | | | |
| 1. Are the following posters displayed in a prominent and accessible area? | | | |
| A. Minimum Wage | | | |
| B. OSHA Job Protection | | | |
| C. Equal Employment Opportunity | | | |
| 2. Are all required state-specific posters displayed? | | | |
| **HAZARD COMMUNICATION** | | | |
| 1. Is the written HAZCOM program available? | | | |
| 2. Is there a MSDS FOR EACH HAZARDOUS CHEMICAL present in the office? | | | |
| 3. Are all containers properly labeled, as to content, hazard? | | | |
| 4. Have employees been trained on chemical hazards? | | | |
| 5. Have all employees signed the HAZCOM acknowledgment form? | | | |
| 6. Is there a list of chemicals maintained on site? | | | |
| **DOCUMENTATION** | | | |
| 1. Is an OSHA 300 Log maintained and posted during February1, to April 30? | | | |
| 2. Are accident report forms available? | | | |
| 3. Is a copy of health and safety policy and procedures available? | | | |

# OFFICE SAFETY INSPECTION REPORT

**OFFICE** _____ **DATE** _____

| ALL NEGATIVE RESPONSES | CORRECTIVE ACTION | ASSIGNED TO | DATE ASSIGNED | DATE COMPLETED | VERIFIED BY |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| DESCRIBE POSITIVE SAFETY OBSERVATIONS |
|---|
| |

# ATTACHMENT 4
# LABORATORY SAFETY INSPECTION REPORT

**LOCATION** _____ **DATE** _____

| | | YES | NO | N/A |
|---|---|---|---|---|
| I. | FIRST AID | | | |
| 1. | Are first aid kit locations identified and accessible? | | | |
| 2. | Are emergency eye wash/safety showers available and inspected monthly? | | | |
| 3. | Is access to eye wash units and safety showers unimpeded? | | | |
| II. | PERSONAL PROTECTIVE EQUIPMENT | | | |
| 1. | Are employees wearing safety glasses in the laboratory? | | | |
| 2. | Are laboratory coats worn by all employees and visitors when working with chemicals and/or samples? | | | |
| 3. | Are gloves worn when chemicals and samples are handled? | | | |
| III. | FIRE PREVENTION/FIRE PROTECTION | | | |
| 1. | Are employees smoking only in designated outdoor areas? | | | |
| 2. | Are flammable storage cabinets available and used when needed? | | | |
| 3. | Has a fire alarm system been established? | | | |
| 4. | Are fire extinguishers available and inspected monthly? | | | |
| 5. | Do employees know the location and use of fire extinguishers? | | | |
| 6. | Are fire extinguisher locations posted? | | | |
| 7. | Have fire extinguishers been professionally inspected during the last year? | | | |
| IV. | EMERGENCY PLANS | | | |
| 1. | Are emergency telephone numbers posted? | | | |
| 2. | Have emergency escape routes been designated? | | | |
| 3. | Are employees familiar with the emergency signal? | | | |
| 4. | Are appropriate spill kit supplies available? | | | |
| 5. | Are emergency exits marked? | | | |
| 6. | Are sprinkler heads unobstructed? | | | |
| V. | ELECTRICAL | | | |
| 1. | Are extension cords kept out of wet areas? | | | |
| 2. | Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets? | | | |
| 3. | Are cords, panels, receptacles, and plugs in good condition? | | | |
| 4. | Are extension cords not being used in lieu of permanent wiring? | | | |
| 5. | Are extension cords not plugged into other extension cords? | | | |
| 6. | Are multi-outlet strips not plugged into other multi-outlet strips? | | | |
| 7. | Has a lockout/tagout system been established? | | | |
| 8. | Are GFCIs being used on all temporary electrical systems and as needed? | | | |
| 9. | Are warning signs exhibited on high voltage equipment (250V or greater)? | | | |
| 10. | Are circuit breakers or fuse panels properly labeled, kept closed, and accessible? | | | |
| VI. | COMPRESSED GAS CYLINDERS | | | |
| 1. | Are like cylinders segregated and stored in well ventilated areas? | | | |
| 2. | Is smoking prohibited in cylinder storage areas? | | | |
| 3. | Are cylinders stored secure and upright? | | | |
| 4. | Are cylinders protected from snow, rain, etc.? | | | |

# ATTACHMENT 4
# LABORATORY SAFETY INSPECTION REPORT

**LOCATION** _____ **DATE** _____

| | | YES | NO | N/A |
|---|---|---|---|---|
| 5. | Are cylinder caps in place for storage and movement? | | | |
| VIII. | WALKING AND WORKING SURFACES | | | |
| 1. | Are accessways, stairways, and ramps clean of ice, mud, snow, or debris? | | | |
| 2. | Are stairways and floor openings guarded? | | | |
| 3. | Are handrails and siderails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches? | | | |
| 4. | Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or equipment? | | | |
| 5. | Are floors free of loose tiles and projections that can create a tripping hazard? | | | |
| VIII. | HAZARD COMMUNICATION | | | |
| 1. | Is there a copy of the Chemical Hygiene Plan (CHP) on site? | | | |
| 2. | Have employees been trained in accordance with the CHP? | | | |
| 3. | Are all containers properly labeled as to content, hazard, etc.? | | | |
| 4. | Is there an updated list of chemicals maintained at the laboratory? | | | |
| 5. | Are there MSDSs for the chemicals present in the laboratory? | | | |
| 6. | Do employees know and understand the effects of exposure from the chemicals they work with? | | | |
| IX. | DOCUMENTATION | | | |
| 1. | Is an OSHA 300A Log maintained on site and posted between February 1and May 1? | | | |
| 2. | Are accident report forms available? | | | |
| X. | FURNITURE AND EQUIPMENT | | | |
| 1. | Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways? | | | |
| 2. | Are desk and file drawers closed after use? | | | |
| 3. | Are cabinets, bookcases, and shelves secured to prevent their falling over? | | | |
| 4. | Is adequate and sufficient lighting provided in all work areas? | | | |
| 5. | Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.? | | | |
| 6. | Do machines with exposed moving parts have guards? | | | |
| XI. | LABORATORY FUME HOODS | | | |
| 1. | Are face velocities posted on each hood? | | | |
| 2. | Is the average face velocity at least 100 ft/min.? | | | |
| 3. | Is the sash position marked or otherwise indicated to show the acceptable position for achieving the desired airflow rate? | | | |
| 4. | Has the hood face velocity been measured with a calibrated instrument in the last 6 months? | | | |
| 5. | Are signs posted on hoods that are not working correctly? | | | |
| 6. | Does the hood contain visual indicators that it is working properly (e.g., manometer, magneheilic guage, etc.)? | | | |

# ATTACHMENT 4
# LABORATORY SAFETY INSPECTION REPORT

**LOCATION** _____ **DATE** _____

| | | YES | NO | N/A |
|---|---|---|---|---|
| XII. | GENERAL LABORATORY RULES | | | |
| 1. | Are open-toed shoes and sandals prohibited in the laboratory? | _____ | _____ | _____ |
| 2. | Are eating, drinking, chewing gum or tobacco products prohibited in the laboratory? | _____ | _____ | _____ |
| 3. | Are food refrigerators labeled such as to prevent chemical storage or vice versa? | _____ | _____ | _____ |
| XIII. | HOUSEKEEPING | | | |
| 1. | Are lab benches orderly? | _____ | _____ | _____ |
| 2. | Are laboratories free of liquid spills? | _____ | _____ | _____ |
| 3. | Are sinks free of accumulated glassware? | _____ | _____ | _____ |
| 4. | Are waste disposal containers available and labeled? | _____ | _____ | _____ |

# PROCEDURE

**Subject: JOB SAFETY ANALYSIS (JSA)**

## 1.0 PURPOSE AND SUMMARY

This procedure provides the guidelines to perform a Job Safety Analysis.

The (JSA) is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. This process can identify less obvious potential hazards that may go undetected during routine management observations or audits. **A new JSA must be completed every day, before commencement of any work activity and updated in the event of changing conditions. It should be understood that changing conditions that a work crew encounters during a work period (inclement weather, another contractor began work in area, etc.) requires that the JSA be modified to address the new hazards. The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.**

## 2.0 TABLE OF CONTENTS


1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
- 3.1 Procedure Responsibility
- 3.2 Action/Approval Responsibilities

4.0 Definitions
5.0 Text
- 5.1 General Requirements
- 5.2 Methods of Conducting JSA's
- 5.3 Analyzing The Job
- 5.4 Common Errors
- 5.5 Identifying the Hazards and Potential Accidents
- 5.6 Accident Types
- 5.7 Writing Instructions
- 5.8 Develop Solutions

6.0 Specific Requirements
- 6.1 Sequence of Basic Job Steps
- 6.2 Potential Hazards
- 6.3 Recommended Action Procedure

7.0 References
8.0 Attachments

## 3.0 Responsibility Matrix

### 3.1 Procedure Responsibility

The Manager/Supervisor is responsible for implementing and enforcing this procedure.

The Safety Representative is responsible for monitoring compliance with this procedure.

Each Employee is responsible for complying with the project safety program, along with the rules and regulations as stipulated in this procedure and instructions issued by the employee's supervisor.

It is the responsibility of management and supervision to ensure that this policy is followed. Accordingly, should the project / site requirements stipulate the use of another method of job safety analysis, it is the responsibility of management and supervision to ensure that the proposed method either meets or exceeds this JSA policy and the accompanying JSA form. Any policy or JSA form that does not cover the items contained herein shall not be used.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1

## 4.0 DEFINITIONS

**HAZARD** - A potential danger. Oil on the floor is a hazard.
**ACCIDENT** - An unintended happening that may result in injury, loss or damage.
**EXAMPLE** - Slipping on the oil is an accident.
**INJURY** - The result of an accident. A sprained wrist from the fall would be an injury.

## 5.0 TEXT

### 5.1 General Requirements

The first page of the JSA form is a checklist that should be used for reference purposes and serves to assist the work crew and supervisor in completing the second page of the JSA. The first page of the JSA form is used to write out the various tasks involved, potential hazards, recommended actions, etc.

Job Safety Analysis is a procedure used to review job methods and uncover hazards:

- That may have been overlooked in a Hazard Analysis, project layout or design of the

equipment, tools processes or work area.

- That may have developed after production started.
- That may have resulted from changes in work procedures or personnel

**The three basic steps in performing a job safety analysis are**

- (Job Task) Break the job down into successive steps or activities and observe how these actions are performed.
- (Potential Hazards) Identify the hazards and potential accidents. This is the critical step because only an identified problem can be corrected or eliminated.
- (Recommended Actions) Develop safe job procedures to eliminate the hazards and prevent potential accidents.

## 5.2 Methods of Conducting JSA's

There are two basic methods for conducting the Job Safety Analysis:

— Direct observation

— Group discussion

A fast and efficient method of conducting a JSA is through direct observations of job performance. In many instances, however, this method may not be practical. However, through direct observation, one can gain knowledge concerning an activity and use it on a future JSA.

For instance, new jobs and those that are done infrequently do not lend themselves to direct observation. When this is the case, the JSA can be made through discussions with persons familiar with the job. Individuals often involved in the process include, but are not limited to, first line supervisors, safety specialists, engineers, experienced employees and outside contractors.

## 5.3 Analyzing The Job

When analyzing the job, most people start with the worst first. You should be guided by the following factors:

- **Frequency of Accidents** (Including "near misses"):
  An element of a job that repeatedly produces accidents is a candidate for starting a JSA. The greater the number of incidents associated with a job element, the greater its priority claim for a JSA.

- **New or Revised Jobs**:
  Jobs created by changes in equipment or in processes obviously have no history of accidents, but their accident potential may not be fully appreciated. Analysis should not be delayed until accidents or near misses occur.
  Any changes from the original task/job shall be noted on the form as a revision. Once this has occurred the new found hazards must be reviewed with the crew.

- **Multiple Employee Exposure**
  Jobs that expose more than one individual to potential hazards should also be analyzed.

## 5.4 Common Errors

Five common errors that are often made when performing a job analysis are:

- Making the breakdown so detailed that an unnecessarily large number of steps are listed.
- Making the job so general that basic steps are not recorded.
- Failure to identify the education and experience level of the target audience.
- Failure to identify end use(s). (i.e., training, actual procedure, basis for procedure, etc.)
- Always relying on the Supervisor for completing the JSA. Supervisor should describe work scope to the crew. The crew should then assist in identifying hazards and controls at the job site with active involvement from the Supervisor. Ultimately, the supervisor is responsible, however, crew members and the Supervisor should be actively involved in each JSA.

## 5.5 Identifying the Hazards and Potential Accidents

The purpose is to identify all hazards, both **physical** and **environmental**. To do this, ask yourself these questions about each step:

- Is there a danger of striking against, being struck by, or otherwise making harmful contact with an object?
- Can the employee be caught in, on, by or between objects?
- Is there a potential for a slip, trip or fall? If so, will it be on the same elevation or to a different elevation?
- Can he strain himself by pushing, pulling, lifting, bending or twisting?
- Is the Environment hazardous to one's safety or health? Has the weather been considered as a factor? Has the work product of others, as it pertains to the environment, been considered???

## 5.7 Accident Types

- Struck by
  - moving or flying object
  - falling material
- Struck against
  - stationary or moving object
  - protruding object
  - sharp or jagged edge
- Contact with
  - acid
  - electricity
  - heat
  - caustic
  - cold
  - radiation
  - toxic and noxious substances
- Overexertion / repetitive
  - Lifting
  - pulling
  - pushing
  - reaching
  - twisting
- Caught
  - in
  - on
  - between
- Fall to
  - same level
  - lower level
- Bodily reaction from
  - voluntary motion
  - involuntary motion
- Rubbed or abraded by
  - friction
  - pressure
  - vibration

## 5.8 Writing Instructions

- Put any qualifying statements first, not last.
- Start each instruction with an action word.
- Each instruction should be observable.
- Each instruction should be measurable.

When evaluating a given procedure, ask the following question.

**"What should the employee do -- or not do -- to eliminate this particular hazard or prevent this potential accident?"**
Answer must be specific and concrete to be beneficial. General precautions such as "be careful"; "use caution" or "be alert" are useless. Answers should state what to do and how to do it.

This recommendation, "Make certain the wrench does not slip or cause loss of balance" is incomplete. It does not tell how to prevent the wrench from slipping. Here is a more complete recommendation. "Set the wrench properly and securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a stance with feet wide apart before exerting full pressure. This prevents loss of balance if

the wrench slips."

Job Safety Analyses can be very beneficial if they are performed correctly. They not only result in a safer job, but also increase productivity and eliminate waste. Take the time to do them correctly; **and more importantly, use them.**

### 5.9 Develop Solutions

The final step in conducting a JSA is to develop a recommended safe job procedure to prevent the occurrence of potential accidents. The principle solutions are:

- Find a new way to do the job.
- Change the physical conditions that create the hazard.
- Try to eliminate remaining hazards by changing work methods or procedures.
- Try to reduce the necessity of doing a job, or at least the frequency that it must be performed.

### 6.0 Specific Requirements

Instructions for Completing Job Safety Analysis Form

Job Safety Analysis (JSA) is an important accident prevention tool that works by finding hazards and eliminating or minimizing them before the job is performed, and before they have a chance to become accidents.

- Use your JSA for job clarification and hazard awareness
- as a guide in new employee training
- for periodic contacts and for retraining of senior employees
- as a reference tool to be used prior to commencing a job which is performed infrequently
- as an accident investigation tool
- Informing employees of specific job hazards and protective measures.

### 6.1 Sequence of Basic Job Steps

Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements used to perform a task, and then determine the next logical set of movements.
For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the conveyor and putting it onto a hand truck is one logical set of movements, so it is one job step.

Everything related to that one logical set of movements is part of that job step. The next logical set of movements might be pushing the loaded hand truck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. Finally, returning the hand truck to the receiving area might be the final step in this type of job.

***Be sure to list all the steps in a job.*** Some steps might not be done each time -- checking the casters on a hand truck, for example. However, that task is part of the job as a whole, and should be listed and analyzed.

## 6.2 Potential Hazards

Identify the hazards associated with each step. Examine each step to find and identify hazards -- actions, conditions and possibilities that could lead to an accident. It is not enough to look at the obvious hazards. It is also important to look at the entire work environment and discover every conceivable hazard that might exist.

- Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time.
- Hazards contribute to accidents, injuries and occupational illnesses. In order to do part three of a JSA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning:

Some people find it easier to identify possible accidents, illnesses, and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. However, be sure you focus on the hazard for developing recommended actions and safe work procedures.

## 6.3 Recommended Action Procedure

Decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness. Among the actions that can be taken are:

1) engineering the hazard out

2) administrative controls

   - job instruction training

   - good housekeeping

- good ergonomics
  (Positioning the person in relation to the machine or other elements in the Environmental in such a way as to eliminate stresses and strains)

3) providing personal protective equipment

- List recommended safe operating procedures on the form, and list required or recommended personal protective equipment for each step of the job.
- Be specific. Say exactly what needs to be done to correct the hazard, such as "lift, using your leg muscles." Avoid general statements like "be careful."
- Give a recommended action or procedure for every hazard.
- If the hazard is a serious one, it shall be corrected immediately.

**The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.**

## 7.0 REFERENCES

"Job Hazard Analysis", U.S. Dept. of Labor -- OSHA Publication No. 3071

"Job Safety Analysis" - Safety Manual No. 5, U.S. Dept. of Interior, Mining Enforcement and Safety Administration

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Job Safety Analysis Form

# ATTACHMENT 1
# EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | |
|---|---|---|---|---|
| | | Manager/ Supervisor | H&S Representative | Employee |
| Responsible for implementing and enforcing procedure | 3.1 | X | | |
| Monitoring for compliance with the procedure. | 3.1 | | X | |
| Complying with the project JSA program, along with the rules and regulations as stipulated in this procedure | 3.1 | | | X |
| Review completed JSA forms for any errors and communicate to the originator of the changes. | 5.5 | | X | |

# JOB SAFETY ANALYSIS

Shaw The Shaw Group Inc

DATE:
JOB#:
PERMIT#:
ISSUED BY:

SUPERVISION/FOREMAN _____ _____

Consider the following and check the items which apply to the job, then review with the work crew.

**PERMITS**

- ____ Required
- ____ Cold Work
- ____ Hot Work
- ____ Entry Permit
- ____ All Conditions Met
- ____ Signed Off When Complete
- ____ Other _____

**PERSONAL PROTECTIVE EQUIP. (PPE)**

- ____ Type of Gloves
- ____ Composition of Gloves
- ____ Special Purpose Gloves
- ____ Tyvek Suit
- ____ Acid Suit /Slicker Suit
- ____ Rubber Boots
- ____ Mono Goggles (vented/non-vented)
- ____ Face Shield
- ____ Respirator
- ____ Fresh Air
- ____ Ear Protection
- ____ Safety Harness
- ____ Burning Goggles
- ____ Other _____

**TOOLS**

- ____ Current Inspection
- ____ Proper Tools for the Job
- ____ Good Tool Condition
- ____ Qualifications
- ____ Other _____

**EMERGENCY EQUIPMENT**

- ____ Fire Extinguishers
- ____ Safety Shower
- ____ Evacuation Route
- ____ Other _____

**ACCESS**

- ____ Scaffold (properly inspected)
- ____ Ladder (Tied off)
- ____ Manlift
- ____ Personnel Basket (inspected & approved)
- ____ Operator Training
- ____ Special Provisions
- ____ Other

**WELDING**

- ____ Flashburns
- ____ Combustibles
- ____ Spark Containment
- ____ Shields
- ____ Grounding
- ____ Water Hose
- ____ Fire Extinguisher
- ____ Fire Blanket
- ____ Fire Watch
- ____ Sewer Covers
- ____ Other _____

**OVERHEAD WORK**

- ____ Barricades
- ____ Signs
- ____ Hole Cover
- ____ Handrail
- ____ Other _____

**ELECTRICAL**

- ____ Locked & Tagged out
- ____ Try Start/Stop Switch
- ____ GFCI Test
- ____ Assured Grounding
- ____ Extension Cord Inspection
- ____ Other _____

**LIFTING**

- ____ Forklift
- ____ Cherry Picker
- ____ Load Chart
- ____ Angle
- ____ Crane
- ____ Chainfall
- ____ Proper Rigging Practices
- ____ Manual Lifting
- ____ Condition of Equipment
- ____ Operator Certificate

**HAZARDS (ENVIRONMENTAL)**

- ____ Electrical Shock
- ____ Heat Stress
- ____ Heavy Objects
- ____ Hot/Cold Surf. Or Mat.
- ____ Inadequate Lighting
- ____ Line Breaking
- ____ Noise
- ____ Poor Access/Egress
- ____ Sharp Objects
- ____ Other _____

**HAZARDS/CHEMICALS**

- ____ Chemical Burn Shin/Eyes
- ____ Flammable
- ____ Ingestion
- ____ Inhalation
- ____ Skin Contamination

**HAZARDS/BODY**

- ____ Fall Potential
- ____ Pinch Points
- ____ Slip-Trip Potential
- ____ Other _____

**OTHER WORK IN AREA**

- ____ Others Working Overhead
- ____ Type Work Others Doing
- ____ PPE Due to Other Work
- ____ Other _____

**Confined Space**

Know the Following:

- Possible hazards within the confined space
- First signs of exposure
- How to summons help
- How to track personnel
- Entering and exiting the confined space
- Maintain contact with all entrants by voice or visual
- Do not attempt to rescue unless you are a part of a coordinated effort
- Remain at entry point assume no duties with take you from there.

SUPERVISOR/FOREMAN RECOMMENDATION: _____

Shaw The Shaw Group Inc

# JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

**Location of Job**
(Unit/Location on Project):

| | | |
|---|---|---|
| Required PPE: | **Safety Access/ Location** | Supervisor of Work: |
| | Safe Haven: | JSA Prepared By: |
| | Wind Direction: | Are other crews in area? |
| Pre-Job Preparation | Evacuation Route: | |
| 1. Fill out JSA<br>2. Review JSA (EVERYONE)<br>3. Sign JSA (EVERYONE) | Assembly Point: | New: / Revised: |

| **Job Task** (What are You Doing) | **Audit the Job** Audit Time: |
|---|---|
| **Potential Hazards** | **Supervisors Comments** |
| **Recommended Action or Procedure** | **Supervisor's Initials:** |

| **Crew Name Signatures:** | | |
|---|---|---|
| | | |
| | | |
| | | |

# PROCEDURE

Subject: **TAILGATE SAFETY MEETINGS**

## 1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for the conductance of tailgate safety meetings. These meetings are to be conducted at each company project site, on a daily basis, prior to the start of any work activities.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Tailgate Safety Meeting** - A short training or informative session that provides safety guidelines for the planned work activities for the day or shift.

## 5.0 TEXT

The project supervisor or his/her designee conducts a tailgate safety meeting at the beginning of each shift or whenever new employees arrive at the work site. The topics discussed at the tailgate safety meeting should cover the work assignments for the day, the expected hazard(s) presented by the work, and an explanation on how employees will protect themselves from those hazards.

The meetings are to be documented by the completion of a Tailgate Safety Meeting Form. The project supervisor will assure that the form is properly completed and signed by all attendees. Completed forms will be maintained in the project files.

The following sections provide guidance for the completion of the form:

A. **Project Name/Number** - Specific project name and number assigned to the project.

B. **Date** - Date of meeting.

C. **Time** - Time at which meeting is held.

D. **Client** - Identification, name, etc. of entity for whom work is to be performed.

E. **Work Activities** - Detailed description of the work activities to be performed that day.

F. **Hospital Name/Address** - Hospital name and address designated to be used for the project.

G. **Phone Number** - Designated hospital non-emergency phone number.

H. **Ambulance** - Phone number for medical emergency transportation.

I. **Safety Topics Presented:**

1. **Chemical Hazards** - Specific chemical name and adverse properties of all chemicals to be encountered on the job that day. A Material Safety Data Sheet (MSDS) for each should be available and discussed in accordance with Procedure HS060.

2. **Physical Hazards** - Address physical hazards associated with the work site, such as slipping/tripping/falling hazards, pinch points, overhead hazards, and nearby operations that could pose a hazard.

3. **Personal Protective Equipment** - Specify levels of protective clothing and protective devices to be used by employees for each of the day's activities.

4. **New Equipment** - Indicate proper work techniques and any hazards associated with new or unfamiliar equipment.

5. **Other Safety Topic(s)** - List any remaining safety topics pertinent to the potential hazards of the job for that day. This is an area where different, unique subjects can be introduced to make the tailgate safety meeting more interesting.

J. **Attendees** - Printed name and signature of all persons in attendance. (Also, list affiliation if not employed by the company.)

K. **Meeting Conducted By** - Printed name and signature of individual conducting the tailgate safety meeting.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS060 Hazard Communication Program

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Tailgate Safety Meeting Form

# ATTACHMENT 1
# TAILGATE SAFETY MEETINGS

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | |
|---|---|---|---|
| | | Vice President of Health and Safety | Project Supervisor |
| Issuance, Revision, and Maintenance of Procedure | 3.1 | X | |
| Conduct Meeting | 5.0 | | X |

## ATTACHMENT 2

## TAILGATE SAFETY MEETING FORM

Project Name/Number: _____ Date: _____ Time: _____

Client: _____

Work Activities: _____

Hospital Name/Address: _____

Hospital Phone No.: _____ Ambulance Phone No.: _____

### Safety Topics Presented

Chemical Hazards: _____

_____

Physical Hazards: _____

_____

Personal Protective Equipment:

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

New Equipment: _____

Other Safety Topic(s): _____

_____

### Attendees

| NAME PRINTED | SIGNATURE |
|---|---|
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |
| | _____ |

Meeting conducted by:

_____

# PROCEDURE

**Subject: HAZARD COMMUNICATION PROGRAM**

## 1.0 PURPOSE AND SUMMARY

This procedure has been developed to ensure that all affected company employees are provided with current information on the hazardous chemicals that they may encounter during their work. The basic principle of Hazard Communication (HAZCOM) is that anyone that works with hazardous chemicals has both a need and a right to know the identities and the hazards of any chemical to which they may be occupationally exposed. This principle has been propagated by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) 1910.1200 *Hazard Communication*.

Some company activities are likely to occur in states or localities that either have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

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- 5.6 Trade Secrets
- 5.7 Contractors

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Article** - A manufactured item other than a fluid or particle which is formed to a specific shape or design during manufacture, has end use function dependent in whole or in part upon its shape or design during end use, which under normal conditions of use does not release more than trace amounts of a hazardous substance and does not pose a physical hazard or health risk to employees.

**Affected Employee** - Any company employee who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies.

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

**Hazardous Chemical** - Any chemical which poses a physical or health hazard.

**Health Hazard** - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

**Immediate Use** - When hazardous chemicals will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

**Label** - Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

**Local Health and Safety Representative** - The person who is responsible for the management and/or oversight of health and safety activities at a particular workplace. He/she may be assigned as a site health and safety officer or act as a home office health and safety manager who is responsible for multiple workplaces. This person does not necessarily need to be physically

located at a workplace in which they are responsible for ensuring that the requirements of this procedure are fulfilled. The local health and safety representative may designate another qualified individual to assume some or all of the responsibilities delineated in this procedure.

**Physical Hazard** - A chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable, or reactive.

**Responsible Party** - The entity responsible for preparation or distribution of Material Safety Data Sheets (MSDS) that can provide additional information on the hazardous chemical and appropriate emergency procedures.

**Trade Secret** - Any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer=s business, and that gives the employer an opportunity to obtain an advantage over competitors who do not currently know or use it.

**Workplace** - An establishment, job site, laboratory, office, or project at one geographic location containing one or more work areas.

## 5.0 TEXT

In accordance with the requirements established in 29 CFR 1910.1200, employers are required to develop, implement, and maintain at each workplace a HAZCOM program. The program contained herein is intended to ensure that the hazards of all chemicals used by employees are evaluated and that information concerning the hazards of each chemical are conveyed to affected employees. The company program generally consists of five provisions, including hazardous chemical inventories, procurement of hazardous chemicals, container labeling, MSDSs, and the development and implementation of employee training programs. Since the company does not typically produce, distribute, or import hazardous chemicals, the focus of this procedure is on establishing an effective consumer/handler type HAZCOM program and the communication of information to our affected employees.

There are some types of chemicals that are specifically exempt from this procedure. These materials include:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1967, as amended (42 U.S.C. 6901 *et seq.*), when subject to regulations issued under that Act by the U.S. Environmental Protection Agency.

- Any hazardous chemical as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when the hazardous chemical is the focus of remedial or removal actions being conducted under CERCLA in accordance with U.S. Environmental Protection Agency regulations.

- Tobacco or tobacco products.

- Wood or wood products, including lumber which will not be processed, where the manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility. Wood or wood products which have been treated with a hazardous chemical are covered by this procedure, and wood which may be subsequently sawed or cut, generating dust.

- Articles.

- Food or alcoholic beverages which are sold, used, or prepared in a retail establishment, or foods intended for personal consumption by employees while in the workplace.

- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when it is in solid, final form for direct administration to patient; drugs which are packaged by the manufacturer for sale to consumers in a retail establishment; and drugs intended for personal consumption by employees while in the workplace.

- Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace.

- Any consumer product or hazardous chemical, as defined by Consumer Product Safety Act and Federal Hazardous Chemicals Act, where the employer can show that it is used in the workplace for the purpose intended by the manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.

- Nuisance particulates where the manufacturer, distributor, or importer can establish that they do not pose any physical or health hazard covered under this procedure.

- Ionizing and nonionizing radiation.

- Biological hazards.

## 5.1 Hazardous Chemical Inventories

A complete list of all hazardous chemicals known to be present in the workplace that may expose an employee to a physical or health hazard will be maintained at each office location and project site. This list will be placed in the front section of the MSDS binder discussed in Section 5.4. The local health and safety representative/site safety officer will be responsible for maintaining the list and revising it as new chemicals are procured or when chemicals are no longer used and have been removed from the workplace. The identity of the hazardous chemical maintained on the list will be consistent with that

which appears on the MSDS. All affected employees will be made aware of the location of the MSDS binder.

### 5.2 Procurement of Hazardous Chemicals

Since the company does not typically manufacture, distribute, or import hazardous chemicals, procurement is the primary method of obtaining hazardous chemicals. The person initiating the procurement of a hazardous chemical will be responsible for requesting a MSDS from the manufacturer or distributor. This MSDS is to be provided either prior to or at the time of receipt of the chemical. Hazardous chemicals are strictly forbidden to be accepted without an accompanying MSDS. Upon receipt of a hazardous chemical, the person receiving the shipment will notify the local health and safety representative so that a review of the MSDS can be conducted. Also, note that the supplier is only required to submit a MSDS with the initial shipment of a hazardous chemical to a specific location.

In the unlikely event that a hazardous chemical is either manufactured, imported, or distributed by the company, the Vice President, Health and Safety will be notified so that required actions, as dictated by OSHA, can be implemented.

### 5.3 Container Labeling

Labeling on hazardous chemical containers is meant to provide immediate information to affected employees about the hazards of chemicals they will be expected to handle during the course of their job duties. It is the responsibility of the manufacturer, importer, or distributor of the chemical to ensure that each hazardous chemical leaving their place of business is labeled, tagged, or marked with the following information:

- Identity of the hazardous chemical (must be common to the label, the MSDS, and the chemical inventory list);
- Appropriate warnings of the hazardous effects of a chemical (words, pictures, symbols, or any combination that appears on the label and convey the specific physical or health hazards including target organ effects); and
- Name and address of the chemical manufacturer, importer, or other responsible party.

The person receiving the shipment is responsible to ensure that each container of hazardous chemical(s) has been provided with this labeling information. Hazardous chemicals that do not contain adequate labeling will not be accepted by the receiving person. In the event that hazardous chemicals that do not contain adequate labeling are inadvertently received, they are not to be handled until the identity of the material and appropriate hazard warnings are provided. If the hazardous chemical is regulated by a chemical-specific health standard, then it must be labeled in accordance with the requirements of that standard.

As long as the hazardous chemicals are maintained in their original, properly labeled container and their composition is not altered, there is no need for additional labeling. In the event that the chemical is transferred from a labeled container to an unlabeled portable container, the user must label this secondary container unless the container is intended for immediate use of the employee who performs the transfer. In this case, the container must be labeled with the identity of the chemical and the appropriate hazard warnings, as described above.

In locations where employees are present who only communicate in languages other than English, all labeling information must be presented in their language as well as in English.

### 5.4 Material Safety Data Sheets (MSDS)

MSDSs are written documents that convey specific, detailed information about the hazards associated with a specific chemical. It is the responsibility of the manufacturer, importer, or distributor to either provide MSDSs prior to shipment or with the shipped materials. The employee receiving the shipment of materials is responsible to ensure that a MSDS has been supplied. As described in Section 5.2, the employee initiating the procurement is responsible for requesting a MSDS from the manufacturer or distributor. In the event that a MSDS has not been provided, it is the responsibility of the receiving person to obtain one from the manufacturer or distributor as soon as possible. The material will not be handled prior to the receipt of a MSDS.

Each MSDS will be forwarded to the local health and safety representative/site safety officer or a designee who will then place a copy into a MSDS binder. This binder will be maintained in the workplace and updated as new materials arrive. The local health and safety representative/site safety officer will ensure that this binder is reviewed with all affected employees and is readily accessible during each work shift. A designated area for the storage of the binder will be established and all employees are to be informed of its location. Employees can request a personal copy of a MSDS by completing the Employee Request for MSDS form provided in Attachment 2. Where employees travel between workplaces during a work shift, the MSDSs may be kept at the primary workplace. Affected employees must be able to immediately obtain information from the MSDSs in the event of an emergency.

MSDSs will be in English and other languages, as necessary, for the particular employees in which the MSDSs will be used. MSDSs are to include the following information:

- Name, address, and telephone number of the responsible party;
- Identity of the chemical as it appears on the label;
- Hazardous ingredients;
- Physical and chemical characteristics;
- Physical and health hazards;
- Primary route(s) of entry;

- OSHA permissible exposure limit (PEL) or other applicable exposure limits;
- Carcinogen information;
- Safe handling and use information;
- Control measures;
- Emergency and first aid procedures; and
- Date of preparation and latest revision date.

## 5.5 Training

All affected employees will be provided with information and training on the hazardous chemicals in their work area at the time of their initial assignment, when new information about the hazards of a chemical is discovered, and whenever a new physical or health hazard that the employees have not previously been informed of is introduced into the workplace. The HAZCOM training record has been provided as Attachment 3.

Information provided in this training will include:

1. Requirements of the HAZCOM program.
2. Any operations in the work area where hazardous chemicals are present.
3. Location of written hazard communication program, listing of hazardous chemicals present and MSDS.
4. Methods and observations that may be used to detect the presence or release of hazardous chemicals by use of monitoring devices, visual appearance or odor.
5. The physical and health hazards of chemicals in the work area.
6. Protection measures to be utilized to prevent exposure, appropriate work practices, emergency procedures and proper PPE to be used.
7. Explanation of the labeling system and the MSDS and how employees can obtain and use the appropriate hazard information.

Training on this HAZCOM program may be satisfied by the use of two different types of training sessions. These sessions include:

- **Tailgate Safety Meetings** - These meetings will be used to convey the methods and observations that may be used to detect the presence or release of a hazardous chemical in the workplace, the physical and health hazards of the chemicals in the workplace, and the measures that can be taken to protect affected employees from these hazards. The guidelines for this meeting are described in Procedure HS051, Tailgate Safety Meetings.

- **Workplace-Specific or Annual Refresher Training** - Either of these training sessions can be used to convey the details of this HAZCOM program. These details include an explanation of labeling systems, the use of MSDSs, and how employees can obtain and use the appropriate hazard information. These training sessions are discussed further in Procedure HS050, Training Requirements.

Workplace-specific and tailgate safety meetings will be facilitated by the local health and safety representative or another individual who is knowledgeable on the requirements of the HAZCOM program and the specific chemicals that are being discussed. Annual refresher training can only be conducted by personnel previously approved by the company Training Department.

### 5.6 Trade Secrets

Some hazardous chemical manufacturers, importers, and distributors may withhold proprietary information required to be present on a MSDS. In such instances, the name and telephone number of the manufacturer, importer, or distributor will be forwarded to the Vice President of Health and Safety for further action. It will be the responsibility of the Vice President of Health and Safety to either obtain the necessary information or to decide to reject the chemical for use in company workplaces.

### 5.7 Contractors

During the execution of our work, there will be situations when the company will be at locations where employees of other entities may be exposed to chemicals being used by the company. It will be the responsibility of the local health and safety representative or designee to provide the other entities= site representative(s) with copies of all MSDSs in which their employees may be exposed, as well as the labeling system in place, the protective measures to be taken, safe handling procedures to be used, and the location and availability of the MSDS binder.

Periodically, company work areas will be located on or adjacent to a facility operated by another entity. In these situations, the local health and safety representative or designee will contact the other entity to obtain applicable MSDS(s) for hazardous chemicals that company employees may be exposed to.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS500 OSHA Regulated Toxic and Hazardous Chemicals
OSHA 29 CFR 1910.1200

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Request for MSDS

3. HAZCOM and Right-to-Know Standards Employee Training Record

# ATTACHMENT 1
# HAZARD COMMUNICATION PROGRAM

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | |
|---|---|---|---|---|---|---|
| | | Purchaser | Receiver | Affected Employee | Local Health and Safety Representative | EH&S Operations Manager |
| Understand and Comply With State and/or Local Regulations | 1.0 | | | | X | |
| Issuance, Revision, and Maintenance of Procedure | 3.1 | | | | | X |
| Review and Understand This Procedure | 5.0 | X | X | X | X | |
| Establish, Update, and Revise MSDS Binder | 5.1 | | | | X | |
| Request MSDSs for Procured Chemicals | 5.2 | X | | | | |
| Initial Review of MSDSs | 5.2 | | | | X | |
| Implement Requirements For Company Manufactured, Imported, or Distributed Chemicals | 5.2 | | | | | X |
| Review Incoming Shipments for Hazard Labeling/MSDS | 5.3 | | X | | | |
| Request Missing MSDSs From Manufacturer or Distributor | 5.4 | | X | | | |
| Provide HAZCOM Training | 5.5 | | | | X | |
| Receive HAZCOM Training | 5.5 | | | X | | |
| Obtain Information on Proprietary Chemicals | 5.6 | | | | | X |
| Transmit MSDSs to Contractors | 5.7 | | | | X | |
| Obtain MSDSs From Other Entities | 5.7 | | | | X | |

## ATTACHMENT 2

## EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Employee Name: (Please print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____

Signature Date

cc: Local Health and Safety Representative

ATTACHMENT 3

## HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS EMPLOYEE TRAINING RECORD

| | INITIAL: |
|---|---|
| 1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies. | |
| 2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training. | |
| 3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access. | |
| 4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations. | |
| 5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records. | |

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

# PROCEDURE

**Subject: MEDICAL POLICIES AND PROCEDURES**

## 1.0 PURPOSE AND SUMMARY

An effective medical surveillance program is a key element in the company's overall program to protect the health and safety of all employees and personnel working with us. Provisions are made for the following:

- Baseline exams;
- Annual exams;
- Exit exams;
- Disability/Medical Limitation Follow-up;
- Re-hiring former employees; and
- Temporary, contractor, and subcontractor personnel.

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    5.4.2 Medical Restrictions Issued
      5.4.2.1 No Impact on Duties
      5.4.2.2 Job Duties Impacted
  5.5 Disability Confirmation
  5.6 Re-hiring Former Employees
6.0 Exception Provisions
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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix can be found as Attachment 1 in Section 8.0.

## 4.0 DEFINITIONS

**Company** – all wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

## 5.0 TEXT

The purpose of a medical surveillance program is to protect the health of the employee, by working in conjunction with an effective hazard recognition and control program. The medical surveillance exam focuses on health effects related to the workplace. Employees covered are all of those who are or may be exposed to hazardous substances or health hazards at or above the Permissible Exposure Limit (PEL) or above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year. As well as all employees who wear a respirator for 30 days or more a year and any employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

Health Resources (800-350-4511) has been selected to manage the delivery of medical surveillance services. Jerry Berke, M.D., M.P.H. has been designated as the company's consulting Medical Director.

### 5.1 Medical Protocols

The company's Medical Surveillance Program consists of various examination modules which differ based upon the employees' job duties and whether it is for baseline, annual update, or exit examination purposes. (See Tabular Protocol, Attachment 2).

The company's examination modules include Pre-placement, Laboratory, Field Exposure, Field Exposure (Trans.) - for DOT Drivers, Field Exposure/Asbestos, and Asbestos. All employees are subject to the specified Baseline examination based on their duties. Baseline examinations are administered on a post offer of employment/pre - placement basis. All incumbent employees whose duties involve <u>potential</u> exposure to safety or health hazards are subject to the specified Annual Update examination, and to the specified Exit examination. (Note: The Exit exam may be waived if the most recent exam on file is less than 6 months old.). Medical exam clearances can be extended for one year pending Health Resources review of the medical extension form.

All employees entering the asbestos-monitoring program must remain in the program while employed by the company, or until such time as an HS professional has documented the employee was never exposed to asbestos in excess of the Permissible Exposure Limit (PEL) during his/her employment with the company.

All employees are subject to drug/alcohol testing required by law, for pre-hire, whenever "reasonable suspicion" of substance abuse exists, when they consent to participate in client-specific programs, for post accident/incident cases and wherever random testing is required either by client-specific programs, company policy, or federal programs. (See Procedure HS101 for more information.)

**5.1.1 Temporary, Contractor, and Subcontractor Personnel.** All employees in this category are subject to the same medical and drug and alcohol testing requirements that would be applicable if a company employee were doing the work.

## 5.2 Local Administration

The local management of the medical surveillance program is the responsibility of the HS Assistant serving each region. This person will work at the direction of the HS professional for purposes of medical surveillance administration. They are responsible for scheduling medical examinations requested by either the HR department or identified on the Health Resources notification lists, receiving medical clearances, communicating medical status information to management, and obtaining management and employee signatures on each medical clearance which identifies restrictions.

## 5.3 Scheduling

**5.3.1 Baseline.** All baseline examinations are conducted strictly upon a post-offer of employment/pre-placement basis. In order to verify that Human Resources have made a formal offer of employment, the HS Assistant is to accept requests for baseline examinations only from Human Resources. Note: The offer letter from Human Resources must be conditional upon a negative drug and alcohol test and being found medically fit for the offered position.)

Baseline examinations done at the inception of employment with the company which result in a positive drug and alcohol test, shall result in the immediate withdrawal of the conditional offer of employment.

HS Assistants are required to keep a supply of examination forms appropriate for the type(s) of employee classifications at their location. Health Resources can be contacted at 800-350-4511 to replenish supplies.

**5.3.2 Annual Updates.** Each month, Health Resources will provide each HS Assistant with a "notification" list of employees due for annual update exams during the coming month, and those employees due from previous periods who have not yet completed their examination.

**5.3.3 Exit.** Exit examinations are required for all employees leaving the company, except those classified "administrative", unless their most recent exam is less than six months old.

**5.3.4 Examinations Conducted Away from the Employees Home Base.** Health Resources Customer Service Department must be contacted to identify the nearest available clinic in their network to service our needs. If no nearby clinic is available, Health Resources can be asked to locate and prepare a nearer clinic to serve the company (there may be an added charge for this service).

## 5.4 Medical Clearance

Clearances will be issued by Health Resources within approximately five business days post exam. It will be sent directly to the local HS Assistant. The HS Assistant is responsible for coordinating requests for retests or additional tests, for obtaining the signatures of the manager and employee on the clearance, and placing the document in the employee's Medical/Exposure Monitoring file.

It is important to note that medical clearances are not confidential medical records. They are designed and intended to communicate employee medical status to management.

**5.4.1 Medical Restrictions Issued.** Whenever a restricted medical clearance is issued, the HS Assistant shall advise the location HS professional and Human Resources representative. The HS and HR representatives will meet with the manager to determine if the medical restriction will have an impact on the employee's ability to perform the essential duties of the intended job.

**5.4.1.1 No Impact on Job Duties.** If the medical limitation is found not to have an impact on the ability to meet essential job functions, the procedures in section 5.4.1 are followed.

**5.4.1.2 Job Duties Impacted.** If a preliminary review indicates that the individual's medical status, as reflected in prescribed medical limitations, will negatively impact their ability to perform the intended job, then the steps listed below must be taken:

1. Consult with Dr. Jerry Berke (the company's Consulting Medical Director) regarding the individual's specific medical status and the essential functions of their job (reference the company's job description).

   If it appears initially that the individual is medically not fit to perform the essential functions of the job, an evaluation of whether the person can perform the essential functions with a reasonable accommodation, pursuant to step 2 shall be made.

   If after evaluation of reasonable accommodations/alternatives, the individual cannot perform the essential functions of the job, placement or continued work in that position is prohibited. Go to step 3.

2. Reasonable Accommodation Evaluation

When an individual is qualified to perform the essential functions of the job, but requires an accommodation (e.g. job restructure, facility changes, provide special equipment, provision of interpreters, etc.) to safely enter the workplace and perform, the manager with the HS and HR representatives will meet with the individual to discuss their specific physical and/or mental limitations and abilities. The purpose is to identify specific potential accommodations that could be made.

Once potential accommodations have been identified, they must be evaluated to determine whether they enable the individual to perform essential job functions, without requiring the company to incur an undue hardship. Following this evaluation, the most promising accommodation(s) must be subjected to a safety review. **Before implementation of any accommodation it must be determined that it will not create a current specific threat of substantial harm to any employee or other work associate.** The safety review shall include reasonable medical judgement that relies on the most current medical knowledge and/or the best objective evidence.

3. Alternate Position Evaluation
When an acceptable reasonable accommodation cannot be identified for the individual to perform the essential functions of their job, the Human Resources Department will seek to identify alternate available positions for which the individual is qualified. The HS staff will be responsible for reviewing the essential functions of any new position with the company's Medical Director to verify that the individual is capable of performing them, and to verify that safety requirements can be met.

**5.5 Disability Confirmation**

When an individual claims to have a disability and requests accommodation, the company is entitled to have the individual examined by a physician to confirm the disability and to evaluate its impact on the ability to perform essential job functions. This examination shall be coordinated by the company's Medical Director to verify that authorized scope is not exceeded.

**5.6 Re-hiring Former Employee**

When a former employee is being re-hired, if the most current company medical examination is less than six months old *and* the location HS professional can confirm that the individual was not subject to hazardous exposures during the non-company employment, the HS professional can choose to waive a new Baseline exam. Annual update will be based on the most recent exam date, not hire date.

All returning former employees shall be subject to drug and alcohol testing at the time of re-hire.

## 6.0 EXCEPTION PROVISIONS

(None Permitted)

## 7.0 CROSS REFERENCES

HS101: Drug and Alcohol Testing
HS102: Access to Employee's Exposure and Medical Records
HS105: Occupational Injuries/Illnesses Procedures

*Technical Assistance Manual for the Americans With Disabilities Act* by the Equal Opportunity Employment Commission.

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Health Resources Tabular Protocol
3. Request for Extension of Medical Surveillance Requirements

## ATTACHMENT 1
## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Employee | HS Professional | HS Asst. | Medical Director | Health Resources | HR | Mgr. |
| Submit to required medical evaluations | 5.1 | X | | | | | | |
| Require temporary, contractor, subcontractor personnel to meet company's medical requirements | 5.1.1 | | | | | | | X |
| Local medical surveillance coordination/ Administration | 5.2 | | X | X | | | | |
| Schedule examinations | 5.3 - 5.4 | | | X | | | | |
| Issue medical clearances | 5.4 | | | | | X | | |
| Obtain management/ associate signatures | 5.4 | | | X | | | | |
| Investigate disability claims, medical restrictions, transfers, accomodations | 5.4.2 | X | X | | X | | X | X |
| Confirm disabilities (medically) | 5.5 | | X | | X | | | |
| Decide on exam waiver for re-hires | 5.6 | | X | | | | | |

# ATTACHMENT 2

## TABULAR PROTOCOL - EXIBIT A

| MODULE | Hyst. & Phys w/ Dipstick UA, Vision Vital Signs | Spiro | Audio | EKG | Chest X-Ray | Bio Chem | Bio Tox | Drug Screen |
|---|---|---|---|---|---|---|---|---|
| **BASELINE** | | | | | | | | |
| Laboratory | X | | | | | X | | DS 10 |
| Laboratory (Neg. Pres. Respirator) | ! | ! | | | | ! | | DS 10 |
| Field Exposure | X | X | X | X | X | X | | |
| Field Exposure (Trans) | X | X | X | X | X | X | | N |
| Field Exposure/Asbestos | X | X | X | X | X# | X | | DS 10 |
| Field Exposure (Trans) Asbestos/Lead | X | X | X | X | X# | X | 6014 | DS 10 |
| Asbestos | X | X | X | X | X# | X | | DS 10 |
| **Six Months** | | | | | | | | |
| Blood Lead | | | | | | | 6014 | |
| **Annual** | | | | | | | | |
| Laboratory | X | | 2Y | X | 5Y | X | | |
| Laboratory (Neg. Pres. Respirator) | ! | ! | | | | ! | | |
| Manufacturing (no respirator use) | | | | | 5Y | X | | |
| Field Exposure | X | X | X | X | 5Y | X | | N/R |
| Field Exposure (Trans) | X | X | X | X | 5Y | X | | |
| Field Exposure (Asbestos) | X | X | X | X | # | X | 6014 | |
| Field Exposure (Trans) Asbestos/Lead | X | X | X | X | # | X | | |
| Asbestos | X | X | X | X | # | X | | |
| **Exit** | | | | | | | | |
| Laboratory | X | X | | | 1Y | X | | |
| Manufacturing | X | X | X | | 1Y | X | | |
| Field Exposure | X | X | X | | 1Y | X | | |
| Field Exposure (Trans) | X | X | X | | 1Y | X | | |
| Field Exposure/Asbestos | X | X | X | | 1Y# | X | 6014 | |
| Field Exposure/Asbestos/Lead | X | X | X | | 1Y# | X | 6014 | |
| Asbestos | X | X | X | | 1Y# | X | | |

# TABULAR PROTOCOL
Exhibit A-2

## Tabular Protocol Legend

| | |
|---|---|
| | At MD discretion |
| # | X-Ray film sent to Health Resources for ILO reading |
| **Y** | Yearly frequency |
| **N** | NIDA drug screen |
| **NL** | NIDA-Like drug screen (5 drugs only) |
| **N/R** | NIDA Random drug screen |
| **DS 10** | 10 drugs |

**NOTE:** All non-NIDA drug and alcohol tests shall follow the protocols in Shaw E & I procedure HS 101 (Exhibit E).

**ASBESTOS CXR SCHEDULE**

| | *Years of Exposure* | Employee Age 15-35 | Employee Age 35-45 | Employee Age 45+ |
|---|---|---|---|---|
| *Frequency of Testing (Y) years* | 0-10 | 5Y | 5Y | 5Y |
| | 10+ | 5Y | 2Y | 1Y |

**CALOSHA ASBESTOS CXR SCHEDULE**

| | *Years of Exposure* | Employee Age < 40 | Employee Age > 40 |
|---|---|---|---|
| *Years of Exposure (Y) years* | 0-10 | 3Y | 1Y |
| | 10+ | 1Y [x] | 1Y [x] |

**NOTE:** CALOSHA requires a three (3) view CXR for asbestos clearance
[x] Oblique view every three years

# TABULAR PROTOCOL
# EXHIBIT A-3
# DRUG SCREENS

| NIDA-LIKE DRUG SCREEN | |
|---|---|
| Marijuana | Cocaine |
| Amphetamines | Opiates |
| PCP | |
| *Includes the NIDA chain of custody procedures and all of the guidelines of the Department of Health and Human Services. The Medical Review Officer (MRO) services are included.* | |

| DS 10 DRUG SCREEN | |
|---|---|
| Amphetamines | Marijuana metabolites |
| Barbiturates | Methadone |
| Benzodiazepines | Methaqualone |
| Cocaine Metabolites | Opiates |
| | Phencyclidine |
| | Propoxyphene |

| REASONABLE CAUSE DRUG SCREEN | |
|---|---|
| Amphetamines | Marijuana metabolites |
| | Methadone |
| | Methaqualone |
| | Opiates |
| | Phencyclidine |

| BIOTOX PANEL 6014 | |
|---|---|
| Lead | Zinc Protoporphyrin |

# ATTACHMENT 3
# REQUEST FOR EXTENSION OF MEDICAL REQUIREMENTS

Employee Name: (print) _____

Social Security Number: _____

Date of Last Physical: _____

Health & Safety Assistant: _____

**Please answer each question below and obtain the indicated signatures. The completed form MUST be faxed to Health Resources, Shaw E&I's medial service provider, at 781-938-4678 prior to your next scheduled annual physical exam.**

| | Yes | No | Unsure |
|---|---|---|---|
| 1. I have spent 30 days or more in the field within the past year on hazardous waste contaminated sites or in a laboratory with exposure, with potential exposure above permissible exposure limits. (PEL's) | | | |
| 2. I expect to work 30 days or more in the field in the upcoming year on hazardous waste contaminated sites or in the laboratory. | | | |
| 3. As a result of work activities in the last twelve months, I was required to wear a respirator for 30 days or more. | | | |
| 4. As a result of scheduled work activities, I anticipate being required to wear a respirator for 30 days or more during the next twelve months. | | | |
| 5. I have worked on a project site during the lat year where the health and safety plan required the use of hearing protection. | | | |
| 6. I have had a change in my medical status in the last year (e.g. surgery, medical treatment, medical diagnosis, etc.) | | | |

**If you have answered YES to any of the above, please explain, in detail, below and/or on the back of this page (i.e. chemical, physical, biological, or ergonomic exposures.)**

_____

_____

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Health & Safety or Supervisor Signature Date

_____

Health & Safety or Supervisor Name (print)

# PROCEDURE

**Subject:** **DRUG AND ALCOHOL TESTING**

## 1.0 PURPOSE AND SUMMARY

The company is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, "look alikes", or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

All employees of the company shall be subject to drug and alcohol testing as described herein. Essential provisions of this procedure include:

- Pre-employment testing for all prospective employees;
- Testing when employee behavior creates "reasonable suspicion" of being under the influence of drugs or alcohol;
- Contractors and subcontractors are required to document that they maintain a substance abuse prevention program with effectiveness comparable to the company program;
- Testing in compliance with U.S. Department of Transportation (DOT Highway/Pipeline) and U.S. Department of Energy (DOE) requirements for regulated employees;
- Client-specific drug and alcohol testing requirements (see Attachment 17);
- Repeating an individual test is specifically prohibited except under certain defined conditions; and
- Training requirements.

DOT testing requirements are found in Sections 5.1 (Drug) and 5.2 (Alcohol), while company requirements are found in Section 5.3. **SECTION 5.3.2 CONTAINS AN EASY REFERENCE TABLE THAT SUMMARIZES THE TYPES OF TESTING AND WHICH EMPLOYEES ARE SUBJECT TO EACH TYPE OF TESTING.**

**NOTE:** When setting up a client-specific, DOT, DOE, or pipeline pool of employees, a list **must** be submitted to the Vice President, Health & Safety. Any/all subsequent changes (additions and deletions) must be communicated to the Vice President as soon as possible.

## 2.0 TABLE OF CONTENTS

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5.0 Text
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- 5.4 Department of Energy (DOE) Testing Requirements
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7.0 Cross References

8.0 Attachments

## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

Responsibility Matrix is Attachment 1 in Section 8.0.

## 4.0 DEFINITIONS

### 4.1 Drug Misuse Prevention Plan (DMPP) Definitions

For purposes of this anti-drug plan, the following definitions apply:

**Accident**

An incident reportable under Part 191 involving gas pipeline facilities or LNG facilities or an accident reportable under Part 195 involving hazardous liquid or carbon dioxide pipeline facilities.

- **§ 191.3 - An accident on a gas pipeline or LNG facility is defined as an "incident", as follows:**

  A. An event that involves a release of gas from a pipeline or of liquefied natural gas or gas from an LNG facility and:

     (1) A death or personal injury necessitating inpatient hospitalization; or

     (2) Estimated property damage, including cost of gas lost, to the operator or others, or both, of $50,000 or more.

  B. An event that results in an emergency shutdown of a LNG facility.

  C. An event that is significant, in judgement of the operator, even though it did not meet the criteria of paragraphs 1 and 2 above.

- **§ 195.50 - An accident report is required for each failure in a pipeline system in which there is a release of the hazardous liquid or carbon dioxide transported resulting in any of the following:**

  A. Explosion or fire not intentionally set by the operator.

  B. Loss of 50 or more barrels of hazardous liquid or carbon dioxide.

  C. Escape to the atmosphere of more than five barrels a day of highly

volatile liquids.

D. Death of any person.

E. Bodily harm to any person resulting in one or more of the following:

(1) Loss on consciousness;
(2) Necessity to carry the person from the scene;
(3) Necessity for medical treatment; or
(4) Disability which prevents the discharge of normal duties or the pursuit of normal activities beyond the day of the accident.

F. Caused estimated property damage, including cost of clean-up and recovery, value of lost product, and damage to the property of the operator or others, or both, exceeding $50,000.

**Blind Sample**
A urine specimen submitted to a laboratory for quality control testing purposes, with a fictitious identifier, so that the laboratory cannot distinguish it from employee specimens, and which is spiked with known quantities of specific drugs or which is blank, containing no drugs.

**Chain-of-Custody**
Procedures to account for the integrity of each urine specimen by tracking its handling and storage from point of specimen collection to final disposition of the specimen. These procedures shall require that an appropriate drug testing custody form from a Department of Health and Human Services (DHHS) certified laboratory be used from time of collection to receipt by the laboratory.

**Collection Site**
A designated clinic/facility where applicants or employees may present themselves for the purpose of providing a specimen of their urine to be analyzed for the presence of drugs.

**Collection Site Person**
A person who instructs and assists applicants and employees through the specimen collection process.

**Commercial Motor Vehicle**
Any self-propelled or towed vehicle used on public highways in interstate commerce to transport passengers or property when:

- The vehicle has a gross vehicle weight rating or gross combination weight

rating of 10,001 or more pounds;

- The vehicle is designed to transport more than 16 passengers, including the driver; or
- The vehicle is used in the transportation of hazardous materials in a quantity requiring placarding under DOT or other highway safety regulations.

**Company**
An organization or commercial enterprise that uses this anti-drug plan.

**Confirmation Test**
A second analytical procedure to identify the presence of a specific drug or metabolite which is independent of the initial test and which uses a different technique and chemical principle from that of the initial test in order to ensure reliability and accuracy. Gas chromatography/mass spectrometry (GC/MS) is the only authorized confirmation method for cocaine, marijuana, opiates, amphetamines, and phencyclidine (PCP).

**Covered Employee**

1. Any person who performs on a pipeline or LNG facility an operating, maintenance, or emergency response function regulated by Parts 192, 193, or 195. Such person may be employed directly by the operator, or by a contractor engaged by the operator. As applied in the regulations, "employee" and "applicant for employment" have the same meaning for the purpose of these requirements. Clerical, truck driving, accounting, or other job functions not covered by Parts 192, 193, and 195 are not subject to the regulations.

2. Employees or contract drivers (used for 90 days or more in any period of 365 days) who hold a CDL and/or operate a commercial motor vehicle.

**Covered Function (safety-sensitive function)**
An operation, maintenance, or emergency-response function that is performed on a pipeline or LNG facility and the function is regulated by Parts 192, 193, or 195.

**DOE Testing Designated Position**
A position whose incumbents are subject to drug testing under DOE regulations.

**DOT Reportable Accident**
An occurrence involving a commercial motor vehicle operating on public road which results in:

- A fatality ("fatality" means any injury which results in the death of a person at the time of the accident or within 30 days of the accident);
- Bodily injury to a person who, as a result of the injury, immediately receives

medical treatment away from the scene of the accident and a citation for a moving violation; or

- One or more vehicles incurring disabling damage as a result of the accident, requiring the vehicle(s) to be transported away from the scene by a tow truck or other vehicle ("disabling damage" is damage which precludes departure of a vehicle from the scene of the accident in its usual manner in daylight after simple repairs) and a citation for a moving violation.

**Exempt Employee**
Employees hired prior to April 1, 1985 who are not subject to DOT or DOE testing, and who have not consented to client-specific testing, are exempt from company testing requirements.

**Fail a Drug Test or Test Positive**
The confirmation test result shows positive evidence of the presence under DOT procedures of a prohibited drug in the employee or applicant's system.

**Initial Test**
A screening to eliminate "negative" urine specimens from further consideration.

**Medical Review Officer (MRO)**
A licensed physician responsible for receiving and reviewing laboratory test results. The MRO is responsible for ensuring that all requirements of 49 CFR Parts 40, 199, and 382, and 10 CFR Part 707 are met, with respect to sample collection, sample handling, analysis, reviews of results, follow-up, retention of positive samples, and shipment of samples for retesting.

**Operator**
An owner or operator of pipeline facilities.

**Pass a Drug Test or Test Negative**
That initial testing or confirmation testing under DOT procedures does not show evidence of the presence of a prohibited drug in the employee's or applicant's system.

**Pipeline**
All parts of the physical facilities through which product moves in transportation. This includes pipe, valves, and other appurtenances attached to pipe, compressor units, metering stations, delivery stations, holders, and fabricated assemblies.

**Pipeline Facilities**
Includes new and existing pipeline, rights-of-way, and any equipment, facility, or building used in the transportation of products.

**Prohibited Drug**
Marijuana, cocaine, opiates, phencyclidine, and amphetamines.

**Refusal to Submit**
Refusal by an individual to provide a urine sample after receiving notice of the requirement to be tested in accordance with the company's anti-drug program.

**Safety Sensitive Position**
Any position wherein the employee has regular job duties where their actions or failure to act could cause major or severe incidents resulting in harm to self, other employees, the public, or the environment. **Placement in this category requires the prior approval of the company Legal Department, except where defined by law or per written employee consent.**

For DOE purposes only, this classification includes employees engaged in the production, use, storage, transportation or disposal of hazardous materials sufficient to cause significant harm to environmental or public safety.

**SAMHSA**
Substance Abuse and Mental Health Services Administration, formerly National Institute on Drug Abuse (NIDA), was established by the Department of Health and Human Services in 1986 to regulate laboratories performing analytical tests (drug tests) on human body fluids for employment purposes in the public sector.

## 4.2 Alcohol Misuse Prevention Plan (AMPP) Definitions

**Accident** means an incident reportable under Part 191 involving gas pipeline facilities or LNG facilities or an accident reportable under Part 195 involving hazardous liquid pipeline facilities.

A. 49 CFR 191.3: An accident on a gas pipeline or LNG facility is defined as an "incident," as follows:

1. An event that involves a release of gas from a pipeline or of liquefied natural gas or gas from an LNG facility and:

   a. A death, or personal injury necessitating inpatient hospitalization; or
   b. Estimated property damage, including cost of gas lost, to the operator or others, or both, of $50,000 or more.

2. An event that results in an emergency shutdown of an LNG facility.

3. An event that is significant, in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2).

B. § 195.50: An accident report is required for each failure in a pipeline system in which there is a release of the hazardous liquid or carbon dioxide transported resulting in any of the following:

1. Explosion or fire not intentionally set by the operator.
2. Loss of 50 or more barrels of hazardous liquid or carbon dioxide.
3. Escape to the atmosphere of more than five barrels a day of lightly volatile liquids.
4. Death of any person.
5. Bodily harm to any person resulting in one or more of the following:

    a. Loss of consciousness;
    b. Necessity to carry the person from the scene;
    c. Necessity for medical treatment; or
    d. Disability which prevents the discharge of normal duties or the pursuit of normal activities beyond the day of the accident.

6. Caused estimated property damage, including cost of clean-up and recovery, value of lost product, and damage to the property of the operator and others, or both, exceeding $50,000.

**Air Blank** means a reading by an evidential breath testing (EBT) device of ambient air containing no alcohol.

**Alcohol** means the intoxicating agent in beverage alcohol, ethyl alcohol or other low molecular weight alcohols including methyl or isopropyl alcohol.

**Alcohol concentration** means the alcohol in a volume of breath expressed in terms of grams of alcohol per 210 liters of breath as indicated by an evidential breath test conducted under the federal regulations.

**Alcohol Use** means the consumption of any beverage, mixture, or preparation, including any medication, containing alcohol.

**Breath Alcohol Technician (BAT)** means an individual who instructs and assists individuals in the alcohol testing process and operates an EBT.

**Canceled or invalid test** means a test that is deemed to be invalid as listed in Attachment 5.

**Company** means all wholly-owned subsidiaries of Shaw E & I.

**Confirmation Test** means a second test following a screening test with a result of 0.02 or greater that provides quantitative data of alcohol concentration.

**Covered employee** means any person who performs on a pipeline or LNG facility an operating, maintenance, or emergency response function regulated by Parts 192, 193, or 195. Such persons may be employed directly by the company, or by a contractor engaged by the company. Clerical, truck driving, accounting, or other job functions not covered by Parts 192, 193, and 195 are not subject to the regulations.

**Covered Function** (safety sensitive function) means an operation, maintenance, or emergency response function that is performed on a pipeline or LNG facility and the function is regulated by Parts 192, 193, or 195, and holders of Commercial Drivers Licenses under Part 382.

**EBT (or evidential breath testing device)** means an EBT approved by the National Highway Traffic Safety Administration (NHTSA) for the evidential testing of breath and placed on NHTSA's "Conforming Products List" (CPL) of evidential breath measurement devices.

**Missed Tests** means any test that is not administered within 8 hours time period. These tests must be reported to RSPA annually and must be submitted with the annual Management Information System (MIS) Data Collection forms.

**Operator** is defined as an owner or operator of pipeline facilities.

**Performing** a covered function is when a safety-sensitive function is being carried out by an employee. This would be considered any person who is actually carrying out the function, ready to carry out the function or immediately available to carry out the function.

**Pipeline** means all parts of the physical facilities through which a product moves in transportation. This includes pipe, valves, and other appurtenances attached to pipe, compressor units, metering stations, delivery stations, holders, and fabricated assemblies.

**Pipeline Facilities** means pipeline, rights-of-way, and any equipment, facility, or building used in the transportation of a product.

**Prohibited Conduct** means anyone who has an alcohol concentration of 0.04 or greater, who has used alcohol within 4 hours of reporting for duty and anyone who has used alcohol on-duty.

**Refusal to Submit (to an alcohol test)** means that a covered employee fails to provide an adequate breath for testing without a valid medical explanation after receiving notice of the requirement to be tested in accordance with the provisions of 49 CFR Part 199 and the company's alcohol misuse prevention plan, or engages in conduct that clearly obstructs the testing process.

**Screening test (or initial test)** means an analytic procedure to determine whether an employee may have a prohibited concentration of alcohol in a breath specimen.

**Screening Test Technician (STT)** means an individual who has successfully completed an approved Department of Transportation non-evidential training course and who will conduct alcohol screening tests in accordance with Part 199 and 40.

**State Agency** means an agency of any of the several states, the District of Columbia, or Puerto Rico that participates under Chapter 601, 49 United States Code.

**Substance Abuse Professional (SAP)** means a licensed physician (Medical Doctor or Doctor of Osteopathy), or a licensed or certified psychologist, social worker, employee assistance professional, or addiction counselor (certified by the National Association of Alcoholism and Drug Abuse Counselors Certification Commission or by the International Certification Reciprocity Consortium/Alcohol & Other Drug Abuse). All must have knowledge of and clinical experience in the diagnosis and treatment of alcohol and controlled substance-related disorders.

## 5.0 TEXT

All persons to be employed by the company are subject to successful completion of drug and alcohol testing prior to being hired. This testing is coordinated by the Health & Safety Department, who advises the candidate of the testing requirements for their particular position.

The Medical Review Officer (MRO) for all aspects of the company Drug and Alcohol Testing Program is:

Dr. Jerry Berke
Health Resources
600 West Cummings Park
Suite 3400
Woburn, MA 01801
800-350-4511

**All employees being tested under the provisions of Section 5.1 and 5.2 (DOT testing) shall be provided with a copy of this procedure when they first enter the program and**

**whenever revisions to this procedure are issued. The company will not falsely represent that drug or alcohol tests are conducted under the provisions of DOT requirements. Regulations call for identifying all positions covered by DOT testing; however, at any time most employees in any job category are not performing regulated work. Therefore, all employees excluding clerical and administrative personnel, meeting the definition of "Pipeline Operations Employee", "Drivers subject to testing", "Covered Employee", or direct supervisors of such employees, in Section 4.0 are subject to the requirements of this section, during that period of time in which they are performing regulated tasks.**

## 5.1 Drug Misuse Prevention Plan (DMPP)

### 5.1.1 Prohibited Drug Policy

- The company has a long-standing commitment to maintain the highest standards for employee safety and health and the use of controlled substances is contrary to these high standards.

- This policy is also to bring the company into compliance with federal law. The purpose of the anti-drug plan is to reduce accidents that result from the use of controlled substances, thereby reducing fatalities, injuries, and property damage.

- The presence in the body of prohibited substances is not condoned.

### 5.1.2 Implementation of Anti-Drug Plan

- The company has implemented the Research and Special Programs Administration, Drug Testing Regulations as set forth in 49 CFR Part 199, the Department of Transportation, Procedures for

- Transportation Workplace Drug Testing Programs as set forth in 49 CFR Part 40, and the Federal Motor Carrier Safety Administration regulations.

- Implementation of the anti-drug plan was effective on August 24, 1995.

### 5.1.3 Background

- The catalyst for the anti-drug plan is Title 49 Code of Federal Regulations (CFR) Part 199 which requires pipeline operators and their contractors who are subject to 49 CFR Parts 192, 193, 195, and 385 to test their employees for prohibited drugs under the

following work-related conditions:

- Pre-Employment;
- Post-Accident;
- Random;
- Reasonable Cause; and
- Return-to-Duty.

- Title 49 CFR Part 40 specifies procedures which must be followed by the company when conducting drug testing pursuant to regulations issued by agencies of the Department of Transportation (DOT).

### 5.1.4 Company Responsibilities

**5.1.4.1** Drug Program Manager (DPM) - Appendix A contains the name, address, and phone number of the responsible individual(s). The DPM or other company designated individual shall be responsible for the preparation of a drug testing anti-drug plan which complies with requirements of the Department of Transportation regulations as set forth in 49 CFR Parts 199 and 40. The DPM shall be responsible for providing oversight and evaluation on the plan; providing guidance and counseling; reviewing of all discipline applied under this plan for consistency and conformance to human resources policies and procedures; scheduling random drug testing and return-to-duty testing; and maintaining a locked file system on drug testing results. The company shall ensure that all covered employees are aware of the provisions and coverage of the company's anti-drug plan.

5.1.4.2 Supervisors - Company individuals responsible for observing the performance and behavior of employees; observation/ documentation of events suggestive of reasonable cause; responsible for requests of second supervisor for substantiation and concurrence for reasonable cause testing, if applicable.

5.1.4.3 Employees - Each employee has the responsibility to be knowledgeable of the requirements of the company's anti-drug plan and to fully comply with the provisions of the plan.

5.1.4.4 **The use or possession of alcoholic beverages while on company property, or in any company vehicle, or on company time, including breaks or lunch, paid or unpaid, on any shift, is strictly prohibited.**

**Those areas of the plan that appear in bold and underlined print reflect this company's independent authority to require additional provisions with regard to the alcohol testing procedures.**

### 5.1.5 Drug Testing Requirements

#### 5.1.5.1 Applicability

- Individuals Subject to Drug Testing - Any applicant/employee who would perform on a pipeline an operating, maintenance, or emergency response function regulated by Part 192, 193, or 195, and operators of commercial motor vehicles as addressed in Part 382, would be subject to drug testing under this program. This does not include clerical, truck driving, accounting, or other functions not subject to Part 192, 193 or 195, except where Part 382 applies. The person may be employed by the operator, be a contractor engaged by the operator, or be employed by such a contractor. Refer to Attachment 12 for specific employee titles subject to testing under this program.

- Procedure for Notifying Employees - This anti-drug testing plan shall be included in the Policy and Procedures Manual. Upon receipt of the company's anti-drug plan, each manager shall post the plan in a prominent location that is readily accessible to all covered employees. All covered employees will be provided a complete copy of the anti-drug plan.

- Substances for Which Testing Must Be Conducted - The company shall test each employee who performs a function listed in Attachment 12 for evidence of the following substances:

  - Marijuana
  - Cocaine
  - Opiates
  - Phencyclidine
  - Amphetamines

#### 5.1.5.2 Drug Tests Required

- Pre-Employment Testing - A pre-employment drug test must be conducted before an individual is hired or contracted and when an individual is transferred/promoted from a non-covered to a covered position. This also applies to employees returning from a leave of absence who have not been participating in the anti-drug plan and subject to the

random selection process. A negative test result is required prior to performing covered functions

- Post-Accident Testing

  - The company shall promptly determine if the employee's performance contributed to the "accident" or cannot be completely discounted as a contributing factor to the accident. Each of these employees shall be drug tested as soon as possible but no later than 32 hours after the accident. The company must take all reasonable steps to obtain a urine specimen from an employee after an accident, as defined above, but any injury should be treated first.

  - If an employee is conscious (employee can communicate) and he/she is able to evidence consent (employee able to sign custody and control form) to the drug test and is able to void normally (without aid of catheters), the specimen shall be collected.

  - If an employee who is subject to post-accident testing is conscious, able to urinate normally (in the opinion of a medical professional), and refuses to be tested, the employee must be removed from duty in accordance with 49 CFR Part 199:9 and 382.

  - A company shall develop written procedures/guidelines for employees and supervisors who are involved in accident situations which require post-accident testing.

  - A company may decide not to test under the post-accident provisions, but such a decision must be based on the best information available immediately after the accident that the employee's performance could not have contributed to the accident, or that, because of the time between that performance and the accident, it is not likely that a drug test

would reveal whether the performance was affected by drug use.

- The following steps will be used to guide the supervisor to a satisfactory outcome in a post-accident situation.

1. Verify the post-accident decision - Does the definition of accident in Section 4.1 apply to the current situation (for either Pipeline or Highway)? Does the possibility exist that the employee's performance contributed to the accident or cannot be completely discounted as a contributing factor to the accident? Anonymous tips must be taken seriously, but should not be the sole reason to initiate a request for a specimen. If witnesses saw a specific event or behavior, ask them to describe what they saw. How far away were they? Before proceeding further, obtain approval from the division manager/department head or designee, and Human Resources, to proceed with post-accident testing.

2. Isolate and inform the employee - Remove the employee from the covered position or work place. Explain that you have reason to believe their performance contributed to the accident or cannot be completely discounted as a contributing factor to the accident.

3. Transport the employee - The potentially affected employee will not be allowed to proceed alone to or from the collection site. In addition to the safety concerns for the employee, accompanying the employee also assures that there is no opportunity en route to the

collection site for the employee to ingest anything that could affect the test result or to acquire "clean" urine from another person.

4. Document the events - Record the activity performed that supports the determination to conduct a post-accident test. This documentation of the employee's activity should be prepared and signed by the supervisor within 24 hours of the accident or before the results of the tests are released, whichever is earlier, if possible.

5. Denial should be an expected reaction - If a person knows they will test positive, they may give many explanations and protestations, wanting to avoid drug testing. If they are not under the influence or affected by a prohibited drug, vehement denial also would be expected. Listen to the employee and carefully evaluate the employee's explanation. Remember, a request for urine specimen is not an accusation; it is merely a request for additional objective data. To the employee it may feel like an accusation, so it is important to stress that this is merely a request for additional data.

6. Following collection - After returning from the collection site, the employee should not be allowed to perform covered functions pending the results of the drug test.

- Random Testing- The primary purposes of

random testing are to deter prohibited drug use and to ensure a drug free workforce. DOT regulations require that covered employees shall be subject to drug testing on an unannounced and random basis. The company shall conduct a number of tests equal to at least 50* percent of all covered employees each calendar year, spread reasonably over a 12-month period. The company will conduct random selection and testing on a quarterly schedule.

- The following is a discussion of the key aspects of the random testing selection process.

  1. Employees remain in the random selection pool at all times, regardless of whether or not they have been previously selected for testing.

  2. Employees shall be selected for testing by using a computer-based random number generator or equivalent random selection method that is matched with an employee's social security number or employee ID number.

  3. The process will be unannounced as well as random. Employees will be notified that they have been selected for testing and should report immediately to the collection site.

  4. Employees will be selected for random testing based on the number of covered employees at the time and the necessary testing rate.

  5. Specimen collection will be conducted on different days of the week throughout the annual

cycle to prevent employees from matching their drug use patterns to the schedule for collection.

- The steps for random testing are:

  1. The DPM (or designee), on a pre-determined date, shall use the random selection procedures to compile a list of covered employees selected for random testing during that testing cycle.

  2. The DPM (or designee) shall ensure that the list of social security numbers or employee identification numbers will identify the correct employees who are to be randomly tested during the testing cycle.

  3. It is the intent of this plan to notify employees of their selection for random testing after they have reported for duty.

     a. The list of employees to be tested will be provided to the appropriate division manager, department head, or supervisor.

     b. The list of employees selected will be retained by the DPM (or designee) in a secure location.

- Notification of Employees:

  1. The appropriate manager/supervisor will notify the employee to be tested to report to the manager/supervisor's office at a specified time.

  2. The employee will not be notified of the test until after reporting for duty.

3. Employees shall report immediately to the collection site or to the collection site within 30 minutes, plus travel time, once notified by the appropriate company official.

- Reasonable Cause Testing - Reasonable cause testing is designed to provide management with a tool (in conjunction with supervisor training on the signs and symptoms of drug use) to identify drug affected Employees who may pose a danger to themselves and others in their job performance. Employees may be at work in a condition that raises concern regarding their safety or productivity. Supervisors must then make a decision as to whether there is reasonable cause to believe an employee is using or has used a prohibited drug.

  - The decision to test must be based on a reasonable and articulate belief that the employee is using a prohibited drug on the basis of specific, contemporaneous physical, behavioral, or performance indicators of probable drug use. At least two of the employee's supervisors, one of whom is trained in detection of the possible symptoms of drug use, shall substantiate and concur in the decision to test an employee. The concurrence by both supervisors can be accomplished by phone, or by having another supervisor travel to the job site, if only one supervisor is available at that particular job site.

  - In making a determination of reasonable cause, the factors to be considered include, but are not limited to the following:

    1. Adequately documented pattern of unsatisfactory work performance, for which no apparent non-impairment related reason exists, or a change in an employee's prior pattern of work performance, especially where there is

some evidence of drug related behavior on or off the work site.

2. Physical signs and symptoms consistent with substance abuse.

3. Evidence of illegal substance use, possession, sale, or delivery while on duty.

4. Occurrence of a serious or potentially serious accident that may have been caused by human error, or flagrant violations of established safety, security, or other operational procedures.

- The following steps will be used to guide the supervisor to a satisfactory outcome in a reasonable cause situation.

1. Verify the reasonable cause decision - Anonymous tips must be taken seriously, but should not be the sole reason to initiate a request for a specimen. Hearsay is not an acceptable basis for reasonable cause referral. If witnesses saw a specific event or behavior, ask them to describe what they saw. How far away were they? How long did they observe the person? What, if anything, caused them to believe it was substance abuse related? On what basis did they reach their conclusion? Before proceeding further, obtain approval from the division manager/department head or designee to proceed with reasonable cause testing.

2. Isolate and inform the employee - Remove the employee from the work location. Explain that there is reasonable cause to believe the

employee's performance is being affected by some substance. Ask the employee to explain the suspected behavior and to describe the events that took place from their perspective. Ask if there is any medication or physical condition that would explain the behavior. A persuasive explanation may or may not deter you from asking for a urine sample. If there is still a reasonable belief that drugs are a factor in the situation/incident, a request for testing should be made; if no reasonable belief is determined then no request for testing should not be made. If the decision to test is made, inform the employee that they are being requested to accompany the appropriate official to the specimen collection site to provide a urine specimen. Inform the employee of the consequences of refusal to submit to testing.

3. Review your findings - During the conversation, observe physical and mental symptoms. Be sure to document any characteristics that either support or contradict initial information. In all cases, a reasonable cause decision must be made by two of the employee's supervisors. This creates greater objectivity, provides additional observation, and generally strengthens the defensibility of the reasonable cause determination.

4. Transport the employee - The potentially affected employee should not be allowed to proceed alone to or from the collection site. In addition to the safety concerns for the employee, accompanying the

employee also assures that there is no opportunity en route to the collection site for the employee to ingest anything that could affect the test result or to acquire "clean" urine from another person.

5. Document the events - Record the behavioral signs and symptoms that support the determination to conduct a reasonable cause test. This documentation of the employee's conduct should be prepared and signed by the witnesses within 24 hours of the observed behavior or before the results of the tests are released, whichever is earlier.

6. Denial should be an expected reaction - If a person knows they will test positive, they may give many explanations and protestations, wanting to avoid drug testing. If they are not under the influence or affected by a prohibited drug, vehement denial also would be expected. Listen to the employee and carefully evaluate the employee's explanation. Remember, a request to provide a urine specimen is not an accusation; it is merely a request for additional objective data. To the employee it may feel like an accusation; so it is important to stress that this is merely a request for additional data.

7. Following collection - After returning from the collection site, the employee shall not perform duties pending the receipt of the drug test results. The employee should make arrangements to be transported home. The employee should be instructed not to drive any motor vehicle due to the

reasonable cause belief that they may be under the influence of a drug. If the employee insists on driving, the proper local enforcement authority should be notified that an employee who we believe may be under the influence of a drug is leaving the company premises driving a motor vehicle.

- Return-to-Duty Testing - An employee who refuses to take or fails a drug test may not return to duty in the covered function until the covered employee has been evaluated face-to-face by a substance abuse professional (SAP), has properly followed any prescribed assistance, has passed a return-to-duty drug test administered under this part, and the employer has determined that the employee may return to duty.

  The MRO shall ensure that testing is conducted in accordance with 49 CFR Part 40 and the provisions of this plan prior to the employee returning to duty in a covered position.

- Follow-up Testing - A covered employee who refuses to take or fails a drug test will be subject to unannounced follow-up drug tests administered by the company following the covered employee's return to duty. The number and frequency of such follow-up testing shall be determined by a substance abuse professional, but shall consist of at least six (6) tests in the first twelve (12) months following the covered employee's return to duty. In addition, following-up testing may include testing for alcohol as directed by the substance abuse professional, to be performed in accordance with 49 CFR Part 40. Follow-up testing shall not exceed 60 months from the date of the covered employee's return to duty.

### 5.1.6 Use of Employee Who Fails or Refuses a Drug Test

- Compliance with this drug testing plan is a condition of employment. Refusal to take a required drug test or failure of a drug test shall result in removal from performing covered functions. Additional disciplinary action up to and including termination may result.

- The company shall not use, in a function covered by Part 199 or 382, anyone who:

  - Fails a drug test as verified by the MRO, or
  - Refuses to take a drug test required by this plan.

- An employee will be given an opportunity to retain his or her employment, provided they first:

  - Have been evaluated face-to-face by a Substance Abuse Professional (SAP), followed any recommendations for drug misuse assistance, if needed;
  - Pass a DOT drug test;
  - Do not fail a drug test required by Part 199 or 382 after returning to duty; and
  - Enter into a company approved evaluation/rehabilitation program and successfully completes the program.

### 5.1.7 Specimen Collection Requirements

- The procedures contained herein and in Attachment 4 shall be complied with by the designated collection sites and all covered employees who report for drug testing. The company will ensure that collection sites utilized by its employees are aware of their responsibilities with regard to the specimen collection process. The collection site shall post or have readily available instructions which explain the specimen collection process. If information on collector, donor, and company representatives responsibilities are provided under separate cover by the company or the collection site, then the above requirement is not required.

- The procedures address the requirements contained in § 40.25.

- The collection site shall have all necessary personnel, materials, equipment, facilities, and supervision to provide for the collection, security, temporary storage, and shipping or transportation of urine

specimens to a certified drug testing laboratory designated by the company. An independent medical facility may also be utilized as a collection site provided the other applicable requirements of Attachment 4 are met.

- A designated collection site shall be any suitable location where a specimen can be collected under conditions set forth in Attachment 4, including a properly equipped mobile facility. A designated collection site shall have an enclosure within which private urination can occur, a toilet for completion of urination, and a suitable clean surface for writing. The site must also have a source of water for washing hands, which if practicable, should be external to the enclosure where urination occurs.

- The collection individual shall use a clean, single-use specimen bottle that is securely wrapped until filled with the specimen and use a tamper proof sealing system, designed in a manner such to ensure against undetected opening.

- The collection individual shall use a shipping container in which the specimen and employee paperwork may be transferred.

- Written procedures, instructions, and training shall be provided as follows:

  - Under normal circumstances, the company will contract for and utilize when possible an independent collection site. The independent collection site shall abide by all procedures, techniques, and methods outlined in 49 CFR Parts 40, 199, and 382, as well as those outlined in this document.

  - When an independent collection site is not available, company collection procedures and training shall clearly emphasize that the collection site person is responsible for maintaining the integrity of the specimen collection and transfer process, carefully ensuring the modesty and privacy of the individual, and is to avoid any conduct or remarks that might be construed as accusatorial or otherwise offensive or inappropriate.

  - The collection site personnel shall have successfully completed training to carry out this function, or shall be a licensed medical professional, or a technician who has been provided instructions for collections and certifies completion

as required in this document.

- Collection site personnel, both medically trained and non-medical, are provided with appropriate DOT specimen collection procedures which outline the proper urine specimen collection procedures to be followed to ensure that all collections are conducted in a proficient manner.

- Collection site personnel, company representatives, and/or donors have access to standard written instructions regarding DOT collection procedures which outline their individual responsibilities during the entire collection process. Same gender collection personnel shall be used if the specimen is being conducted under the direct observation procedures.

- Unless it is impracticable for any individual to perform this function, a direct supervisor of an employee shall not serve as the collection site individual for a drug test of the employee.

- A copy of the standard written instructions setting forth the donor's or employee representative's responsibilities during the specimen collection must be provided prior to the test being conducted.

### 5.1.8 Drug Testing Laboratory

#### 5.1.8.1 SAMHSA Laboratory

- The company shall use a drug testing laboratory certified under DHHS Mandatory Guidelines for Federal Workplace Drug Testing Programs; 53 CFR 11970, April 11, 1988 and subsequent amendments.

- The laboratory shall provide services in accordance with Part 40, 382, and Part 199. The name and address of each SAMHSA laboratory used by the company is contained in Attachment 14.

- The laboratory shall permit inspections by the company, the RSPA or Federal Motor Carrier Safety Administration Administrator, or if the company is subject to the jurisdiction of a state agency, a representative of the state agency.

#### 5.1.8.2 Laboratory Procedures

These procedures are addressed in Attachment 13.

### 5.1.9 Blind Performance Test Procedures

#### 5.1.9.1 General

- The company shall use blind testing quality control procedures as provided in this section.

**5.1.9.2 Covered Employees.** For companies with 2,000 or more covered employees, approximately 75 percent of the blind performance test samples shall be blank (i.e., containing no drugs or otherwise as approved by DOT) and 15% shall be positive for one or more drugs per sample in a distribution such that all the drugs to be tested are included in approximately equal frequencies of challenge and 10% must either be adulterated with a substance cited in HHS Guidelines or substituted. The positive samples shall be spiked only with those drugs for which the employer is testing. This paragraph shall not be construed to prohibit spiking of other (potentially interfering) compounds, as technically appropriate, in order to verify the specificity of a particular assay.

#### 5.1.9.3 Investigations and False Positives

- RSPA shall investigate, or shall refer to DHHS for investigation, any unsatisfactory performance testing result and, based on this investigation, the laboratory shall take action to correct the cause of the unsatisfactory performance test result. A record shall be made of the investigative findings and the corrective action taken by the laboratory, and that record shall be dated and signed by the individual responsible for the day-to-day management and operation of the drug testing laboratory. RSPA shall send the document to the company as a report of the unsatisfactory performance testing incident. RSPA shall ensure notification of the finding to DHHS.

- Should a false positive error occur on a blind performance test specimen and the error is determined to be an administrative error (clerical, sample mix-up, etc.), the company shall promptly notify RSPA. RSPA and the company shall require the laboratory to take corrective action to minimize the occurrence of the particular error in

the future, and, if there is reason to believe the error could have been systemic, RSPA may also require review and reanalysis of previously run specimens.

- Should a false positive error occur on a blind performance test specimen and the error is determined to be a technical or methodological error, the company shall instruct the laboratory to submit all quality control data from the batch of specimens which included the false positive specimen to RSPA. In addition, the laboratory shall retest all specimens analyzed positive for that drug or metabolite from the time of final resolution of the error back to the time of the last satisfactory performance test cycle. This retesting shall be documented by a statement signed by the individual responsible for day-to-day management of the laboratory's urine drug testing. RSPA may require an on-site review of the laboratory which may be conducted unannounced during any hours of operation of the laboratory. DHHS has the option of revoking or suspending the laboratory's certification or recommending that no further action be taken if the case is one of less serious error in which corrective action has already been taken, thus reasonably assuring that the error will not occur again.

### 5.1.10 Review of Drug Testing Results

#### 5.1.10.1General

- The company shall have on staff or contract for the services of an MRO. The MRO shall be a licensed physician with knowledge of drug abuse disorders. The MRO shall review all negative and positive drug test results and interview individuals tested positive to verify the laboratory report before the company is notified. The review of a negative test may be an administrative process to ensure the chain-of-custody procedures were intact. The MRO shall ensure that testing is conducted in accordance with 49CFR Part 40 and the provisions of this plan prior to the employee returning to duty in a covered position.

- The MRO has contracted with the company to provide the services of MRO for this drug testing policy in accordance with the requirements of §§ 40.33, 199.15, and 382.403. A listing of the company MRO(s) which includes their

name(s) and address(es) is contained in Attachment 14.

### 5.1.10.2 Reporting and Review of Results

- The MRO shall review confirmed positive results. An essential part of the drug testing program is the final review of confirmed positive results from the laboratory. A positive test result does not automatically identify an employee/applicant as having used drugs in violation of a DOT regulation. An individual with a detailed knowledge of possible alternate medical explanations is essential to the review of results. This review shall be performed by the MRO prior to the transmission of results to company administrative officials. The MRO review shall include review of the chain-of-custody to ensure that it is complete and sufficient on its face.

- The duties of the MRO with respect to negative results are purely administrative.

### 5.1.10.3 Qualifications and Responsibilities

- The MRO shall be a licensed physician with knowledge of substance abuse disorders and may be an employee of the company or a private physician retained for this purpose. The MRO shall not be an employee of the laboratory conducting the drug test unless the laboratory establishes a clear separation of functions to prevent any appearance of a conflict of interest including assuring that the MRO has no responsibility for, and is not supervised by or the supervisor of, any persons who have responsibility for the drug testing or quality control operations of the laboratory.

- The role of the MRO is to review and interpret confirmed positive test results obtained through the company testing program. In carrying out this responsibility, the MRO shall examine alternate medical explanations for any positive test result. This action shall include conducting a medical interview with the individual and review of the individual's medical history, or review of any other relevant biomedical factors. The MRO shall review all medical records made available by the tested individual when a confirmed positive test could have resulted from legally prescribed medication. The MRO shall not, however, consider the results of urine

samples that are not obtained or processed in accordance with DOT regulations.

- The MRO may require the original specimen be reanalyzed to determine the accuracy of the test result. The MRO shall verify that the laboratory report and assessment are correct.

### 5.1.10.4 Positive Test Results

- Prior to making a final decision to verify a positive test result, the MRO shall give the individual an opportunity to discuss the test result with him/her.

- The MRO shall contact the individual directly, on a confidential basis, to determine whether the employee wishes to discuss the test result. A staff person under the MRO's supervision may make the initial contact, and a medically licensed or certified staff person may gather information from the employee. Except as provided in paragraph 5 of this section, the MRO shall talk directly with the employee before verifying a test as positive.

- If, after making all reasonable efforts and documenting them, the MRO is unable to reach the individual directly, the MRO shall contact a designated management official who shall direct the individual to contact the MRO as soon as possible. If it becomes necessary to reach the individual through the designated management official, such official shall employ procedures that ensure, to the maximum extent practicable, that the requirement of the employee to contact the MRO is held in confidence.

- If, after making all reasonable efforts, the designated management official is unable to contact the employee, the company may place the employee on temporary medically unqualified status or medical leave.

- The MRO may verify a test as positive without having communicated directly with the employee about the test in three circumstances:

  - The employee expressly declines the opportunity to discuss the test;

  - The designated company representative has successfully made and documented a contact with the employee and instructed the employee to contact the MRO, and more than three days have passed since the date the employee was successfully contacted by the designated company representative; or

  - Neither the MRO nor the designated company representative, after making all reasonable efforts, has been able to contact the employee, within 10 days of the date of which the MRO received the confirmed positive test result from the laboratory.

- If a test is verified positive under the circumstances specified above, the employee may present to the MRO information documenting that serious illness, injury, or other circumstances unavoidably prevented the employee from being contacted by the MRO or designated company representative or from contacting the MRO within the times provided. The MRO, on the basis of such information, may reopen the verification allowing the employee to present information concerning a legitimate explanation for the confirmed positive test. If the MRO concludes that there is a legitimate explanation, the MRO declares the test to be negative.

- If the MRO determines, after appropriate review, that there is no legitimate medical explanation for the confirmed positive test result other than the unauthorized use of a prohibited drug, the MRO shall refer:

  - The individual tested to the DPM (or designee) for disciplinary action: and
  - For evaluation by a SAP who shall determine what assistance, if any, the employee needs in resolving problems associated with drug misuse.

  - Evaluation and rehabilitation may be provided by a SAP under contract with the company, but Shaw E & I shall ensure that the SAP, who determines that a covered employee requires assistance in resolving problems with drug abuse, does not refer the covered employee to the SAP's private practice or to a person or organization from which the SAP receives renumeration or in which the SAP has a financial interest.

### 5.1.10.5 Verification for Opiates; Review for Prescription Medication

- Before the MRO verifies a confirmed positive result for opiates, the MRO shall determine that there is clinical evidence—in addition to the urine test—of unauthorized use of any opium, opiate, or opium derivative (e.g., morphine/codeine).

- This requirement does not apply if the company's GC/MS

confirmation testing for opiates confirms the presence of 6-monoacetylmorphine.

**5.1.10.6 Reconfirmation Analysis Authorization**

- Should any question arise as to the accuracy or validity of a positive test result, only the MRO is authorized to order a reconfirmation of the original sample and such retests are authorized only at laboratories certified by DHHS.

- The MRO shall authorize a reconfirmation of the original sample if requested in writing by the employee within 60 days of the employee having received actual notice of the positive test.

- If the retest is negative, the MRO shall cancel the test and notify both the company and the employee.

**5.1.10.7 Results Consistent with Legal Drug Use.** If the MRO determines there is a legitimate medical explanation for the positive test result, the MRO shall report the test result to the company as negative.

**5.1.10.8 Results Scientifically Insufficient**

- The MRO, based on review of inspection reports, quality control data, multiple samples, and other pertinent results, may determine that the result is scientifically insufficient for further action and declare the test specimen negative. In this situation the MRO may request reanalysis of the original sample before making this decision. The MRO may request that reanalysis be performed by the same laboratory or that an aliquot of the original specimen be sent for reanalysis to an alternate laboratory which is certified in accordance with the DHHS guidelines.

- The laboratory shall assist in this review process as requested by the MRO by making available the individual responsible for day-to-day management of the urine drug testing laboratory or other employee who is a forensic toxicologist or who has equivalent forensic experience in urine drug testing, to provide specific consultation as required by the company. The company shall include in any required annual report to RSPA or the Federal Motor Carrier Safety Administration a summary of any negative findings based on

scientific insufficiency but shall not include any personal identifying information in such reports.

**5.1.10.9 Disclosure of Information**

- Except as provided in this paragraph, the MRO shall not disclose to any third party medical information provided by the individual to the MRO as a part of the testing verification process.· The MRO may disclose such information to the company, DOT or other federal safety agency, or a physician responsible for determining the medical qualification of the employee under the appropriate DOT regulation, as applicable, only if:

  - An applicable DOT regulation permits or requires such disclosure;

  - In the MRO's reasonable medical judgment, the information could result in the employee being determined to be medically unqualified under an applicable DOT rule; or

  - In the MRO's reasonable medical judgment, in a situation in which there is no DOT rule establishing physical qualification standards applicable to the employee, the information indicates that continued performance by the employee of his or her covered function could pose a significant safety risk.

- Before obtaining medical information from the employee as part of the verification process, the MRO shall inform the employee that information may be disclosed to third parties as provided in this paragraph and the identity of any parties to whom information may be disclosed.

**5.1.11 Retention of Samples**

**5.1.11.1General.** Samples that yield positive results on confirmation must be retained by the laboratory in properly secured, long-term, frozen storage for at least 365 days.

**5.1.11.2 Retention Period**

- Within this 365 day period, the employee or designated

representative, RSPA or other state agencies with jurisdiction, or the company may request in writing that the sample be retained for an additional period.

- If the laboratory does not receive the request to retain the sample within the 365 day period, the sample may be discarded.

### 5.1.12 Retesting of Samples

**5.1.12.1General.** An employee/applicant may request in writing to the MRO a retest of the sample within 60 days of notification of a positive test result from the MRO.

**5.1.12.2 Retest Provisions.** The employee may specify that the specimen be retested by the original laboratory or sent to another certified laboratory. Retests for DOT employees will be paid by the company. The non-DOT employee may be required to pay in advance for the shipment and reanalysis of the sample. The non-DOT employee will be reimbursed for the costs incurred in the reanalysis if the retest of the specimen is negative. If the employee requests a retest at a second laboratory, then the original laboratory must follow the approved custody and control procedures in transferring a portion of the specimen.

**5.1.12.3 Detection Levels.** Because some analytes deteriorate or are lost during freezing and/or storage, quantitation for a retest is not subject to a specific cutoff requirement but must provide data sufficient to confirm the presence of the drug or metabolite.

### 5.1.13 Employee Assistance Program (EAP)

**5.1.13.1 Scope of Program.** The AAP will provide education and training on drug use to all Employees. The education shall include:

- Informational material displayed on bulletin boards, employee break rooms, locker rooms, etc., and distributed to employees.
- A community service hot-line telephone number for employee assistance displayed on bulletin boards and distributed to employees, and
- Distribution of the company's policy regarding the use of prohibited drugs to all new employees. The policy shall be displayed in prominent places throughout the company (i.e., employee bulletin board, break room, locker rooms).

**5.1.13.2 Supervisor Training.** Supervisory personnel responsible for those employees covered under Part 199 and 382 will receive training under the anti-drug plan. The training shall include at least one 60-minute period of training on the specific, contemporaneous physical, behavioral, and performance indicators of probable drug use. This training shall be for supervisors who may determine whether an employee must be drug tested for reasonable cause.

### 5.1.14 Recordkeeping Procedures

#### 5.1.14.1 General

- The DPM (or designee) shall maintain a locked file system which will contain drug test results. This file shall be maintained as Confidential. Employee files shall be handled on strict "need to know" basis.

- Drug tests results shall not be included in personnel files. Information regarding an individual's drug testing result or rehabilitation may be released only upon written consent of the individual, except that:

- Such information must be released regardless of consent to RSPA or other government agency as a part of an accident investigation;

- Such information may be disclosed regardless of consent in a lawsuit, grievance, or other proceeding initiated by or on behalf of the individual and arising from a verified positive drug test.

**5.1.14.2 Statistical Data.** Statistical data related to drug testing and rehabilitation that is non name-specified and training records may be released to RSPA or other governmental agency upon request.

**5.1.14.3 Record Retention.** The records that must be maintained are:

- Records that demonstrate the collection process conforms to § 40.25 shall be retained for a 5-year period.

- Employee drug test results that show positive and test type (pre-employment test, random test, post-accident test, or post-rehabilitation test), and records that demonstrate

rehabilitation (including the MRO's determination). These records shall be retained for a 5-year period and must include the following information:

- Job classification and functions of employee.
- Prohibited drug(s) used.
- Disposition of employee (i.e., rehab, suspension, termination, etc.)
- Employee drug tests that demonstrate negative results shall be retained for a period of 2 year.
- A record indicating the total number of Employees tested and the results of tests separated into categories shall be retained for a 5-year period.
- Training records confirming that supervisors and Employees have been trained as required under § 199.19 and 382, and copies of training material used shall be retained for a 3-year period.

### 5.1.15 Contractor Monitoring

**5.1.15.1 General.** The company shall include a clause in the gas pipeline contracts that drug testing, education and training shall be addressed by the contractor in accordance with Part 199, 382, and Part 40 for covered functions.

**5.1.15.2 Records and Access.** Contractors shall retain copies of appropriate records required by Part 199, 382, and Part 40. The records and access to the contractor's property shall be readily accessible for inspection by the company, RSPA, Federal Motor Carrier Safety Administration and representatives of those state agencies under which jurisdiction the company operates.

**5.1.15.3 Monitoring Procedures.** Confirmation of contractor compliance (see Attachment 15 for Contractor Monitoring Procedures).

**5.1.15.4 Contractor Coverage.** The company can, as an alternative to the above guidance, provide coverage for the contractor's Employees by including them in the company's drug testing program and random pool for the duration of the contract.

## 5.2 Alcohol Misuse Prevention Plan (AMPP)

**5.2.1 Alcohol Misuse Prevention Policy.** The company has a long-standing commitment to maintain the highest standards for employee safety and

health and to help prevent accidents/injuries resulting from the misuse of alcohol by Employees who perform covered functions.

In addition, the company must comply with all DOT regulations and other regulations which require affirmative actions to eliminate the impact of the misuse of alcohol in the workplace. The purpose of the alcohol misuse prevention plan is to reduce accidents that result from the misuse of alcohol, thereby reducing fatalities, injuries, and property damage.

The Alcohol Misuse Prevention Plan contained herein sets forth the requirements of 49 CFR Part 199, 40 and 382. The Alcohol Supplement (Attachment 16) provides background for Employees regarding the benefits or an alcohol-free workplace and recognizing signs of abuse.

**The use or possession of alcoholic beverages while on company property, or in any company vehicle, or on company time, including breaks or lunch, paid or unpaid, on any shift, is strictly prohibited.**

**5.2.1.1 Implementation of Alcohol Misuse Prevention Plan (AMPP).** The company has implemented the Research and Special Programs Administration, Alcohol Regulations as set forth in 49 CFR Part 199, Subpart B and the Department of Transportation, Procedures for Transportation Workplace Alcohol Testing Programs as set forth in 49 CFR Part 40, Subpart C, and Federal Motor Carrier Safety Administration regulations 49 CFR Part 382.

The privacy/confidentiality of any covered employee subject to this plan must be maintained at all times.

Implementation of the alcohol misuse prevention plan was effective on January 1, 1995.

**5.2.1.2 Background.** The catalyst for the alcohol misuse plan is Title 49 Code of Federal Regulations (CFR) Part 382 (Highway) and Part 199 Subpart B which requires pipeline operators subject to 49 CFR Parts 192, 193, and 195, and their contractors to test their Employees for use of alcohol under the following work-related conditions:

- Post-Accident
- Reasonable Suspicion
- Return-to-duty
- Follow-up
- Random (Highway only)

Title 49 CFR Part 40 specifies procedures which must be followed by the company when conducting alcohol misuse testing pursuant to regulations issued by agencies of the Department of Transportation.

**5.2.1.3 Preemption Provisions.** Except as provided in paragraph 2 of this section, Part 199 Subpart B and 382 preempts any state or local law,

rule, regulation, or order to the extent that:

- Compliance with both the state or local requirement and this regulation is not possible;
- Compliance with the state or local requirement is an obstacle to the accomplishment and execution of any requirement as set forth in 49 CFR Part 199, Subpart B and 382; or
- The state or local requirement is a pipeline safety standard applicable to interstate pipeline facilities.

This provision shall not be construed to preempt provisions of state criminal law that impose sanctions for reckless conduct leading to actual loss of life, injury, or damage to property, whether the provisions apply specifically to transportation Employees or employers or to the general public.

### 5.2.1.4 Company Responsibilities

- Alcohol Program Manager (APM) - Attachment 10 contains the name, address, and phone number of the responsible individual(s). The APM or other company-designated individual shall be responsible for the preparation of an alcohol misuse plan which complies with requirements of the Department of Transportation regulations as set forth in 49 CFR Parts 199 Subpart B and 49 CFR Part 40 Subpart C. The APM shall be responsible for providing oversight and evaluation on the plan; providing guidance and counseling; reviewing of all discipline applied under this plan for consistency and conformance to human resources policies and procedures- scheduling for types of testing (return-to-duty, or follow-up, etc.); maintaining a locked file system on all alcohol test results- and overseeing the referral of Employees for evaluation and treatment as it is defined in 49 CFR Part 199.243. The company shall not falsely represent that an alcohol test is being conducted under the provisions of 49 CFR Part 199.

- Supervisor(s) - Company individuals responsible for observing the performance and behavior of Employees; observation/documentation of events suggestive of reasonable suspicion; and post-accident testing if determined that it is applicable.

- Employees - The company shall ensure that each employee is notified and aware of the provisions of the company AMPP and is knowledgeable of the requirements of the company's AMPP. Each employee must fully comply with the provisions of the plan.

**5.2.1.5 Employee/Supervisor Alcohol Testing Provisions**

- **Individuals Subject to Alcohol Testing** - Any applicant/employee who performs on a pipeline, an operating, maintenance, or emergency response function regulated by Part 192, 193, 195, or 382 is subject to alcohol testing under this program. This does not include clerical, truck driving, accounting, or other functions not subject to Part 192, 193 or 195, but does include drivers subject to Part 382. The person may be employed by the operator, be a contractor engaged by the operator, or be employed by such a contractor.

- **Procedures for Notifying Covered Employees** - Upon receipt of the company's AMPP, each manager shall post the plan in a prominent location or indicate where a copy is readily accessible to all covered Employees. All covered Employees will be provided a complete copy of the AMPP.

- **Criteria for Employee Notification**

  - **General Criteria** - The company shall provide written educational materials explaining the alcohol misuse requirements and the company's policies and procedures on how they will comply with those requirements.

    a. The company will distribute to each covered employee a copy of the plan prior to the start of alcohol testing and to each person subsequently hired/transferred to perform covered functions.

    b. The company shall provide written notice to representatives of employee organizations on the availability of this written educational information.

  - **Required Information** - The company shall provide written materials to all covered Employees that shall

include detailed information and discussion of the following elements:

a. Name of company representative designated to answer questions for covered Employees about the alcohol regulations.
b. Covered Employees who are subject to the alcohol regulations.
c. Information about covered functions which provides sufficient guidance on which portions of the work day the covered employee is required to be in compliance with the AMPP.
d. Information concerning covered employee conduct which specifies what is prohibited by the AMPP.
e. Circumstances under which a covered employee will be tested for alcohol under the AMPP.

f. Procedures that cover:
   1. Testing for presence of alcohol;
   2. Protection of employee rights;
   3. Integrity of breath testing process;
   4. Safeguarding validity of test results; and
   5. Assignment of test results to proper employee.
g. Information concerning requirement for covered employee to submit to various types of alcohol tests.
h. Information detailing what constitutes a refusal and consequences of such refusal.
i. Information detailing consequences of covered Employees who violate the prohibitions as set forth in the AMPP. It must address removal from performing covered functions and guidance on referral for evaluation and/or treatment.
j. Information detailing consequences of covered Employees who test at an alcohol concentration of 0.02 or greater but less than 0.04.
k. Information detailing alcohol misuse and:
   1. How it impacts on an individual's

health, work and personal life;

2. Detecting signs and symptoms of an alcohol problem; and,
3. Intervening, evaluating and resolving problems associated with alcohol use (suspicions, confrontation, referral to AAP and referral to management official).

### 5.2.1.6 Alcohol Tests Required

- **Post-Accident Testing**

  - The company shall promptly determine and test each surviving covered employee for alcohol if that employee's performance contributed to the accident or cannot be completely discounted as a contributing factor to the accident. The decision not to administer an alcohol test under this section shall be based on the company's determination, using the best available information at the time of the determination, that the employee's performance could have not have contributed to the accident.

  - The company shall conduct an alcohol test within two hours of the accident. If the test is not conducted within two hours of the accident, the company shall prepare and maintain a written document explaining why the test was not conducted. The company shall continue all efforts to conduct the alcohol test. If the test is not conducted within eight hours, the company shall cease all attempts to conduct the test and shall prepare and maintain written documentation as to why the test was not conducted.

  - An employee shall not be prohibited from leaving the scene of an accident for a period of time necessary to obtain assistance in responding to the accident or to obtain necessary medical personnel to administer medical care to any injured personnel.

  - An employee who is subject to post-accident testing who fails to remain readily available for such testing,

including notifying the company or company representative of his/her location if he/she leaves the scene of the accident prior to submission to such test, may be deemed by the company to have refused to submit to testing.

- The employee must remain available for alcohol testing and may not consume any alcohol for 8 hours following the accident or until the alcohol test has been conducted. Notwithstanding the previous statement, Employees should seek and obtain emergency medical care whenever necessary or a covered employee should not be prohibited from leaving the scene of an accident for the period necessary to obtain assistance in responding to the accident. The following steps will be used to guide supervisor to a satisfactory outcome in a post-accident situation.

1. Verify the post-accident decision - Does the definition of accident in Section 4.2 apply to the current situation? Does the possibility exist that the employee's performance contributed to the accident or cannot be completely discounted as a factor which contributed to the accident? Anonymous tips must be taken seriously, but should not be the sole reason to initiate a request for a specimen. If witnesses saw a specific event or behavior, ask them to describe what they saw. How far away were they? Before proceeding further, individual may need to obtain approval from the division manager/department head or designee to proceed with post-accident testing.
2. Isolate and inform the employee - Remove the employee from the work area. Explain that you have reason to believe his/her performance contributed to the accident or cannot be completely discounted as a contributing factor to the accident and therefore, they will be required to submit to an alcohol test.
3. Transport the employee. - The potentially affected employee should not be allowed to

proceed alone to or from the collection site (the collection site may be at the accident scene). In addition to the safety concerns for the employee, accompanying the employee also assures that there is no opportunity en route to the collection site for the employee to ingest anything that could affect the outcome of the alcohol test

4. Document the events - Record the activity performed that supports the determination to conduct a post-accident alcohol test. This documentation of the employee's activity should be prepared and signed by the supervisor and remain on file.
5. Denial should be an expected reaction - If a person knows he/she will test positive, he/she may give many explanations and protestations, wanting to avoid submission to an alcohol test. If he/she is not under the influence of alcohol, vehement denial also would be expected. Listen to the employee and carefully evaluate the employee's explanation. Remember, a request for an alcohol test is not an accusation; it is merely a request for additional objective data.
6. Following, administration of alcohol test - After returning from the collection site, the employee should not be allowed to return to performing any covered functions if their alcohol test result is positive and if any disciplinary action is pending.

- **Reasonable Suspicion Testing.** Reasonable suspicion testing is designed to provide management with a tool (in conjunction with supervisor training on the signs and symptoms of alcohol misuse) to identify alcohol affected Employees who may pose a danger to themselves and others in their job performance. Employees may be at work in a condition that raises concern regarding their safety or productivity. Supervisors must then make a decision as to whether there is reasonable suspicion to believe an employee is using or has used alcohol.

Reasonable suspicion testing will only be conducted based

on observations made during, just preceding, or just after the period of the work day that the employee is expected to be in compliance. The company will direct a covered employee to undergo reasonable suspicion testing only while the employee is performing, just before performing, or just after ceasing to perform a covered function.

- Supervisor Reasonable Suspicion Determinations:

  a. The company's determination that reasonable suspicion exists to require a covered employee to undergo an alcohol test shall be based on specific, contemporaneous, articulable observations concerning the appearance, behavior, speech, or body odors of the employee. The required observations shall be made by a supervisor who has received at least 60 minutes of training in detecting the symptoms of alcohol misuse.
  b. The supervisor's observation must be made just before, during, or just after the employee is performing a covered function.
  c. The supervisor who makes such a determination that reasonable suspicion exists shall not be authorized to conduct the breath alcohol test on that employee.
  d. **The supervisor must follow the Human Resources contact requirements in Section 5.1.1.2**.

- In making a determination of reasonable suspicion, the factors to be considered include, but are not limited to the following:

  a. Adequately documented pattern of unsatisfactory work performance, for which no apparent non-impairment related reason exists, or a change in an employee's prior pattern of work performance, especially where there is some evidence of alcohol related behavior on or off the work site.
  b. Physical signs and symptoms consistent with alcohol abuse.
  c. Evidence of prohibited alcohol use,

possession, sale, or delivery while on duty.

d. Occurrence of a serious or potentially serious accident that may have been caused by human error, or flagrant violations of established safety, security, or other operational procedures.

- The following steps will be used to guide the supervisor to a satisfactory outcome in a reasonable suspicion:

a. Verify the reasonable suspicion decision - Anonymous tips must be taken seriously, but should not be the sole reason to initiate a request for a specimen. Hearsay is not an acceptable basis for reasonable suspicion referral. If witnesses saw a specific event or behavior, ask them to describe what they saw. How far away were they? How long did they observe the person? What, if anything, caused them to believe it was alcohol related? On what basis did they reach their conclusion? Before proceeding further, obtain concurrence or approval from the manager, department head, or designee to proceed with reasonable suspicion alcohol testing.

b. Isolate and inform the employee - Remove the employee from the work location. Explain that there is reasonable suspicion to believe the employee's performance is being affected by alcohol. Ask the employee to explain the suspected behavior and to describe the events that took place from his/her perspective. Ask if there is any medication or physical condition that would explain the behavior. A persuasive explanation may or may not deter you from asking for the employee to submit to an alcohol test. If there is still a reasonable suspicion that alcohol is a factor in the situation, a request for testing should be made if no reasonable belief is determined then a request for testing should not be made. If the decision to test is made, inform

the employee that they are being requested to accompany the appropriate company official or representative to the specimen collection site to conduct an alcohol test. Inform the employee of the consequences of refusal to submit to alcohol testing.

c. Review your findings - During the conversation, observe physical and mental symptoms. Be sure to document any characteristics that either support or contradict initial information. In all cases, a reasonable suspicion decision must be made by a supervisor who has received the required training. This creates greater objectivity, provides additional observation, and generally strengthens the defensibility of the reasonable suspicion determination.

d. Transport the employee - The potentially affected employee should not be allowed to proceed alone to or from the collection site. In addition to the safety concerns for the employee, accompanying the employee also assures that there is no opportunity en route to the collection site for the employee to ingest anything that could affect the alcohol test result.

e. Document the events - Record the behavioral signs and symptoms that support the determination to conduct a reasonable suspicion alcohol test. This documentation of the employee's conduct should be prepared and maintained on file to document the request for reasonable suspicion alcohol testing.

f. Denial should be an expected reaction - If a person knows he/she will test positive, he/she may give many explanations and protestations, wanting to avoid alcohol testing. If he/she is not under the influence or affected by alcohol, vehement denial also would be expected. Listen to the employee and carefully evaluate the employee's explanation. Remember, a request to submit to an alcohol test is not an accusation; it is merely a request for additional objective data.

g. Following administration of alcohol test - After returning from the collection site, the employee should not be allowed to return to performing any covered functions if their alcohol test result is positive. The employee should make arrangements to be transported

home. The employee should be instructed not to drive any motor vehicle due to the reasonable suspicion belief that he/she may be under the influence of alcohol. If the employee insists on driving, the proper local enforcement authority may be notified that an employee who the company believes may be under the influence of alcohol is leaving the company premises driving a motor vehicle.

- The company shall conduct an alcohol test within two hours of a determination to test under reasonable suspicion. If the test is not conducted within two hours of the reasonable suspicion determination, the company shall prepare and maintain a written document explaining why the test was not conducted. The company shall continue all efforts to conduct the alcohol test. If the test is not conducted within eight hours, the company shall cease all attempts to conduct the test and shall prepare and maintain written documentation as to why the test was not conducted.

- The company shall not permit a covered employee to report for duty or remain on duty requiring the performance of covered functions while the employee is under the influence of or impaired by alcohol, as shown by the behavioral, speech, or performance indicators of alcohol misuse, nor shall the employee be permitted to perform or continue to perform covered functions until:

  a. An alcohol test is administered and the employee's alcohol concentration measures less than 0.02;
  b. For pipeline work, the start of the employee's next regularly scheduled duty period, but not less than 8 hours following the determination that there is reasonable suspicion to believe that the employee has violated the prohibitions as contained in the AMPP;or

  c. For commercial motor vehicle operation, 24

hours have elapsed since the determination that there is a reasonable suspicion that the driver has violated the prohibition concerning the use of alcohol. Except as provided above, the company shall not take any action under 49 CFR Part 199 or 382 against a covered employee based solely on the employee's behavior and appearance in the absence of an alcohol test. However, this does not prohibit the company from taking any disciplinary action otherwise consistent with local and/or state laws or **company procedures**.

- **Return-to-Duty Testing**

  - If the substance abuse professional makes a determination that some form of evaluation and/or treatment is required then the employee must comply with the recommended provisions in order to be considered eligible to return-to-duty.

  - The company shall ensure that before an employee may return-to-duty to perform covered functions after engaging in prohibited conduct, as set forth in section 5.2.1.7 of the plan, that the employee shall undergo a return-to-duty alcohol test with a result indicating an alcohol concentration of less than 0.02.

- **Follow-up Testing**

  - Following the determination that a covered employee is in need of assistance in resolving problems associated with alcohol misuse, the employee will be subject to unannounced follow-up alcohol testing as directed by a substance abuse professional. An employee who returns to duty shall be subject to a reasonable program of follow-up alcohol testing, without prior notice, for up to 60 months after his/her return to duty.

  - The employee shall be subject to at least six, unannounced alcohol follow-up tests during the first

12 months following his/her return to duty.

- The company may require a covered employee to submit to drug follow-up testing when the substance abuse professional has reason to suspect drug involvement. The drug testing must comply with the requirements contained in 49 CFR Part 40, Subpart A.

- Follow-up testing shall be conducted just before the employee is to perform, while an employee is performing or just after the employee has ceased performing a covered function.

- **Random Testing (Highway Only).** The selection of drivers for random alcohol testing shall be made by a scientifically valid method, such as a random number table of a computer-based random number generator that is matched with drivers' Social Security Numbers, payroll identification numbers, or other comparable identifying numbers. Under the selection process used, each driver shall have an equal chance of being tested each time selections are made.

The employer shall randomly select a sufficient number of drivers for alcohol testing during each calendar year to equal an annual rate of 10%. If the employer conducts random testing through a consortium, the number of drivers to be tested may be calculated for each individual employer or may be based on the total number of drivers covered by the consortium who are subject to random alcohol and/or controlled substances testing at the same minimum annual percentage rate under this part or any DOT alcohol or controlled substances testing rule.

Each employer shall ensure that random alcohol tests conducted under this part are unannounced and that the dates for administering random alcohol and controlled substances tests are spread reasonably throughout the calendar year.

The company shall require that each driver who is notified of selection for random alcohol and/or controlled substances testing proceeds to the test site immediately; provided, however, that if the driver is performing a safety-sensitive

function at the time of notification, the company shall instead ensure that the driver ceases to perform the safety-sensitive function and proceeds to the testing site as soon as possible.

A driver shall only be tested for alcohol while the driver is performing safety-sensitive functions, just before the driver is to perform safety-sensitive functions, or just after the driver has ceased performing such functions.

If a given driver is subject to random alcohol testing under the alcohol testing rules of more than one DOT agency for the same employer, the driver shall be subject to random alcohol and/or controlled substances testing at the minimum annual percentage rate established for the calendar year by the DOT agency regulating more than 50 percent of the driver's function.

If the company is required to conduct random alcohol or controlled substances testing under the alcohol or controlled substances testing rules or more than one DOT agency, the company may:

a. Establish separate pools for random selection, with each pool containing the DOT-covered Employees who are subject to testing at the same required minimum annual percentage rate; or

b. Randomly select such Employees for testing at the highest minimum annual percentage rate established for the calendar year by any DOT agency to which the company is subject.

- **Provisions Governing Retesting of Covered Employees**

- A covered employee tested and found to have an alcohol concentration of 0.02 or greater but less than 0.04 shall not be permitted to perform or continue to perform covered functions until:

  a. The employee's alcohol concentration measures less than 0.02 in another alcohol test administered in compliance with this plan; or

b. The start of the employee's next regularly scheduled duty period, but not less than 8 hours following administration of the alcohol test (Pipeline) or 24 hours (Highway).

- Except as provided above, the company shall not take any action under 49 CFR Part 199 pr 392 against a covered employee based solely on test results showing an alcohol concentration less than 0.04. However, this does not prohibit the company from taking any disciplinary action otherwise consistent with local and/or state law or **company procedures**.

### 5.2.1.7 Alcohol Prohibited Conduct

- **General.** The company shall provide guidance to all covered Employees regarding the various types of alcohol prohibited conducts. A covered employee who engages in prohibited conduct shall be advised of available resources to evaluate and resolve problems associated with alcohol use.

- **Alcohol Concentration.** A covered employee shall be prohibited from reporting for duty or remaining on duty requiring the performance of covered functions while having an alcohol concentration of 0.04 or greater. If a company representative has actual knowledge that a covered employee has an alcohol concentration of 0.04 or greater, the employee shall not be permitted to perform or continue to perform covered functions.

- **Pre-Duty Use.** The company shall prohibit a covered employee from using alcohol within 4 hours prior to performing covered functions, or, if an employee is called to duty to respond to an emergency, within the time period after the employee has been notified to report for duty. If the company has actual knowledge that a covered employee' has used alcohol within 4 hours prior to performing covered functions or within the time period after the employee has been notified to report for duty, the employee shall not be permitted to perform or continue to perform covered functions.

- **On-Duty Use.** The company shall prohibit a covered

employee from using alcohol while performing covered functions. If a company representative has actual knowledge that a covered employee is using alcohol while performing covered functions, the employee shall not be permitted to perform or continue to perform covered functions.

### 5.2.1.8 Use of Employee Who Refuses Alcohol Test

- **General.** Refusal to submit to a random, post-accident, reasonable suspicion or follow-up alcohol test shall result in the covered employee not being allowed to perform or to continue to perform any covered functions.

- **Additional Requirements. The company may impose additional disciplinary actions as necessary. This may include removal from performing covered functions, suspension (with or without pay), and even termination.**

### 5.2.1.9 Disciplinary Actions

- **General.** A covered employee who has engaged in prohibited conduct as described in §§ 199.215 through 199.223 (alcohol concentration, on-duty use, pre-duty use, use following an accident and refusal to submit to an alcohol test) and 382 shall not be permitted to perform covered functions or continue to perform covered functions.

- **Required Referrals and Evaluations.** If not terminated for violation of the company's drug and alcohol policy, no covered employee who has violated the rules on alcohol misuse or refuses to submit to testing can perform any covered function unless and until that employee has:

  a. Been evaluated by a SAP to determine whether the employee is in need of assistance in resolving problems related to alcohol use;
  b. Completed any treatment recommended by the SAP;
  c. Been evaluated by a SAP to ensure that the employee has properly followed the treatment program;

d. **Entered into a company approved evaluation/ re- habilitation program and successfully completed the program**; and

e. Undergone a return-to-duty alcohol test with resulting alcohol concentration of less than 0.02.

- Evaluation, treatment and rehabilitation may be provided by the operator, SAP under contract, or SAP not affiliated with the operator.
- The company shall ensure that a SAP who determines that a covered employee who requires assistance in resolving problems associated with alcohol misuse does not refer the employee to the SAP's private practice or to a person or organization from which the SAP receives remuneration or has a financial interest. This does not prohibit a SAP from referring an employee for assistance to a public agency (state, county, or municipality); a person under contract with the company to provide treatment for alcohol on behalf of the company; the sole source of therapeutically treatment under the employee's health insurance policy; or sole source of therapeutically treatment reasonably accessible to the employee.

- **Levels of Disciplinary Actions.** Disciplinary action as set forth below will be taken under each of the described circumstances.

  - Refusal to report for assessment with a substance abuse professional. If an employee refuses to report for assessment, evaluation, and/or referral for treatment with a substance abuse professional, he/she will be terminated.
  - Refusal to enter or successfully complete a rehabilitation program. If an employee, after assessment, is referred for rehabilitation and the employee refuses to enter or successfully complete such a rehabilitation assessment program, he/she will be terminated.
  - Repeat usage. In all cases of an employee having an alcohol concentration of 0.04 or greater, and who has tested a second time, at alcohol concentrations

0.04 or greater, will be terminated.

- Refusal to submit to an alcohol test. An employee who refuses to provide an adequate breath for alcohol testing without a valid medical explanation after he/she has received notice of the requirement to be tested in accordance with the requirements of the AMPP, or who engages in conduct that clearly obstructs the testing procedure, will be terminated from the company.
- On duty use of alcohol. On duty use or possession of alcohol on company time or on company premises will result in termination from the company.
- Results of an alcohol (confirmation) test indicating an alcohol concentration of 0.04 or greater. When an employee has tested for alcohol in a concentration of 0.04 or greater, the employee will be removed from performing a covered function and shall be suspended and shall be referred to a substance abuse professional who shall determine what assistance. if any, the employee needs in resolving problems associated with alcohol misuse.
- Results of an alcohol (confirmation) test indicate an alcohol concentration of 0.02 or greater, but less than 0.04. When an employee has tested for alcohol in a concentration of 0.02 or greater but less than 0.04, that employee will be removed from performing a covered function and suspended without pay for the remainder of his/her shift.
- Results of a second alcohol (confirmation) test indicate an alcohol concentration of 0.02 or greater, but less than 0.04. When an employee has an alcohol test conducted and the alcohol concentration is 0.02 or greater, but less than 0.04, on a second test, it will result in termination from the company.
- Results of a second alcohol (confirmation) test indicate alcohol concentration 0.02 or greater. but less than 0.04 after an alcohol test which had introduced an alcohol concentration of 0.04 or greater. When an employee has an alcohol test conducted and the alcohol concentration is 0.02 or greater, but less than 0.04 after having had a prior alcohol concentration 0.04 or greater, then that employee will be removed from performing covered functions and shall be suspended and referred to the

substance abuse professional and any subsequent alcohol concentration 0.02 or greater will result in immediate termination.

**5.2.1.10 Alcohol Testing Requirements**

- **Scope.** The alcohol testing procedures contained herein and in Attachment 5 shall be complied with by the designated alcohol testing sites.

  These procedures address the requirements contained in 49 CFR Part 40 Subpart C.

- **General.** The alcohol testing site shall have all necessary personnel, materials, equipment, facilities, and supervision to provide for the testing and processing of alcohol test results. An independent medical facility may also be utilized as an alcohol testing site provided the other applicable requirements of Attachment 5 are met.

  An alcohol testing site shall be any suitable location where a breath alcohol test can be collected under conditions set forth in Attachment 5, including a properly equipped mobile facility. A designated alcohol testing site shall provide for privacy during the testing period and completion of all necessary record procedures.

  Detailed alcohol testing procedures are outlined in Attachment 5.

**5.2.1.11 Alcohol Testing Equipment**

- **General.** The company shall use only approved evidential breath testing (EBT) devices and non-evidential devices for conducting the alcohol testing provisions required in the AMPP. These devices are listed on NHTSA's conforming products list (CPL).

- **Screening Devices.** The company shall utilize either non-evidential devices or EBTs listed on the CPL for screening tests with capabilities to distinguish alcohol from acetone, capable of performing air blank prior to collection, and capable of performing external calibration.

- **Confirmation Devices.** The company shall utilize an EBT

listed on the CPL for confirmation testing that has the capabilities listed below. The EBT shall also be able to distinguish alcohol from acetone; be capable of testing an air blank prior to each collection of breath, and performing an external calibration.

- Capable of being attached independently or by direct link to a separate printer, print a result in triplicate (or three consecutive identical copies) of each breath test;
- Capable of assigning a unique and sequential number to each completed test so that the number can be read by the BAT and the employee before each test and be printed out on each copy of the result;
- Capable of printing out the manufacturer's name of the device, serial number and time of the test.

- **NHTSA Conforming Products List.** All devices that will be used by the company for alcohol testing are NHTSA approved evidential breath alcohol testing devices. NHTSA has model specifications for evidential breath testing devices. NHTSA periodically publishes an updated Conforming Products List, which states which devices have met NHTSA standards.

- **Quality Assurance Plan (QAP) Information.** QAP for EBTs. - The company will ensure that each EBT used for testing their Employees shall have a QAP developed by the manufacturer.

  The company shall ensure that the QAP for each EBT utilized has procedures which include:

  a. Methods for conducting external calibration of the EBTs;
  b. Scheduling of minimum intervals for performing external calibrations on each EBT utilized;
  c. Ensuring there are tolerances on an external calibration check;
  d. Ensuring there are inspection, maintenance, and calibration requirements; and
  e. Ensuring each EBT has a QAP which has been submitted and approved by NHTSA.

The company or designated agent shall maintain specific records which demonstrate that the EBTs used are subjected to the required external calibration checks as required by the manufacturer.

The company or designated agent shall ensure that an EBT taken out of service shall not be returned to service until the required external calibration checks are completed and shall ensure that accurate records are maintained.

The company or designated agent will ensure that required inspections, maintenance and calibration checks are conducted by the manufacturer or maintenance representative. When the EBT is not being used it will be stored in a controlled access space.

- **Quality Assurance Plans for Non-Evidential Screening Devices.** Each Non-Evidential Screening Device used shall have an approved quality assurance plan (QAP) to including the following:

  - The plan shall designate the method or methods to be used to perform quality control checks; the temperatures at which the non-evidential screening device shall be stored and used, as well as other environmental conditions (e.g., altitude, humidity) that may affect the performance of the device; and, where relevant, the shelf fife of the device.
  - The QAP shall prohibit the use of any device that does not pass the specified quality control checks or that has passed its expiration date.
    a. The manufacturers' instructions on or included in the package for each saliva testing device shall include directions on the proper use of the device, the time frame within which the device must be read and the manner in which the reading is made.
    b. The employer and its agents shall comply with the QAP and manufacturer's instructions for each non-evidential screening device it uses for alcohol screening tests.

### 5.2.1.12 Breath Alcohol Technician and Screening Test Technician Guidance

- **Breath Alcohol Technician (BAT)**

The BAT shall receive sufficient training and be certified to proficiency in the specific operation of the EBT device he/she uses in the required alcohol testing procedures as outlined in the AMPP. These procedures include the following:

1. Each BAT used by the company shall be able to demonstrate by successful completion of a course of instruction which, at a minimum, provides training in the principles of EBT methodology, operation, and calibration checks; the fundamentals of breath analysis for alcohol content; and the procedures required for obtaining a breath sample, and interpreting and recording EBT results.
2. The company shall ensure that only courses of instruction that are equivalent to the NHTSA, as amended, model course may be used to train BATs to proficiency. Upon request to NHTSA, they will review a BAT instruction to determine equivalency.
3. The company shall ensure that the course of instruction shall provide documentation that the BAT has demonstrated competence in the operation of the specific EBT(s) to be used by the company.
4. The company shall ensure that any BAT who will perform an external calibration check of an EBT shall be trained to proficiency in conducting the check on the particular model of the EBT . to be used by the company. The BAT training shall also include practical experience and demonstrated competence in preparing the breath alcohol simulator or alcohol standard, and in the maintenance and calibration of the particular EBT.
5. The company shall ensure the BAT(S) receive sufficient additional training to ensure proficiency concerning any new or additional devices or changes in technology for equipment used by the company.
6. The company or its designated agent, who

are involved in conducting alcohol testing, shall establish documentation regarding the training and proficiency testing of any BAT it uses to test Employees. The documentation shall be maintained in accordance with the requirements of the AMPP.

- The company may authorize a BAT qualified supervisor of an employee to conduct an alcohol test for that employee if another BAT in unavailable to perform the required test in a timely manner. However, the supervisor who makes a determination that reasonable suspicion exists shall not be authorized to conduct the alcohol test on that employee.

  The company may permit law enforcement officers who have been certified by state or local governments to conduct alcohol tests if they are deemed to be qualified to perform as a BAT. In order for a test to be accepted under the DOT requirements, the officer must have been certified by a state or local government to use the EBT that was used for the appropriate test.

- **Screening Test Technician (STT)**

  - The STT shall receive sufficient training and be certified to proficiency in the specific operation of the non-evidential screening device he/she uses in the required alcohol testing procedures as outlined in the AMPP. These procedures include the following:

    a. Each STT used by the company shall be able to demonstrate by successful completion of a course of instruction which is either the Department of Transportation's (DOT) model course or a course of instruction detained by the DOT to be equivalent.

    b. The non-evidential training must involve changes, contrasts, or other readings that are indicated on the device in terms of color. The STT shall, in order to be proficient, be able to discern correctly changes, contrasts,

or readings.

c. The STT shall receive additional training, as needed, to ensure proficiency, concerning new or additional devices or changes in technology that he or she will be using.

d. The employer or its agent shall document the training and proficiency of each STT it uses to test Employees and maintain the documentation.

e. Anyone meeting the requirements of a BAT may act as a STT, provided that an individual has demonstrated proficiency in the operation of the non-evidential screening device he or she will be using.

### 5.2.1.13 Disclosure of Alcohol Information/Records

- **General**

  - The company shall maintain all alcohol related testing information including all test results and other appropriate records in a secure manner to prevent the disclosure of such information to unauthorized personnel.

  - The APM or designee shall maintain a locked file system which will contain the alcohol testing information and records. This file shall be maintained as confidential. Employee files shall be handled on strict "need to know" basis.

  - Alcohol test results shall not be included in personnel files.

- **Disclosure Provisions**

  - The company shall not release covered employee information that is contained in records as required to be maintained by the provisions of the AMPP and in accordance with federal requirements except as required by law or when expressly authorized or required by 49 CFR Parts 199, 40 and 382.

  - A covered employee is entitled, upon written

request, to obtain copies of any records pertaining to the employee's use of alcohol, including any records pertaining to his/her alcohol tests. The company shall promptly provide the requested records. Access to an employee's records shall not be contingent upon payment for records other than those specifically requested.

- The company shall permit access to all facilities utilized in complying with the requirements of 49 CFR Parts 199, 40, and 382 to the Secretary of Transportation or any DOT or state agency with regulatory authority over the company.

- The company shall make available copies of all results for alcohol testing and any other information pertaining to the administrative process of the operator's AMPP as required by 49 CFR Parts 199, 40, and 382 when requested by the Secretary of Transportation or any DOT or state agency with regulatory authority over the company. When specified by the agency the information shall include name specific alcohol test results, records, and reports.

- When requested by the National Transportation Safety Board as part of an accident investigation, the company shall disclose information related to its administration of any post-accident alcohol tests administered following the accident under investigation.

- The company shall make records available to a subsequent employer upon receipt of the written request from the covered employee. Disclosure by the subsequent regulated employer is permitted only as expressly authorized by the terms of the employee's written request.

- The company may disclose required information pertaining to a covered employee to the employee or the decision-maker in a lawsuit, grievance, or other proceeding initiated by or on behalf of the individual, and arising from the results of an alcohol test administered as required by the AMPP and the

regulations set forth in 49 CFR Parts 199, 40, and 382 or from the company's determination that the covered employee engaged in prohibited alcohol conduct including, but not limited to, a worker's compensation, unemployment compensation, or other proceeding relating to a benefit sought by the employee.

- The company shall release information regarding a covered employee's records as directed by the specific, written consent of the employee authorizing release of the information to an identified person. Release of such information by a regulated entity receiving the information is permitted only in accordance with the terms of the employee's consent.

- The company shall maintain all records required by this section and shall release this information only under the terms as specific in Section 5.1.13.4 of this plan and procedure HS102. The company will ensure that records regarding the EBTs and BATs are maintained in a confidential manner and are released only in accordance with applicable federal regulations as outlined in this plan.

### 5.2.1.14 Employee Assistance Program (AAP)

- **Scope of Program.** The AAP will provide education and training on alcohol misuse to all Employees. The education shall include:

  - Informational material displayed on bulletin boards, employee break rooms, locker rooms, etc., and distributed to Employees;
  - A community service hot-line telephone number for employee assistance displayed on bulletin boards and distributed to Employees; and
  - Distribution of company's policy regarding the alcohol misuse to all Employees. The policy shall be displayed in prominent places throughout the company (i.e., employee bulletin board, break room, locker rooms).

- **Supervisor Training.** Supervisory personnel responsible for those Employees covered under Parts 199 and 382 will receive training under the alcohol misuse prevention plan. The training shall include at least one 60-minute period of training on the specific, contemporaneous physical, behavioral, speech, and performance indicators of probable alcohol misuse. This training shall be for supervisors who may determine whether an employee must be alcohol tested for reasonable suspicion.

### 5.2.1.15 Recordkeeping Procedures

- **General.** The Vice President, Health & Safety or designee shall maintain the alcohol testing records in accordance with the provisions set out in the AMPP. These records will be maintained in a secure location with controlled access. Records shall be maintained for the specified periods of time as required in 49 CFR Parts 199, 40, and 382.

- **Record Retention Provisions**

  - The following types of records shall be maintained for a minimum period of 5 years:

    a. Records of employee alcohol test results with results indicating an alcohol concentration of 0.02 or greater;
    b. Documentation of refusals to take required alcohol tests;
    c. Calibration procedures and documentation of each EBT used in alcohol testing, including records of the results of external calibration checks;
    d. Employee referrals and evaluations;
    e. Management Information System (MIS) annual alcohol misuse report data; and
    f. Documents pertaining to "missed tests" (a post-accident or reasonable suspicion test that could not be conducted within the prescribed time frame).

  - The following types of records shall be maintained for a minimum period of 2 years:

a. Records related to the collection process (except calibration of EBT devices);
b. Records related to training;
c. Records of the inspection and maintenance of each EBT used in employee testing;
d. Documentation of the company's compliance with the Quality Assurance Plan (QAP) for each EBT it uses for alcohol testing under the AMP;
e. Records of the training and proficiency testing of each BAT/STT used in employee testing; and
f. All log books, if applicable, used in conjunction with the alcohol testing provisions.

- The following types of records shall be maintained for a minimum period of 1 year:

  a. Records of all test results below 0.02.

- **Maintenance of Specific Types of Records**

  - The following types of records related to the collection process shall be maintained:

    a. Calibration documentation for EBT devices;
    b. Documentation of BAT/STT training;
    c. Documents generated in connection with decisions to administer reasonable suspicion alcohol tests;
    d. Documents generated in connection with decisions to administer post-accident alcohol tests; and
    e. Documents verifying existence of a medical explanation of the inability of a covered employee to provide adequate breath for alcohol testing.

  - The following types of records related to test results:

    a. Company's copy of the alcohol test form, including the results of the test.
    b. Documents related to the refusal of any

covered employee to submit to a required alcohol test.

c. Documents presented by a covered employee to dispute the result of an alcohol test administered under the AMPP.

- Records related to other violations outlined in the AMPP.

- The following types of records related to referrals and evaluations:

  a. Records pertaining to a determination by a SAP concerning a covered employee's need for assistance.
  b. Records concerning a covered employee's compliance with the recommendations of the SAP.

- Records related to the company's MIS annual alcohol misuse testing data and "missed test" information. The company shall submit the required alcohol misuse MIS testing data and "missed test" information to RSPA as prescribed by the regulations. This report shall contain the following MIS informational elements:
  a. Number of covered Employees;
  b. Number of covered Employees subject to testing under the alcohol misuse rule of another DOT agency;
  c. Number of screening tests;
  d. Number of confirmation tests;
  e. Number of confirmation tests indicating an alcohol concentration of 0.02 or greater, but less than 0.04, by type of test;
  f. Number of alcohol tests indicating an alcohol concentration of 0.04 or greater, by type of test;
  g. Number of covered Employees with a confirmation test indicating an alcohol concentration of 0.04 or greater or who have violations of other alcohol misuse provisions who were returned to duty in a covered position;
  h. Number of covered Employees who were

administered alcohol and drug tests at the same time, with both a positive drug test and an alcohol test indicating an alcohol concentration of 0.04 or greater;

i. Number of covered Employees who were found to have violated other provisions of Section 199.215-199.221, and any action taken in response to the violation;

j. Number of covered Employees who refuse to submit to an alcohol test required by Parts 199 or 382 and any action taken in response to the refusal; and

k. Number of supervisors who have received required training during the reporting period in determining the existence of reasonable suspicion of alcohol misuse.

- The following types of records related to education and training of Employees and supervisors:

  a. Materials on alcohol misuse awareness, including a copy of the company's policy on alcohol misuse;

  b. Documentation of compliance with the requirements of 199.23;

  c. Documentation of training provided to supervisors for the purposes of qualifying the supervisors to make a determination concerning the need for alcohol testing based on reasonable suspicion; and

  d. Certification that any training conducted under the AMPP complies with the requirements of 40 CFR Part 199, 40, and 382.

### 5.2.1.16 Contractor Monitoring

- The company may (1) cover contractor Employees under operator's plan or (2) may provide in contract that contractor must establish and implement alcohol breath testing, education, and training in accordance with Part 199, 40, and 382 for covered functions.

- Contractors shall retain copies of appropriate alcohol testing records as required by 49 CFR Part 199, 40, and 382. The

records and access to the contractor's property shall be readily accessible for inspection by the company, RSPA, Federal Motor Carrier Safety Administration, and representatives of those state agencies under which jurisdiction the company operates.

- Confirmation of contractor compliance/ monitoring - Refer to Attachment 11 for specific guidance in how to develop an effective contractor compliance and monitoring program.

- The company can, as an alternative to the above guidance provide coverage for the contractors Employees by including them in the company's alcohol testing program for the duration of the contract or work project. When contractor Employees are covered under the company's AMPP, the contractor shall ensure that their Employees comply with all the provisions contained in the company's AMPP.

## 5.3 Shaw E & I

Deviations from this procedure or classifications as safety sensitive require prior legal approval. All Employees not subject to Section 5.1, 5.2, or 5.4 are subject to Section 5.3.

### 5.3.1 Categories of Drug and Alcohol Testing

**5.3.1.1 Pre-employment/Pre-placement.** All prospective Employees are subject to a pre-employment drug testing. This test can be conducted prior to hiring, or may be done at the time of the pre-placement medical examination, with hiring conditioned on passing the drug test.

All Employees transferring to a position requiring periodic drug and alcohol testing, from a position that does not require such testing, shall submit to a new drug and alcohol test prior to assuming the duties of the new position.

**5.3.1.2 Reasonable Cause Testing.** All Employees are subject to drug and alcohol testing whenever their work performance or behavior creates a reasonable belief that they are using or may have recently used a prohibited drug or alcohol. Supervisors requesting a reasonable cause test for an employee must submit written (hand written is acceptable) documentation of the observed behavior or performance problem to Human Resources before the test can be conducted (approval may be obtained from a Health & Safety

Manager if Human Resources is unavailable). Exceptions to the requirement for written documentation may be made only with the concurrence of a Human Resources Manager or the Vice President, Health & Safety. The test shall be initiated immediately upon documentation of contemporaneous observations. While at the local clinic, the employee's condition shall be evaluated by a licensed physician.

Entire worksites are also subject to reasonable cause testing when the site accident statistics exceed those of the company, when testing has been requested by a client to ensure a Drug Free Workplace, or when the company has received information that is believed to be reliable regarding drug activities on site. Approval for site-wide testing must be provided by the Vice President, Health and Safety and Human Resources Manager prior to such testing.

All Employees subject to reasonable cause testing will be required to submit specimens for a urine drug test (Shaw E & I Protocol 1) and a blood alcohol test. DOT (Hwy/Pipeline) Employees will be required to submit an additional urine specimen to be run under the Shaw E & I Protocol 2 (DOT/DHHS).

**5.3.2 Drug and Alcohol Testing Matrix**

Employees are subject to drug and alcohol testing as per the requirements listed below. Testing protocols are found as Attachments 2 and 3 in Section 8.0.

## DRUG AND ALCOHOL TESTING MATRIX

| TESTING TYPE | EMPLOYEES COVERED | TEST PROTOCOLS |
|---|---|---|
| Pre-Employment | DOT Highway (with CDL) regulated Employees | 2 |
| | DOT Pipeline | 2 |
| | All Others | 1 |
| Reasonable Cause | All Employees except DOT regulated | 1 + blood alcohol |
| | DOT (Pipeline & Highway with CDL) | 2 + breathalyzer [1] |
| Post-Accident | All Employees covered by DOT Pipeline & Highway (with CDL) | 2 + breathalyzer |
| Random | DOT Highway (with CDL) regulated Employees | 2 + breathalyzer |
| | DOT Pipeline | 2 |
| Post-Positive Follow-up | All Employees covered by DOT Pipeline & Highway (with CDL) | 2 and/or breathalyzer [1] |
| | All other Employees and DOE | 1 + breathalyzer [1] |

[1] Under the company program, when breathalyzer is not available, substitute blood alcohol. **This substitution is NOT authorized for DOT tests.** For DOT, the follow-up tests will be for the same abuse component as the initial positive test (i.e., if positive for drugs, test will be for drugs). However, if the Substance Abuse Professional determines that multiple substance abuse is or may be occurring, testing for both drugs and alcohol can be required, regardless of the original test results.

**5.3.3 Specimen Collection Procedures.** Specimens will be collected by the medical facility designated to service the office or project location. Specific collection instructions are provided with the collection kit provided by the testing laboratory (copy included as Attachment 4).

The procedures to be followed during the collection of specimen samples for the drug testing program are in place so that the proper chain of custody and specimen control are maintained. It is every employee's right and responsibility to be aware of the safeguards in place to prevent tampering, switching or adulteration of their specimen sample.

Before testing, the specimen collection sites will be prepared to provide for the collection, security, temporary storage and shipping of urine specimens to the testing laboratory.

Upon the employee's arrival at the collection site, the collector shall request the employee to present photo identification (driver's license, employee card, etc.). The collector shall request the employee to remove unnecessary outer garments and personal belongings (e.g., purse, briefcase, etc.)

The employee will be instructed to wash and dry his/her hands prior to urination. He/she shall be asked to void into a disposable specimen container and not to flush the toilet until the specimen has been handed over to the collector. The employee will observe the collector completing the chain-of-custody procedure.

The employee and the collector will keep the specimen in view at all times until it has been packaged and sealed for shipment. The employee is asked to read and sign a statement certifying that the urine in the bottle came from his/her body at the time of collection. A copy of the chain-of-custody document will be given to employee.

**5.3.4 Testing Laboratory.** All company employee specimens shall be analyzed by Lab Corp, 69 First Avenue, Raritan, NJ 08869. All tests will be handled under procedures agreed upon by the testing laboratory and the Corporate Health & Safety office. All specimens testing positive on initial screening will be subject to GC/MS confirmation.

**5.3.5 Consequences of Failing or Refusing to Take a Drug and Alcohol Test**

**5.3.5.1 Failing a Drug Test.** All positive tests will be immediately reported to the Human Resources Department. Any person failing a pre-employment drug test, whether done prior to offer of employment or during the pre-placement medical evaluation, shall be denied employment with the company. An employee who fails a drug test will be discharged unless he/she successfully completes a rehabilitation program, passes a drug test, submits to follow-up testing as set forth in section 5.3.1.3, and is recommended by the Human Resources Department for return to duty. The employee will be subject to discharge if he/she fails a drug test after completing the rehabilitation program.

**5.3.5.2 Refusing to Take a Drug Test.** The company will not hire an applicant or an individual who refuses to take a drug test required by this plan. An employee who refuses to take a drug test will be subject to termination.

**5.3.5.3 Adulterated Sample.** The submission of an adulterated sample by an applicant or employee will be considered as refusal to take a drug test.

**5.3.6 Training and Education.** The company will provide Supervisor training and employee education for its employees.

**5.3.6.1 Supervisor Training.** The company provides Supervisor training to educate supervisors on company and DOT drug use prevention requirements, as well as the provisions of this policy. Supervisor training consists of a minimum of sixty (60) minutes covering the specific contemporaneous physical, behavioral, and performance indicators of probable drug abuse.

**5.3.6.2 Employee Training.** The company provides all employees with drug-free awareness education. Awareness education will consists minimally of the display and distribution of informational material, display and distribution of a community hot-line number for employee assistance, and display and distribution of the company's policy regarding the use of prohibited drugs.

**5.3.7 Repeat Testing.** Replacing a test with a new specimen and test is specifically prohibited unless an error is found in either the chain-of-custody or analytical procedures. This determination will generally be made by the MRO; however, the Regional Human Resources and Vice President, Health & Safety may make this determination for non-DOT tests.

**5.3.8 Waiver of Testing.** Waiver of individual drug and alcohol tests is only authorized for DOT random and post-positive follow-up tests. Emergency or significantly extenuating circumstances are required, such as an employee who is on vacation and unavailable. Operational inconvenience associated with out-of-town assignment is **NOT** grounds for waiver of testing unless the MRO is unable to located a suitable local collection facility. The only persons authorized to issue a testing waiver are the MRO, a Regional Human Resources Director, or the Vice President, Health & Safety.

**5.3.9 Notification of Criminal Convictions**

**All Employees shall notify the company of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction.**

**5.3.10 Special Testing Requests, Program Summary.** It is the policy of the

company to deny permission for conducting drug and alcohol testing of employees by clients and/or government agencies except where required by applicable law. This statement plus a summary of the company's Drug and Alcohol Program is provided as Attachment 6 in Section 8.0.

**5.3.11 Contractors and Subcontractors.** Contractors doing work for the company shall document that they have drug and alcohol programs in place, which are of comparable effectiveness as the company program. Profit center and project managers are responsible for this verification.

**5.3.12 Client-Specific Drug and Alcohol Testing Requirements.** Certain oil and pipeline companies require the company to follow their protocol for drug and alcohol testing. The company Client-Specific Agreements for Drug and Alcohol Testing (Attachment 17) gives the specifics for each company currently on our list. This list will be updated periodically as new companies are added. A consent form must be signed by all employees scheduled to work on such jobs (full-sized, blank forms can be found as the last pages of Attachment 17). Consent forms must be forwarded to Corporate Health & Safety for retention.

## 5.4 Department Of Energy (DOE) Testing Requirements

In addition to the company requirements in Section 5.3, Employees in positions covered by the DOE Personnel Security Assurance Program (PSAP) and/or the DOE Personnel Assurance Program (PAP) shall be placed in a random pool subject to testing at a rate equal to 100% of the total persons in the pool per annum. Employees engaged in DOE work who are directly involved in production, use, storage, transportation or disposal of hazardous materials sufficient to cause significant harm to the environment or public health and safety shall be in a random pool tested at a rate equal to 50% of the total persons in the pool per annum. All personnel subject to DOE-required testing shall be initially tested prior to performing regulated work.

**5.4.1 Waiver of Testing.** Waiver of individual drug and alcohol tests is only authorized for random, post accident, and post-positive follow-up tests. Emergency or significantly extenuating circumstances are required, such as an employee who is on vacation and unavailable. Operational inconvenience associated with out-of-town assignment is **NOT** grounds for waiver of testing unless the MRO is unable to locate a suitable local collection facility. The only persons authorized to issue a testing waiver are the MRO, a Regional Human Resources Director, or the Vice President, Health & Safety.

## 6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013: Health & Safety Procedure Variances. Approval from the Corporate Legal Department must be obtained in addition to those required in HS013.

## 7.0 CROSS REFERENCES

HR024 Drugs and Other Controlled Substances
HS013 Health & Safety Procedure Variances
HS102 Management of Employee Exposure and Medical Records
HS810 Commercial Motor Vehicle Operation and Maintenance
49 CFR Part 40: Department of Transportation - Highways
49 CFR Part 199: Department of Transportation - Pipelines
10 CFR Part 707: Department of Energy

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Drug and Alcohol Testing Protocol 1
3. Drug and Alcohol Testing Protocol 2
4. Collections Procedures - Drug Testing
5. Evidential Breath Testing and Non-Evidential Collection Procedures
6. Shaw E & I Drugs and Alcohol Program Summary
7. General Consent to Participate in Client-Specific Drug/Alcohol Testing
8. Drug/Alcohol Testing Flow Chart (Random, Reasonable Suspicion, Post Accident Testing)
9. Release & Consent Form
10. Alcohol Personnel and Services Contracts
11. Contractor Alcohol Monitoring Procedures
12. List of Covered Positions - DOT/RSPA (Pipeline) Testing
13. Laboratory Procedures
14. Drug Personnel and Services
15. Contractor Monitoring Procedures
16. Alcohol Supplement
17. Client-Specific Agreements for Drug & Alcohol Testing

# ATTACHMENT 1
# DRUG AND ALCOHOL TESTING

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | |
|---|---|---|---|---|---|---|
| | | Employee | Vice President, HS | Regional Director, HR | Project Manager | MRO |
| Issue, revise, maintain procedure | 3.1 | | X | | | |
| Provide copy of HS101 to covered DOT Employees | 5.1 | | | | X | |
| Coordinate local testing program | 5.3 | | | | X | |
| Provide specimen | 5.3 | X | | | | |
| Contract DEPARTMENT OF HEALTH & HUMAN SERVICES (DHHS)-approved lab, MRO | 5.4 | | X | | | |
| Handle positive (failed) tests | 5.5 | | | X | X | |
| Verify subcontractor programs | 5.9 | | | | X | |
| Evaluate test results | 5.10 | | X | X | | X |

## ATTACHMENT 2

## Drug and Alcohol Testing: Protocol 1

| Drug Group | EMIT Screen Detection Level ng/ml | GC/MS Confirmation Detection Level ng/ml |
|---|---|---|
| Amphetamines | 1000 | 500 |
| Barbiturates | 300-1000 | 200 |
| Benzodiazepines | 300 | 200 |
| Cocaine metabolites | 300 | 150 |
| Marijuana metabolites | 50 | 15 |
| Methadone | 300 | 200 |
| Methaqualone | 300 | 200 |
| Opiate metabolites | 2000 | 2000 |
| Phencyclidine | 25 | 25 |
| Propoxyphene | 300 | 200 |
| Ethanol* (blood alcohol) | 50 mg/dl of blood | GC only confirmation |

* Ethanol test is included only on Reasonable Cause tests, not pre-hire tests.

**ATTACHMENT 3**

## Drug and Alcohol Testing: Protocol 2 (DHHS)

| Drug Group | EMIT Screen Detection Level ng/ml | GC/MS Confirmation Detection Level ng/ml |
|---|---|---|
| Amphetamine | 1000 | 500 |
| Cocaine metabolites | 300 | 150 |
| Marijuana metabolites | 50 | 15 |
| Opiate metabolites | 2000 | 2000 |
| Phencyclidine | 25 | 25 |

| **Breathalyzer** | **Prescreen** | **Confirmation Test** |
|---|---|---|
| Alcohol | .02gm/210L breath | .04 |

# ATTACHMENT 4
# SPECIMEN COLLECTION PROCEDURES

## A. Scope

1. The drug testing custody and control form is to be used as a permanent record on which identifying data on the employee and on the specimen collection and transfer process are retained. The drug testing plan requires testing for marijuana, cocaine, opiates, amphetamines, and phencyclidine.

2. Urine specimens collected under this plan may be used only to test for controlled substances designated or approved for testing as described in this attachment and shall not be used to conduct any other analysis or test.

3. This plan does not prohibit procedures reasonably incident to analysis of the specimen for controlled substances (i.e., determination of PH or tests for specific gravity, creatinine concentration, or presence of adulterants).

## B. General Procedures

1. The collection site person shall utilize the drug testing custody and control form (CCF) provided by COMPANY; this form must address the requirements as contained in § 40.23. The CCF form must comply with the provisions as contained in 49 CFR Part 40 with regard to the information that must be contained on the form.

2. The drug testing custody and control form may include such additional information as may be required for billing or other legitimate purposes necessary to the collection, provided that personal identifying information on the donor (other than the social security number or employee identification number may not be provided to the laboratory. Donor medical information may appear only on the copy provided to the donor.

3. The collection individual shall use a clean, single-use specimen bottle that is securely wrapped until filled with the specimen and use a tamper proof sealing system, designed in a manner such to ensure against undetected opening.

4. Written procedures, instructions, and training shall be provided as follows:

   a. Under normal circumstances, the company will contract for and utilize when possible, an independent collection site. The independent collection site shall abide by all procedures, techniques, and methods outlined in 49 CFR Part 40, Part 199, and any DOT agency regulation, as well as those outlined in this document.

   b. When an independent collection site is not available, company collection

procedures and training shall clearly emphasize that the collection site person is responsible for maintaining the integrity of the specimen and collection and transfer process, carefully ensuring the modesty and privacy of the individual, and is to avoid any conduct or remarks that might be construed as accusatorial or otherwise offensive or inappropriate.

c. The collection site personnel shall have successfully completed training to carry out this function, or shall be a licensed medical professional, or a technician who has been provided instructions for collections and certifies completion as required in this document.

d. Collection site personnel, both medically trained and non-medical, are provided with appropriate DOT specimen collection procedures which outline the proper urine specimen collection procedures to be followed to ensure that all collections are conducted in a proficient manner.

e. Collection site personnel, company representatives and/or donors have access to standard written instructions regarding DOT collection procedures which outline their individual responsibilities during the entire collection process. Same gender collection personnel shall be used if a urine collection is monitored by non-medical personnel or if the specimen is being conducted under the direct observation procedures.

f. Unless it is impracticable for any individual to perform this function, a direct supervisor of an employee shall not serve as the collection site individual for a drug test of the employee.

## C. Collection Site Designation

1. The company shall have sufficient designated drug collection facilities which will provide all necessary personnel, materials, equipment, facilities, and supervision to conduct collections, security, temporary storage, and shipping or transportation of specimens to a DOT certified lab. The company may utilize an independent medical facility as a collection site provided that all the requirements for collection are met.

2. A collection site may be any site designated by the company where a specimen can be collected under conditions as set forth in this attachment. This would include the use of a mobile collection facility. The collection site shall provide the following:

   a. An enclosure to provide private urination;
   b. A toilet for completion of urination (exception: use of a single-use collector is used with sufficient capacity to hold the entire void);
   c. Suitable writing surface to complete paperwork; and
   d. Source of water for washing hands (should be external to enclosure where void

occurs).

A complete list of approved collection facilities can be obtained by contacting the local Health & Safety Assistant.

**D. Security**

1. The purpose of this paragraph is to prevent unauthorized access which could compromise the integrity of the collection process of the specimen.

2. The designated collection site is to be secure. If a collection site facility is dedicated solely to urine collection, it shall be secure at all times. If a facility cannot be dedicated solely to drug testing, the portion of the facility used for testing shall be secure during drug testing.

3. A facility normally used for other purposes, such as a public rest room or hospital examining room, may be secured by visual inspection to ensure other persons are not present and undetected access (i.e., through a rear door not in the view of the collection site person) is not possible. Security during collection may be maintained by effective restriction of access to collection materials and specimens. In the case of a public rest room, the facility must be posted against access during the entire collection procedure to avoid embarrassment to the employee or distraction of the collection site person.

4. If it is impractical to maintain continuous physical security of a collection site from the time the specimen is presented until the sealed mailer is transferred for shipment, the following minimum procedures shall apply:

   a. The specimen shall remain under the direct control of the collection site person from delivery to its being sealed in the mailer.

   b. The mailer shall be immediately mailed, maintained in secure storage, or remain until mailed under the personal control of the collection site person.

**E. Chain-of-Custody**

1. The chain-of-custody block of the drug testing custody and control form shall be properly executed by authorized collection site personnel upon receipt of specimens.

2. Handling the transportation of urine specimens from one authorized individual or place to another shall always be accomplished through chain-of-custody procedures. Every effort shall be made to minimize the number of persons handling specimens.

**F. Access to Authorized Personnel Only**

1. No unauthorized personnel shall be permitted in any part of the designated collection site when urine specimens are collected or stored. Only the collection site person may handle specimens prior to their securement in the mailing container or monitor or observe a specimen collection (under the conditions specified in this section).

2. To promote security of specimens, avoid distraction of the collection site person, and ensure against any confusion in the identification of specimens, the collection site person shall have only one donor under supervision at anytime.

3. For this purpose, a collection procedure is complete when the urine bottle has been sealed and initialed, the drug testing custody and control form has been executed, and the employee has departed the site (or, in the case of an employee who was unable to provide a complete specimen, has entered a waiting area).

## G. Privacy

1. Procedures for collecting urine specimens shall allow individual privacy unless there is a reason to believe that a particular individual may alter or substitute the specimen to be provided, as further described in this paragraph.

2. For purposes of this procedure, the following circumstances are the exclusive grounds constituting a reason to believe that the individual may alter or substitute the specimen:

   a. The employee has presented a urine specimen that falls outside the normal temperature range (32° - 38°C/90° - 100°F)

   b. The last urine specimen provided by the employee (i.e., on a previous occasion) was determined by the laboratory to have a specific gravity of less than 1.003 and a creatinine concentration below .2g/L.

   c. The collection site person observes conduct clearly and unequivocally indicating an attempt to substitute or adulterate the sample (i.e., substitute urine in plain view, blue dye in specimen presented); or

   d. The employee has previously been determined to have used a controlled substance without medical authorization and the particular test was being conducted under a DOT regulation providing for follow-up testing upon or after return to service.

3. A higher-level supervisor of the collection site person, or a designated employer representative, shall review and concur in advance with any decision by a collection site person to obtain a specimen under the direct observation of a same gender collection site person based upon the circumstances described in paragraph 2 above.

## H. Integrity and Identity of Specimen

The collection site person shall take precautions to ensure that a urine specimen is not adulterated or diluted during the collection procedure and that information on the urine bottle and on the urine custody and control form can identify the individual from whom the specimen was collected. The following minimum precautions shall be taken to ensure that unadulterated specimens are obtained and correctly identified.

1. To deter the dilution of specimens at the collection site, toilet bluing agents shall be placed in toilet tanks wherever possible, so that reservoir of water in the toilet bowl always remains blue. Where practicable, there shall be no other source of water (i.e., no shower or sink) in the enclosure where urination occurs. If there is another source of water in the enclosure, it shall be effectively secured or monitored to ensure it is not used as a source for diluting the specimen.

2. When an individual arrives at the collection site, the collection site person shall ensure that the individual is positively identified as the employee selected for testing (i.e., through presentation of photo identification or identification by the employer's representative). If the individuals identify cannot be established, the collection site person shall not proceed with the collection. If the employee requests, the collection site person shall show proper identification to the employee.

3. If the individual fails to arrive at the assigned time, the collection site person shall contact the appropriate authority to obtain guidance on the action to be taken.

4. The collection site person shall ask the individual to remove any unnecessary outer garments such as a coat or jacket that might conceal items or substances that could be used to tamper with or adulterate the individual's urine specimen and empty their pockets. The collection site person shall ensure that all personal belongings such as a purse or briefcase remain with the outer garments. The individual may retain his or her wallet. If the employee requests it, the collection site person shall provide the employee a receipt for any personal belongings.

5. The individual shall be instructed to wash and dry his or her hands prior to urination.

6. After washing hands, the individual shall remain in the presence of the collection site person and shall not have access to any water fountain, faucet, soap dispenser, cleaning agent, or any other materials which could be used to adulterate the specimen.

7. The individual may provide their specimen in the privacy of a stall or otherwise partitioned area that allows for individual privacy. The collection site person shall provide the individual with a specimen bottle or collection container, if applicable, for this purpose.

8. The collection site person shall note any unusual behavior or appearance on the urine custody and control form.

9. In the exceptional event that an employer-designated collection site is not accessible and there is an immediate requirement for specimen collection (i.e., circumstances require a post-accident test), a public rest room may be used according to the following procedures:

    a. A collection site person of the same gender as the individual shall accompany the individual into the public rest room which shall be made secure during the collection procedure.
    b. If possible, a toilet bluing agent shall be placed in the bowl and any accessible toilet tank.
    c. The collection site person shall remain in the rest room, but outside the stall, until the specimen is collected.
    d. If no bluing agent is available to deter specimen dilution, the collection site person shall instruct the individual not to flush the toilet until the specimen is delivered to the collection site person. After the collection site person has possession of the specimen, the individual will be instructed to flush the toilet and to participate with the collection site person in completing the chain-of-custody procedures.

10. If the company is using the single collection method then the following procedures shall be used:

    a. The collector may choose to direct the employee to urinate either directly into a specimen bottle or into a separate collection container.

    b. If a separate collection container is used, the collection site person shall pour at least 30 ml of the urine from the collection container into the specimen bottle in the presence of the employee.

11. Collection Methodology

    a. Upon receiving the specimen from the individual, the collection site person shall determine if it has at least 45 ml of urine for the split specimen collection method. If the individual is unable to provide such a quantity of urine, the collection site person shall instruct the individual to drink up to 40 ounces of fluids spread over a period of up to three hours and, again attempt to provide a complete sample using a fresh collection container. The original insufficient specimen shall be discarded. If the employee is still unable to provide an adequate specimen, the insufficient specimen shall be discarded, testing discontinued, and the employer is notified. The MRO shall refer the individual for a medical evaluation to develop pertinent information concerning whether the individual's inability to provide a specimen is genuine or constitutes a refusal to test. Upon completion of the examination, the

MRO shall report his or her conclusions to the employer in writing.

b. In pre-employment testing, if the COMPANY does not wish to hire the individual, the MRO is not required to make such a referral. Upon completion of the examination, the MRO shall report his or her conclusion to the COMPANY in writing.

12. Employers shall follow the procedures for split sample method of collection set forth below:

a. The donor shall urinate into a collection container or specimen bottle capable of holding at least 60 ml.

b. If a collection container is used, the collection site person, in the presence of the donor, pours the urine into two specimen bottles. Thirty (30) ml shall be poured into one bottle, to be used as the primary specimen. At least 15 ml shall be poured into the other bottle, to be used as the split specimen.

c. If a single specimen bottle is included as a collection container, the collection site person shall pour 30 ml of urine from the specimen bottle into a second specimen bottle (to be used as the primary specimen) and retain the remainder (at least 15 ml) in the collection bottle (to be used as the split specimen).

d. Both bottles shall be shipped in a single shipping container, together with copies 1, 2, and the split specimen copy of the chain-of-custody form, to the laboratory.

e. If the test result of the primary specimen is positive, the employee may request that the MRO direct that the split specimen be tested in a different DHHS-certified laboratory for presence of the drug(s) for which a positive result was obtained in the test of the primary specimen. The MRO shall honor such a request if it is made with 72 hours of the employee having been notified of a verified positive test result.

f. When the MRO informs the laboratory in writing that the employee has requested a test of the split specimen, the laboratory shall forward, to a different DHHS-approved laboratory, the split specimen bottle, with seal intact, a copy of the MRO request, and the split specimen copy of the chain-of-custody form with appropriate chain-of-custody entries.

g. The result of the test of the split specimen is transmitted by the second laboratory to the MRO.

h. Action required by DOT agency regulations as the result of a positive drug test (i.e., removal from performing a safety-sensitive function) is not stayed pending

the result of the test of the split specimen.

i. If the result of the test of the split specimen fails to reconfirm the presence of the drug(s) or drug metabolite(s) found in the primary specimen, the MRO shall cancel the test, and report the cancellation and the reasons for it to DOT, the employer, and the employee.

13. After the specimen has been provided and submitted to the collection site person, the individual shall be allowed to wash his or her hands.

14. Immediately after the specimen is collected, the collection site person shall measure the temperature of the specimen. The temperature measuring device used must accurately reflect the temperature of the specimen and not contaminate the specimen. The time from urination to temperature measure is critical and in no case shall exceed 4 minutes.

15. A specimen temperature outside the range of 32°C - 38°C/90°F - 100°F, constitutes a reason to believe that the individual has altered or substituted the specimen (see Section 6.2.a).

16. Immediately after the specimen is collected, the collection site person shall also inspect the specimen to determine its color and look for any signs of contaminants. Any unusual findings shall be noted on the urine custody and control form.

17. All specimens suspected of being adulterated shall be forwarded to the laboratory for testing.

18. Whenever there is reason to believe that a particular individual has altered or substituted the specimen as described in Section G.2.a and c., a second specimen shall be obtained as soon as possible under the direct observation of a same gender collection site person.

19. Both the individual being tested and the collection site person shall keep the specimen in view at all times prior to its being sealed and labeled. As provided below, the specimen shall be sealed by placement of a tamper-proof seal over the bottle cap and down the sides of the bottle and labeled in the presence of the employee. If the specimen is transferred to a second bottle, the collection site person shall request the individual to observe the transfer of the specimen and the placement of the tamper-proof seal over the bottle cap and down the sides of the bottle.

20. The collection site person and the employee shall be present at the same time during procedures outlined in items 21 through 24 of this section.

21. The collection site person shall place securely on the bottle an identification label which contains the date, the individual's specimen number, and any other identifying

information provided or required by the employer. If separate from the label, the tamper-proof seal shall also be applied.

22. The individual shall initial the identification label on the specimen bottle for the purpose of certifying that it is the specimen collection from the donor.

23. The collection site person shall enter on the drug testing custody and control form all information identifying the specimen. The collection site person shall sign the drug testing custody and control form certifying that the collection was accomplished according to the applicable federal requirements.

24. The individual shall be asked to read and sign a statement on the drug testing custody and control form that the specimen collected from him/her is in fact that specimen he/she provided.

25. The collection site person shall complete the chain-of-custody portion of the drug testing custody and control form to indicate receipt of the specimen from the employee and shall certify proper completion of the collection.

26. The urine specimen and chain-of-custody form are now ready for shipment. If the specimen is not immediately prepared for shipment, the collection site person shall ensure that it is appropriately safeguarded during temporary storage.

27. Control of Specimen:

    a. While any part of the above chain-of-custody procedures is being performed, it is essential that the urine specimen and custody documents be under the control of the involved collection site person.

    b. If the involved collection site person leaves their work station momentarily, the collection site person shall take the specimen and drug testing custody and control form with them or shall secure them. After the collection site person returns to the work station, the custody process will continue. If the collection site person is leaving for an extended period of time, they shall package the specimen for mailing before leaving the site.

    c. The collection site person shall not leave the collection site in the interval between presentation of the specimen by the employee and securement of the sample with an identifying label bearing the employee's specimen identification number and seal initialed by the employee. If it becomes necessary for the collection site person to leave the site during this interval, the collection shall be nullified and at the election of the COMPANY a new collection may be begun.

## I. Collection Control

To the maximum extent possible, collection site personnel shall keep the individual's specimen bottle within sight both before and after the individual has urinated. After the specimen is collected, it shall be properly sealed and labeled.

**J. Transportation to Laboratory**

Collection site personnel shall arrange to ship the collected specimens to the drug testing laboratory. The specimens shall be placed in shipping containers designed to minimize the possibility of damage during the shipment (i.e., specimen boxes and/or padded mailers). The collection site person shall ensure that the chain-of-custody documentation is attached to each container sealed for shipment to the drug testing laboratory.

**K. Failure to Cooperate**

If the employee refuses to cooperate with the collection process, the collection site person shall inform the designated COMPANY representative and shall document the non-cooperation on the drug testing custody and control form.

**L. Employee Requiring Medical Attention**

If the sample being collected from an employee in need of medical attention as part of a post-accident test given in an emergency medical facility, necessary medical attention shall not be delayed in order to collect the specimen.

**M. Use of Chain-of-Custody Forms**

A chain-of-custody form shall be used for maintaining control and accountability of each specimen from the point of collection to final disposition of the specimen. The date and purpose shall be documented on the form each time a specimen is handled or transferred and every individual in the chain shall be identified. Every effort shall be made to minimize the number of persons handling specimens.

## ATTACHMENT 5
EVIDENTIAL BREATH TESTING AND NON-EVIDENTIAL COLLECTION PROCEDURES

### A. Scope

1. The evidential and non-evidential testing procedures set forth in this attachment address all the requirements as set forth in 49 CFR Part 40 and specifies the required form and disposition of such testing forms.

### B. Alcohol Testing Form

1 . The BAT/STT shall utilize the Breath Alcohol Testing form provided by company. The alcohol testing form must comply with the provisions as contained in 49 CFR Part 40 with regard to the information that must be contained on the form. The form must address the specific requirements contained in § 40.59. The company may not modify or revise the form.

2. The company may utilize a DOT Breath Alcohol Testing form or a form that is directly generated by an EBT and may omit the space for affixing a separate printed result to the testing form. The form shall provide triplicate or three consecutive identical copies with copy I (white copy) being retained by the company, copy 2 (green copy) shall be provided to the employee, and copy 3 (blue copy) shall be retained by the BAT/STT.

3. The breath alcohol testing form may include such additional information as may be required for billing or other legitimate purposes necessary to the testing, provided that personal identifying information on the individual (other than the social security number or employee identification number) may not be provided.

### C. Breath Testing Locations

1. The company shall ensure that there are sufficient breath testing sites or the availability of BATs/STTs located within a reasonable proximity to each of the company's work locations.

2. The company shall conduct the testing in a location that affords visual and aural privacy to the employee being tested. All necessary equipment, personnel, and materials for conducting the alcohol testing shall be provided at the testing site.

3. A mobile collection facility, such a van that is equipped for alcohol testing, that meets the requirements set forth in the AMPP may be utilized.

4. No unauthorized persons shall be permitted access to the testing site when the EBT remains unsecured, or to prevent such individuals from seeing or hearing a test result.

5. When not in use, the EBT shall be stored in a controlled access space.

6. In some circumstances the company may have to conduct such alcohol testing outdoors at the scene of an accident that does not meet the requirements as specified in post-accident provisions of the AMPP. In these situations the BAT/STT shall provide the necessary visual and aural privacy to the employee to the greatest extent practicable.

7. The BAT/STT shall supervise only one employee's use of the EBT at a time. The BAT/STT shall not leave the alcohol testing site while the testing process is in progress.

**D. Breath Alcohol Testing Preparations**

1. When an employee arrives at the alcohol testing site, the BAT/STT shall ensure that the individual is positively identified as the employee selected for alcohol testing (e.g., through presentation of photo identification or identification by the company's representative). If the employee's identity cannot be established, the BAT/STT shall not proceed with the alcohol test. If the employee requests, the BAT/STT shall show proper identification to the employee.

2. The BAT/STT shall explain the alcohol testing process to the employee.

3. If the employee fails to arrive at the assigned time, the BAT/STT should contact the appropriate authority to obtain guidance on any action to be taken.

**E. Screening Test Procedures for Evidential Breath Testing and Non-Evidential Breath Testing Devices**

1. The BAT shall begin the alcohol testing process by completing Step I on the Alcohol Breath Testing form. The employee shall then complete Step 2 by signing the certification. Refusal by the employee to sign the certification shall be regarded as a refusal to take the alcohol test.

2. The BAT shall select an individually-sealed mouthpiece and it shall be opened in full view of the employee and attach it to the EBT in accordance with the manufacturer's instructions.

3. The BAT shall instruct the employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT instrument indicates that an adequate amount of breath has been obtained.

4. If the EBT does not meet the requirements listed under Section 5.1.21.12 of the AMPP, the BAT shall show the employee the result displayed on the EBT. The BAT shall record the displayed result, test number, testing device, serial number of the testing device, time and quantified result in Step 3 of the form.

5. If the EBT provides a printed result but does not print the results directly onto the form, the BAT shall show the employee the result displayed on the EBT. The BAT shall then affix the test result printout to the breath alcohol test form in the designated space. The result shall be secured in such a manner that will provide clear evidence of removal, such as the use of tamper-evident tape.

6. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the employee the result displayed on the EBT.

7. If the result of the screening alcohol test is a breath alcohol concentration of less than 0.02, the BAT shall date the form and sign the certification in Step 3 of the form.

8. If a test result printed by the EBT does not match the displayed result, the BAT shall note the disparity in the "Remarks" section. Both the BAT and the employee shall initial or sign the notation. The alcohol test is invalid and the company representative and the employee shall be so advised.

9. At this point, no further testing is authorized. The BAT shall transmit the result of less than 0.02 to the APM or other appropriate company representative in a confidential manner. The company shall receive and store the information so as to ensure that confidentiality is maintained as required in the AMPP.

10. If the result of the screening test is an alcohol concentration of 0.02 or greater, then the BAT shall perform a confirmation test. If the confirmation test will be conducted by a different BAT, then the BAT who conducts the screening test shall complete and sign the form and log entry. The BAT will upon completion of the alcohol test provide the employee with Copy 2 of the breath alcohol testing form.

**F. Screening Test Procedures for Non-Evidential Saliva Devices**

1. STT will inform the employee of the procedures for the non-evidential testing. The STT shall begin the alcohol testing process by completing Step 1 on the Alcohol Breath Testing form. The employee shall then complete Step 2 by signing the certification. Refusal by the employee to sign the certification shall be regarded as a refusal to take the alcohol test.

2. The STT shall check the expiration date of the salvia testing device, show the date to the employee. In the event, the date has passed the device is not be used and a

new device should be obtained for use.

3. The STT shall open an individually sealed package containing the device in the presence of the employee.

4. The STT shall offer the employee the opportunity to use the swab. If the employee chooses to use the swab, the STT shall instruct the employee to insert the absorbent end of the swab into the employee's mouth, moving it actively throughout the mouth for a sufficient time to ensure that it is completely saturated as provided in the manufacturer's instruction for the device.

5. If the employee chooses not to use the swab, or in all cases in which a new test is necessary because the device did not activate, the STT shall insert the absorbent end of the swab into the employee's mouth, moving it actively throughout the mouth for a sufficient time to ensure that it is completely saturated, as provided in the manufacturer's instruction for the device the STT shall wear a surgical grade glove while conducting the test.

6. The STT shall place the device on a flat surface or otherwise in a position in which the swab can be firmly placed into the opening provided in the device for this purpose. The STT shall insert the swab into this opening and maintain firm pressure on the device until the device indicates that it is activated.

7. If the procedures of steps 3 through 5 are not followed successfully (e.g., the swab breaks, the STT drops the swab on the floor or another surface, the swab is removed or falls from the device before the device activated), the STT shall discard the device and swab and conduct a new test using a new device The new device shall be one that has been under the control of the employer or STT prior to the test. The STT shall note in the remarks section of the form the reason for the new test. In this case, the STT shall offer the employee the choice of using the swab himself or herself or having the STT use the swab. If steps 3 through 5 are not successfully followed on the new test, the collection shall be terminated and an explanation provided in the remarks section of the form. A new test shall then be conducted, using an EBT for both the screening and confirmation tests.

8. If steps 3 through 5 are completed successfully, but the device is not activated, the STT shall discard the device and swab and conduct a new test, in the same manner as stated above. In this case, the STT shall place the swab into the employee's mouth to collect saliva for the new test.

9. The STT shall read the result displayed on the device two minutes after inserting the swab into the device. The STT shall show the device and its reading to the employee and enter the result on the form.

10. Devices, swabs gloves and other materials used in saliva testing shall not be reused,

and shall be disposed of in a sanitary manner following their use.

11. In any case in which the result of the screening test is an alcohol concentration of less than 0.02 the STT shall date the form and sign the certification and fill in the date in Step 3 of the form.

12. If the result of the screening test is an alcohol concentration of 0.02 or greater, a confirmation test shall be performed.

13. If the STT that performed the screening test is a different individual from that who will serve as the BAT during the confirmation test, then the STT will provide the employee with Copy 2 of the form and the BAT will follow the procedures for a confirmation test.

14. If the confirmation test will be conducted at a different site from the screening test the employer or its agent shall ensure that:

    a. The employee is advised not to eat, drink, put any object or substance in his/her mouth and to the extent possible not to belch during the waiting period before the confirmation test. This time period begins with the completion of the screening test.

    b. The employee is advised that he or she must not drive, perform a safety sensitive duty or operate heavy equipment, as noted in block 4 of the alcohol testing form.

    c. The employee is under observation of a BAT, STT, or other employer personnel while in transit from the screening test site to confirmation test site.

15. The STT shall enter, in the "Remarks" section of the form, a notation that the screening test was performed using a saliva device.

16. Following the completion of the screening test, the STT shall date the form and sign the certification in Step 3 of the form.

## G. Confirmation Test Procedures

1. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT will require the employee to provide positive identification such as photo ID card or identification by a company representative. The BAT will, upon request of the employee being tested, provide such identification.
2. The BAT shall instruct the employee not to eat, drink, put any object or substance in his/she mouth and, to the extent possible, not belch during the waiting period just

prior to the confirmation test being conducted. This waiting period shall begin with the completion of the screening test and shall not be less than 15 minutes, but must be within 30 minutes of the completion of the screening test. The time the employee spends in transit between the screening test and confirmation test, the employee is under direct observation, counts toward the mandatory 15 minute deprivation period. If the BAT conducts the confirmation test more than 30 minutes after the result of the screening test has been obtained the BAT shall note in the "Remarks" section of the form the time that elapsed between the screening and the confirmation test and the reason why the confirmation test could not be conducted within 30 minutes of the screening test. The BAT shall explain to the employee that the reason for this is to prevent any accumulation of mouth alcohol leading to an artificially high reading and that it is for the benefit of the employee to comply with these instructions. The BAT shall also explain that the test will be conducted at the end of the required waiting period, even if the employee has disregarded the instructions. Should the BAT become aware that the employee has not complied with the instructions as provided, the BAT shall note the observations in the "Remarks" section of the form.

3. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT shall initiate a new Breath Alcohol Testing form. The BAT shall then complete step I on the form and the employee shall then complete Step 2 by signing the certification. If the employee should choose not to sign the certification, the BAT shall then make an appropriate notation in the "Remarks" section indicating the employee's refusal to take the alcohol test. The BAT shall note in the "Remarks" section that a different BAT conducted the screening test.

4. The BAT shall open, in the presence of the employee, a new individually sealed mouthpiece and attach the mouthpiece to the EBT in accordance with the manufacturer's instructions. The BAT will then instruct the employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT indicates that an adequate amount of breath has been obtained.

5. The BAT shall ensure, prior to the confirmation test being administered to the employee, that the EBT shall register 0.00 on an air blank. If the reading is greater, the BAT shall conduct one more air blank. Should the EBT again register greater than 0.00, the testing shall not proceed using that EBT. An EBT taken out of service because of failure to perform an air blank accurately shall not be used for testing until a check of external calibration is conducted and the EBT is found to be within the accepted tolerance limits. Alcohol testing using another EBT may proceed.

6. In the event that the screening and confirmation test results are not identical, the confirmation test result shall be deemed to be the final result on which any action by the company may be taken in order to comply with the requirements of the AMPP

and any applicable federal requirements.

7. If the EBT provides a printed result but does not print the results directly onto the form, the BAT shall show the employee the result displayed on the EBT. The BAT shall then affix the test result printout to the breath alcohol test form in the designated space. The result shall be secured in such a manner that will provide clear evidence of removal, such as the use of tamper-evident tape.

8. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the employee the result displayed on the EBT.

9. After the confirmation test is completed, the BAT shall date the form and sign the certification in Step 3 of the form. The employee shall then be instructed to sign the certification and fill in the date in Step 4 and if the results are .04 or greater. If the employee should elect to not sign the certification or to provide his/her initials in the log book entry for the test conducted, it shall not be considered as a refusal to be tested. The BAT shall then note the employee's failure to sign or initial the log book entry in the "Remarks" section of the testing form.

10. If a test result printed by the EBT does not match the displayed result, the BAT shall note the disparity in the "Remarks" section, Both the BAT and employee shall initial or sign the notation on the testing form. The test shall be considered "invalid" and the company representative and the employee shall be so advised.

11. The BAT shall transmit all alcohol testing results to the APM or other designated company representative in a confidential manner. All communications by BATs shall be to the APM or designee only and may be provided in writing, in person, or by telephone or electronic means. The BAT shall ensure that immediate transmission of test results to the company is conducted in order for the company to prevent the employee from performing any covered functions.

12. Should the initial transmission not be accomplished in writing, but via telephone notification, the APM or designee shall establish a mechanism to verify the identity of the BAT providing the information. The BAT shall follow the initial transmission by providing to the APM or designee the company's copy of the breath alcohol testing form. The test results shall be stored in such a manner so as to protect the confidentiality of the results and to eliminate the disclosure of information to unauthorized persons.

## H. Refusals to Test and Uncompleted Tests

1. Refusal by an employee to complete and sign Step 2 of the breath alcohol testing form, to provide breath or a saliva sample, to provide an adequate amount of breath, or otherwise to cooperate with the testing process in a way that prevents the

completion of the test shall be noted by the BAT/STT in the "Remarks" section of the form. The testing process shall be terminated and the BAT/STT shall immediately notify the company APM or designee.

2. If a screening or confirmation test cannot be completed or if an event occurs to invalidate the test, the BAT/STT shall, if practicable, begin a new screening or confirmation test using a new breath alcohol testing form with a new sequential test number.

## I. Inadequate Amount of Breath for EBTs and Non-EBT Devices

1. If the employee is unable, or alleges that he/she is unable, to provide a sufficient amount of breath to permit a valid breath test because of a medical condition, the BAT or STT shall again instruct the employee to attempt to provide an adequate amount. If the employee refuses to make the attempt, the BAT or STT shall immediately inform the APM.

2. If the employee attempts and fails to provide an adequate amount of breath, the BAT or STT shall so note in the "Remarks" section of the testing form and shall immediately inform the APM. The APM shall direct the employee to obtain, as soon as practical after the attempt, an evaluation from a licensed physician who is acceptable to the company concerning the employee's medical ability to provide an adequate amount of breath.

3. If the physician determines, in his/her reasonable medical judgment, that a medical condition has or could have precluded the employee from providing an adequate amount of breath, the employee's failure to provide an adequate amount of breath shall not be deemed as a refusal to take an alcohol test. The physician shall provide to the company APM a written statement of the basis of his/her conclusion.

4. If the physician, in his/her reasonable medical judgment, is unable to make the determination that a medical condition has precluded the employee from providing an adequate amount of breath, the employee's failure to provide an adequate amount of breath shall be regarded as a refusal to take a test. The physician shall provide a written statement of the basis for his/her conclusion to the company APM.

## J. Inadequate Amount of Saliva for Non-Evidential Testing Devices

1. If an employee is unable to provide sufficient saliva to complete a test on a saliva screening device (e.g. the employee does not provide sufficient saliva to **activate** the device) the STT shall conduct a new test using a new device as described in Section F "Screening Test Procedures for Non-Evidential Saliva Devices #7."

    a. If the employee refuses to complete the new test, the STT shall terminate testing and immediately inform the employer. This constitutes as a refusal to

test.

2. If a new test is completed, but there is an insufficient amount of saliva to activate the device the STT shall immediately inform the employer, which shall then immediately initiate an alcohol test to be administered to the employee using an EBT.

## K. Invalid Tests

1. A breath alcohol test shall be invalid under the following circumstances:

   a. The EBT does not pass its next external calibration check. This invalidates all test results of 0.02 or greater on tests conducted since the last valid external calibration test. This would not invalidate any negative tests conducted.
   b. The BAT does not observe the minimum 15-minute waiting period prior to conducting, the confirmation test.

   c. The BAT does not perform an air blank of the EBT before a confirmation test, or an air blank does not result in a reading of 0.00 prior to the administration of an alcohol test.

   d. The BAT does not sign the breath alcohol testing form.

   e. The BAT fails to note in the remarks section of the form that the employee has failed or refused to sign the form following the recording or printing on or attachment to the form of the test results.

   f. An EBT fails to print a confirmation test result.

   g. The sequential test number or alcohol concentration displayed on the EBT is not the same as the sequential test number or alcohol. concentration on the printed result.

2. An alcohol test using a non-evidential saliva screening device shall be invalid under the following circumstances:

   a. The result is read before two minutes or after 15 minutes from the time the swab is inserted into the device.
   b. The device does not activate.

   c. The device is used for a test after the expiration date printed on its package.

   d. The STT fails to note in the remarks section of the form that the screening test was conducted using a saliva device.

3. An alcohol test using a non-evidential alcohol testing device shall be invalid under the following circumstances:

   a. The STT has failed to note in the remarks section of the form that the employee has failed or refused to sign the form following the recording on the form of the test result.

## ATTACHMENT 6
## DRUGS AND ALCOHOL PROGRAM SUMMARY

The company is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, "look alikes", or any substance represented as a controlled substance, creates an impediment toward meeting these commitments.

Key Program Elements

1. Use, possession, or sale of controlled substances is prohibited.
2. Provisions for person or property searches are established.
3. All Employees are subject to drug and alcohol testing.
4. Types of testing include pre-employment, periodic, and reasonable suspicion/for cause.
5. Employees regulated by DOT (Hwy/Pipeline) are tested in accordance with DOT regulations.
6. Employees covered by the DOE PSAP or PAP programs are tested in accordance with DOE requirements.
7. Individuals testing positive on a pre-employment test are denied employment.
8. Employees testing positive on a reasonable suspicion/for cause test are subject to termination.
9. Employees testing positive on a periodic test, or voluntarily requesting help, are provided with employee assistance and rehabilitation services one time. Failure to complete the program, or a subsequent positive test, will subject the employee to termination.
10. Random testing is used only as part of the rehabilitation and followup program, except where required by applicable law.

It is the policy of the company to deny permission for conducting drug and alcohol testing of employees by clients and/or government agencies; except where required by applicable law. The company will provide, when requested, written certification that project employees have met all company Drugs and Alcohol Program requirements.

This summary pulls together information found in several company procedures. Further information can be obtained by contacting the Vice President, Health & Safety at 412-372-7701.

## ATTACHMENT 7

## CONSENT TO DRUG TESTING AND RELATED MATTERS

I have been advised that my employer, Shaw E & I has been given the opportunity to perform certain
work for _____ ("CLIENT"). CLIENT requires its contractors (such as Shaw E & I) to adhere to certain measures to assure that work for CLIENT is performed by workers who do not abuse alcohol or drugs. I desire to participate in such work for CLIENT and to do so I voluntarily consent to abide by the requirements of CLIENT's drug and/or alcohol testing program, and I acknowledge receiving, reading and understanding either a summary or complete copy of CLIENT's program.

I understand and agree to abide by CLIENT's drug testing program even though it may require that I undergo drug and/or alcohol testing which is more rigorous, comprehensive, invasive and / or frequent than would otherwise be required of employees who have not given their consent hereto.

I otherwise agree to comply with and be bound by CLIENT's program, rules and regulations applicable to employees, as they may be amended from time to time. I understand that a copy of the program and those rules and regulations is available for my inspection upon request.

**I understand that my agreement to this Consent is not required for my continued employment. Rather, I have given this Consent freely and voluntarily because of the benefits which I may receive on account of being available to do work on CLIENT projects.**

I understand that even though I grant this Consent, the company cannot guarantee that I will be asked to perform actual work on CLIENT projects, in part because CLIENT does not guarantee any work, or any particular amount of work, to the company. I also understand that my continued employment with the company is not conditioned on my granting or not withdrawing this Consent, but I understand that the company's ability to continue to maintain levels of employment is dependent upon it being able to satisfy its customers and, therefore, to have sufficient persons available to perform work for customers according to the customer's rules and regulations. I also understand and agree that the company can withdraw me at any time from this program, with or without cause. Also, nothing in this Consent alters the fact that I am an "at-will" employee of the company, as that term is commonly understood.

I may also withdraw my consent to continued participation in this program at any time by written notice to my supervisor. By withdrawing my consent, however, I do not revoke this Consent for acts and occurrences happening before that withdrawal or which may arise or result from acts or occurrences happening before that withdrawal.

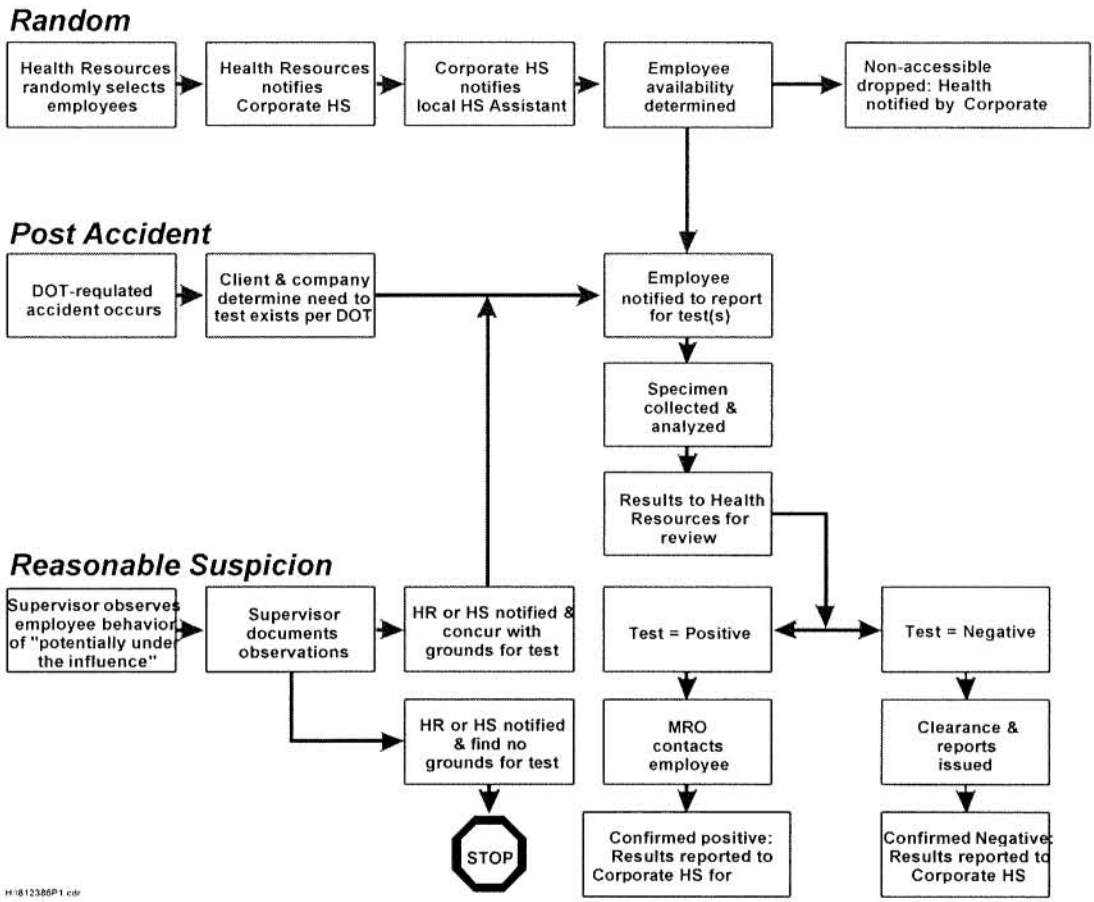
Having read this consent form and had answered any questions I may have concerning these matters, I FREELY AND VOLUNTARILY CONSENT AND AGREE TO ALL OF THE TERMS AND CONDITIONS OF THIS CONSENT.

_____

___Printed Name  Signature

_____

___ Social Security Number Date




**ATTACHMENT 8 - DRUG & ALCOHOL TESTING FLOW CHART**
**(DOT Random, Post-Accident, Reasonable Suspicion Testing)**
January 12, 2001

## ATTACHMENT 9

## RELEASE & CONSENT FORM

Name Employee Number Work Location

Social Security No. Home Telephone No.

Home Address

In accordance with and subject to the terms and safeguards of the company's Drug Abuse Policy, I hereby acknowledge the requirements to give one or more specimens of my urine to the company, its designated agents including any medical facility, laboratory or medical person, upon the request of the company. This specimen shall be used solely to detect the presence of prohibited drugs.

I further consent and agree that the laboratory results of any tests performed on such specimen(s) shall be furnished by the laboratory solely to the Medical Review Officer designated in the Policy, the company's Drug Abuse Program Manager, and the appropriate federal (e.g., DOT), and state agencies where required by applicable law and regulations. I also authorize the release of this information to any physician needing it to determine my physical qualification in accordance with DOT regulations, if applicable.

I understand that company agents will hold the test results confidential and release them only in accordance with the company's Drug Abuse Policy. I further understand that refusal to sign this form or a positive test result may result in disciplinary action up to and including discharge.

I understand that if this test is conducted for fulfilling pre-employment requirements, a positive result would render me ineligible for hire with the company for at least two years.

Executed this _____ day of _____, _____ at

_____

Employee Signature Witness Signature

HS101.10/2-20-95

## ATTACHMENT 10
## ALCOHOL PERSONNEL AND SERVICES CONTACTS

1. Alcohol Program Manager (APM)

   Warren C. Houseman
   Vice President, Health & Safety
   Shaw E & I
   2790 Mosside Boulevard
   Monroeville, PA 15146
   412-858-3917

2. Substance Abuse Professional (SAP) or Third Party Provider Network

   Value Options
   340 Golden Shore
   Long Beach, CA 90802
   800-325-5253

3. Employee Assistance Program (AAP)

   Value Options
   340 Golden Shore
   Long Beach, CA 90802
   800-325-5253

# ATTACHMENT 11
# CONTRACTOR ALCOHOL MONITORING PROCEDURES

## A. Objective

In order to assure a contractor's compliance with DOT's regulations, the following procedures are to be followed in determining compliance with the alcohol misuse testing regulations as set forth in 49 CFR Part 199 Subpart B, 49 CFR Part 40 Subpart C, and 49 CFR Part 382.

## B. Procedures for Determining Compliance

1. Qualifying Potential Contractors(s). Qualifications of the potential contractor as it pertains to alcohol testing policies/procedures is assured by requesting the potential contractor to submit a copy of its AMPP for review and compliance with RSPA/DOT/FHWA regulations. **After review of the AMPP is completed, written correspondence to the contractor will advise it whether or not the AMPP man is acceptable or in need of further additions, deletions, revisions** or **clarifying language.** The review of the contractor plan shall be completed utilizing the criteria established in the RSPA Alcohol Misuse Inspection form. Addenda made to the contractor's plan shall be attached to the previously submitted AMPP. Upon approval of the addendum, a letter of acceptance is then sent to the contractor. The contractor is now eligible to bid on company contract work that would be covered under Parts 199, 40, and 382.

2. Monitoring Contractor's Compliance. The contractor may be required to provide information on their Employees who will perform covered functions for the operator. This information may include the name and job title of its Employees who will perform any work or functions covered by Part 199 and 382 under that contract. A list of each contractor's covered Employees may be distributed to appropriate company field management personnel and job sites.

3. Statistical Submission. All pipeline contractors will be required to submit AMPP testing statistical information on a periodical basis which may be based on the duration of the contract. Typically this requirement will be conducted on a monthly or quarterly basis. The company may require a more frequent schedule for submission of data should they determine a need for such statistics.

4. Statistical Record Retention. The company shall maintain a complete file on each contractor's statistical drug testing data reports. The company shall make available these reports when requested by the RSPA Administrator, designated representative, or representatives of those state agencies under which jurisdiction the company operates.

## ATTACHMENT 12
## SHAW E & I COVERED POSITIONS

At any given time, the vast majority of Shaw E & I Employees in any listed position are **not** performing work regulated by any DOT drug and alcohol testing regulations. Employees in listed positions are only subject to the requirements of this procedure when engaged in activities defined in Section 4 (DOT).

**HOURLY:**

Field Civil Operations Supervisor I*
Field Civil Operations Supervisor II*
Field Civil Operations Supervisor III*
Field Civil Operations Supervisor IV*
Field Control Room Operator I*
Field Control Room Operator II*
Field Control Room Operator III*
Field DOT Driver I
Field DOT Driver II
Field Engineering Technician I
Field Engineering Technician II
Field Engineering Technician III
Field Equipment Operator I
Field Equipment Operator II
Field Equipment Operator III
Field Equipment Operator IV
Field Equipment Operator V
Field Equipment Operator/Foreman I*
Field Equipment Operator/Foreman II*
Field Health & Safety Technician I
Field Health & Safety Technician II
Field Health & Safety Technician III
Field Health & Safety Technician IV
Field Health & Safety Technician V
Field Lead Technician I*
Field Lead Technician II*
Field Lead Technician III*
Field Lead Technician IV*
Field Maintenance Technician I
Field Maintenance Technician II
Field Maintenance Technician III
Field Maintenance Technician IV
Field Maintenance Technician V
Field Maintenance Supervisor *
Field Plant Maintenance Specialist I
Field Plant Maintenance Specialist II
Field Plant Maintenance Specialist III
Field Plant Maintenance Specialist IV
Field Plant Maintenance Supervisor *
Field Plant Outside Operator I*
Field Plant Outside Operator II*
Field Plant Outside Operator III*
Electronics Technician I
Electronics Technician II
Electronics Technician III
Instrumentation & Electrical Supervisor *
Field Services Technician I
Field Services Technician II
Field Services Technician III
Field Services Technician IV

*Denotes supervisory positions subject to training requirements.

**NON-EXEMPT:**

Engineering Technician I
Engineering Technician II
Engineering Technician III
Field Technician I
Field Technician II
Maintenance Supervisor*

**EXEMPT:**

Assistant Engineer/Scientist
Consultant
Field Engineer I
Field Engineer II
Field Engineer III
Health & Safety Coordinator I
Health & Safety Coordinator II
Health & Safety Coordinator III
Project Manager I*
Project Manager II*
Project Manager III*
Superintendent I*
Superintendent II*
Site Manager I*
Site Manager II*
Chemist I
Chemist II
Chemist III
Chemist IV

*Denotes supervisory positions subject to training requirements.

## ATTACHMENT 13
## LABORATORY PROCEDURES

### A. Testing

- **Initial Test**
  The initial test shall use a screening test which meets the requirement of the Food and Drug Administration for commercial distribution.

- **Confirmatory Test**
  All specimens identified as positive on the initial test shall be confirmed using gas chromatography/mass spectrometry (GC/MS) techniques at the cutoff values listed in this paragraph for each drug. All confirmation shall be by quantitative analysis. Concentrations which exceed the linear region of the standard curve shall be documented in the laboratory record as "greater than highest standard curve value".

### B. Reporting Results

The laboratory shall report test results to the company's MRO within an average of 5 working days after receipt of the specimen by the laboratory. Before any test result is reported (the results of initial tests, confirmatory tests, or quality control data), it shall be reviewed and the test certified as an accurate report by the responsible individual. The report shall identify the drugs/metabolites tested for, whether positive or negative, the specimen number assigned by the employer, and the drug testing laboratory specimen.

The laboratory shall report as negative all specimens which are negative on the initial test or negative on the confirmatory test. Only specimens confirmed positive shall be reported positive for a specific drug.

The MRO may request from the laboratory and the laboratory shall provide quantitation of test results. The MRO shall report whether the test is positive or negative and may report the drug(s) for which there was a positive test, but shall not disclose the quantitation of test results to the company. The MRO may reveal the quantitation of a positive test result to the company, the employee, or the decision maker in a lawsuit, grievance, or other proceeding initiated by or on behalf of the employee and arising from a verified positive drug test.

The laboratory may transmit results to the MRO by various electronic means (i.e., teleprinter, facsimile, or computer) in a manner designed to ensure confidentiality of the information. Results may not be provided verbally by telephone. The laboratory and employer must ensure the security of the data transmission and limit access to any data transmission, storage, and retrieval system.

The laboratory shall send only to the MRO the original or a certified true copy of the drug testing custody and control form (copy 1), which, in the case of a report positive for drug use, shall be signed (after the required certification block) by the individual responsible for day-to-day management of the drug testing laboratory or the individual responsible for attesting to the validity of the test reports, and attached to which shall be a copy of the test report.

The laboratory shall provide to the company official responsible for coordination of the drug testing program a quarterly statistical summary of urinalysis testing of the company's Employees and shall not include in the summary any personal identifying information. Confirmation data shall be included from test results reported within that quarter. Normally this summary shall be forwarded not more than 14 calendar days after the end of the quarter covered by the summary. The summary shall contain the following information:

- Number of specimens received for testing
- Number of specimens confirmed positive for:
    - Marijuana metabolite
    - Cocaine metabolite
    - Morphine, codeine
    - Phencyclidine
    - Amphetamine
    - Methamphetamine
- Number of specimens for which a test was not performed

Quarterly reports shall not include data from which it is reasonably likely that information about individuals' tests can be readily inferred. If necessary, in order to prevent the disclosure of such data, the laboratory shall not send a report until data are sufficiently aggregated to make such an inference unlikely. In any quarter in which a report is withheld for this reason, the laboratory will so inform the employer in writing.

The laboratory shall make available copies of all analytical results for company drug testing programs when requested by DOT with regulatory authority over the company.

Unless otherwise instructed by the company in writing, all records pertaining to a given urine specimen shall be retained by the drug testing laboratory for a minimum of 2 years.

## C. Long Term Storage

Long term frozen storage (-20°C or less) ensures that positive urine specimens will be available for any necessary retest during administrative or disciplinary proceedings. Drug testing laboratories shall retain and place in properly secured long term frozen storage for a minimum of 1 year all specimens confirmed positive, in their original labeled specimen

bottles. Within this 1 year period, an employer (or other person designated in a DOT agency regulation) may request the laboratory to retain the specimen for an additional period of time, but if no such request is received the laboratory may discard the specimen after the end of 1 year, except that the laboratory shall be required to maintain any specimens known to be under legal challenge for an indefinite period.

**D. Retesting Specimens**

Because some analytes deteriorate or are lost during freezing and/or storage, quantitation for a retest is not subject to a specific cutoff requirement but must provide data sufficient to confirm the presence of the drug or metabolite.

**E. Subcontracting**

Drug testing laboratories shall not subcontract and shall perform all work with their own personnel and equipment. The laboratory must be capable of performing testing for the five classes of drugs (marijuana, cocaine, opiates, phencyclidine, and amphetamines) using the initial immunoassay and confirmatory GC/MS methods specified in this attachment. This paragraph does not prohibit subcontracting of laboratory analysis if specimens are sent directly from the collection site to the subcontractor, the subcontractor is a laboratory certified by DHHS as required in this attachment, the subcontractor performs all analysis and provides storage required under this attachment, and the subcontractor is responsible to the company for compliance with this attachment and applicable DOT regulations as if it were the prime contractor.

**F. Inspections**

DOT, any company utilizing the laboratory, DHHS, or any organization performing laboratory certification on behalf of DHHS reserves the right to inspect the laboratory at any time. Company contracts with laboratories for drug testing, as well as contracts for collection site services, shall permit the company and the DOT of jurisdiction (directly or through an agency) to conduct unannounced inspections.

**G. Documentation**

The drug testing laboratories shall maintain and make available for at least 2 years documentation of all aspects of the testing process. This 2 year period may be extended upon written notification by DOT or by any company for which laboratory services are being provided. The required documentation shall include personnel files on all individuals authorized to have access to specimens; chain-of-custody documents; quality assurance/quality control records; procedure manuals; all test data (including calibration curves and any calculations used in determining test results); reports; records on performance testing; performance on certification inspections; and hard copies of computer-generated data. The laboratory shall maintain documents for any specimen known to be under legal challenge for an indefinite period.

## H. Protection of Employee Records

Employer contracts with laboratories shall require that the laboratory maintain employee test records in confidence, as provided in DOT regulations.

The contracts shall provide that the laboratory shall disclose information related to a positive drug test of an individual to the individual, the employer, or the decision-maker in a lawsuit, grievance, or other proceeding initiated by or on behalf of the individual and arising from a certified positive drug test.

Upon written request from the employee, the laboratory shall provide access to any and all records relating to his or her drug test and any records relating to the results of any relevant certification, review, or revocation of certification proceedings.

## ATTACHMENT 14
## DRUG PERSONNEL AND SERVICES

1. Drug Program Manager (DPM):

   Warren C. Houseman
   V.P., Health & Safety
   Shaw E & I
   412-858-3917

2. Medical Review Officer (MRO):

   Jerry Berke, M.D., M.P.H.
   Health Resources
   600 West Cummings Park
   Suite 3400
   Woburn, MA 01801
   800-350-4511

3. SAMHSA Laboratory:

   Lab Corp
   69 First Avenue
   Raritan, NJ 08869

4. Employee Assistance Program (AAP):

   Value Options
   340 Golden Shore
   Long Beach, CA 90802
   800-325-5253

# ATTACHMENT 15
# CONTRACTOR MONITORING PROCEDURES

## A. Objective

In order to assure a contractor's compliance with DOT's regulations, the following procedures are to be followed in determining compliance with the drug testing regulations as set forth in 49 CFR Part 199 and Part 40.

## B. Procedures for Determining Compliance

1. Qualifying Potential Contractor: Qualifications of the potential contractor as it pertains to drug testing policies/procedures is assured by requesting the potential contractor to submit a copy of its anti-drug plan for review and compliance with RSPA/DOT regulations. After review of the anti-drug plan is completed, written correspondence to the contractor will advise it whether or not the plan is acceptable or in need of further additions, deletions, revisions or clarifying language. The review of the contractor plan shall be completed utilizing the criteria established in the RSPA Headquarters Drug Inspection form and the DOT Part 40 Drug Inspection forms. Addenda made to the contractor's plan shall be attached to the previously submitted plan. Upon approval of the addendums, a letter of acceptance is then sent to the contractor. The contractor is now eligible to bid on company contract work that would be covered under Part 199 and Part 40.

2. Monitoring Contractor's Compliance: The contractor may be required to provide information on his/her Employees who will perform covered functions for the operator. This information may include the name and job title of the Employees who will perform any work or functions covered by Part 199 under that contract. A list of each contractor's covered Employees may be distributed to appropriate company field management.

3. All contractors will be required to submit drug testing statistical information on a periodical basis which may be based on the duration of the contract. Typically, this requirement will be on a monthly or quarterly basis. The company may require a more frequent schedule for submission of drug testing data should they determine a need for such statistics.

4. The company shall maintain a complete file on each contractor's statistical drug testing reports. The company shall make available these reports when requested by the RSPA Administrator, agency designated representative, or representatives of those state agencies under which jurisdiction the company operates.

# ATTACHMENT 16
# DRUG AND ALCOHOL SUPPLEMENT

## A. Why You Should Get Involved

1. Although Shaw E & I has no history of substance abuse problems, we recognize that alcoholism and alcohol misuse are problems throughout American.

2. There are three good reasons why you should be concerned if any of your co-workers are using drugs or alcohol on the job.

   - Your health and safety may be at risk.
   - Alcohol misuse costs you money.
   - Alcohol creates a negative work environment.

3. According to the National Institute on Alcohol Abuse and Alcoholism, drug and alcohol use on the job costs society an estimated $102 billion a year. Since most of this cost is passed on to you in the form of higher health insurance rates or in consumer prices, drug and alcohol use on the job costs you and your fellow workers a significant amount of money.

4. Absenteeism among problem drinkers or alcoholics is 3.8 to 8.3 times greater than normal. If your fellow workers don't come to work, you may have to do their jobs in addition to your own.

5. Workers who misuse alcohol don't function at their full potential. Not only is absenteeism a problem, when they are at work these Employees may have reduced capabilities and productivity. Since our product is the safe transportation of hazardous liquid (or natural gas), alcohol misuse is an especially serious issue.

6. No matter what your position is in the organization, there is something you can do to ensure that drug and alcohol use on the job never becomes a problem. Acceptance of any misuse puts you, the company, and the public at risk.

## B. Effects of Alcohol Misuse on an Individual's Health, Work, and Personal Life

1. Alcohol is a central nervous system depressant. Taken in large quantities, it causes not only the euphoria associated with being drunk, but also adversely affects your judgement, ability to think, and your motor functions. Drink enough alcohol fast enough and it can kill you.

2. Long term overuse of alcohol can cause liver damage, heart problems, sexual dysfunction, and other serious medical problems.

3. In some cases, alcohol use can lead to physical and psychological dependence on alcohol. Alcoholism is a serious chronic disease. Left untreated, it will inevitably get worse.

4. Workers who use alcohol (and other drugs) affect everyone. Studies show that compared to alcohol-and-drug-free workers, substance abusers are far less productive, miss more workdays, are more likely to injure themselves or someone else, and file more workers' compensation claims.

5 The measurable dollar costs of workplace substance abuse from absenteeism, overtime pay, tardiness, sick leave, insurance claims, and workers' compensation can be substantial. However, the hidden costs resulting from diverted supervisory and managerial time, friction among workers, damage to equipment, and damage to the company's public image mean that workplace substance abuse can further cut profits and competitiveness.

6. Alcohol can also destroy relationships, lead to serious problems with the law (i.e., drunk driving), and even cause harm to the people you love.

7. If drinking affects your work life, it could lead to job loss and all the financial problems that would follow.

**C. Signs and Symptoms of Alcohol Misuse**

Any one or more of the following signs may indicate a drinking problem:

- Family or social problems caused by drinking;
- Job or financial difficulties related to drinking;
- Loss of a consistent ability to control drinking;
- "Blackouts" or the inability to remember what happened while drinking;
- Distressing physical and/or psychological reactions if you try to stop drinking;
- A need to drink increasing amounts of alcohol to get the desired effect;
- Marked changes in behavior or personality when drinking;
- Getting drunk frequently;
- Injuring yourself or someone else while intoxicated;
- Breaking the law while intoxicated; or
- Starting the day with a drink.

## D. Available Methods of Evaluating and Resolving Problems Associated with the Misuse of Alcohol

1. Outpatient programs exist in a variety of settings:

   - Community mental health centers;
   - Full service agencies;
   - Private physicians and therapists' offices;
   - Occupational settings; and
   - Specialized alcoholism treatment facilities.

2. Inpatient services, designed for those with more serious alcohol problems, can be found in hospitals, residential care facilities, community halfway houses, and some alcoholism clinics.

3. Your local phone directory will list helpful referral organizations such as:

   - Local council on alcoholism;
   - Alcoholics Anonymous;
   - Community alcoholism or mental health clinic;
   - Social services or human resources department; and
   - County medical society.

4. The SAP for Shaw E & I is Value Options, 340 Golden Short, Long Beach, CA 90802, 800-325-5253. The SAP will perform an initial evaluation, recommend any additional treatment if necessary, and refer Employees needing assistance for treatment covered under our health insurance program.

## E. Effects of Marijuana on an Individuals Health

1. When marijuana is smoked, it is irritating to the lungs. Chronic smoking causes emphysema-like conditions.

2. One cigarette (joint) of marijuana contains cancer causing substances equivalent to one-half to one pack of cigarettes.

3. One joint causes the heart to race and be overworked. People with undiagnosed heart conditions are at risk.

4. Marijuana is commonly contaminated with the fungus Aspergillus, which can cause serious respiratory tract and sinus infections.

5. Marijuana smoking lowers the body's immune system response, making users more susceptible to infection.

6. Chronic smoking causes change in brain cells and brain waves.

7. The active chemical, tetrahydrocannabinol (THC), and 60 other related chemicals in marijuana concentrate in the ovaries and testes.

8. Chronic smoking of marijuana in males causes a decrease in the sex hormone, testosterone, and an increase in estrogen, the female sex hormone.

9. One of the most common effects of prenatal cannabinoid exposure is underweight newborn babies.

**F. Signs and Symptoms of Marijuana Use**

1. Reddened eyes (often masked by eye drops)
2. Slowed speech
3. Distinctive odor on clothing
4. Lackadaisical, "I don't care" attitude
5. Chronic fatigue and lack of motivation
6. Irritating cough, chronic sore throat.

**G. Effects of Cocaine on an Individuals Health**

1. Cocaine use causes the heart to beat faster and harder and rapidly increases blood pressure which could lead to ruptured vessels causing strokes and heart attacks.

2. Strong psychological dependency can occur with one "hit" of crack. Cocaine causes the strongest mental dependency of any known drug.

3. Treatment success rates are lower than for other chemical dependencies.

**H. Signs and Symptoms of Cocaine Use**

1. Financial problems
2. Frequent and extended absences from meetings or work assignments
3. Increased physical activity and fatigue
4. Isolation and withdrawal from friends and normal activities
5. Secretive behaviors, frequent non-business visitors, delivered packages, phone calls
6. Unusual defensiveness, anxiety, agitation
7. Wide mood swings
8. Runny or irritated nose
9. Dilated pupils and visual impairment
10. Profuse sweating and dry mouth
11. Talkativeness.

## I. Effects of Opiates on an Individuals Health

1. IV needle users have a high risk for contracting hepatitis and AIDS due to the sharing of needles.
2. Narcotics increase pain tolerance. As a result, people could more severely injure themselves or fail to seek medical attention after an accident due to the lack of pain sensitivity.
3. Narcotics' effects are multiplied when used in combination with other depressant drugs and alcohol, causing increased risk for an overdose.

## J. Signs and Symptoms of Opiate Use

1. Mood changes
2. Impaired mental functioning and alertness
3. Constricted pupils
4. Depression and apathy
5. Impaired coordination
6. Physical fatigue and drowsiness
7. Nausea, vomiting and constipation.

## K. Effects of Amphetamines on an Individuals Health

1. Regular use produces strong psychological dependence and increasing tolerance to drug
2. High doses may cause toxic psychosis resembling schizophrenia
3. Intoxication may induce a heart attack or stroke due to spiking of blood pressure
4. Chronic use may cause heart and brain damage due to severe construction of capillary blood vessels
5. The euphoric stimulation increases impulsive and risk-taking behavior, including bizarre and violent acts
6. Withdrawal from the drug may result in severe physical and mental depression.

## L. Signs and Symptoms of Amphetamine Use

1. Hyperexcitability, restlessness
2. Dilated pupils
3. Increased heart rate and blood pressure
4. Heart palpitations and irregular beats

5. Profuse sweating
6. Rapid respiration
7. Confusion
8. Panic
9. Talkativeness
10. Inability to concentrate.

# ATTACHMENT 17
# CLIENT-SPECIFIC AGREEMENTS FOR DRUG & ALCOHOL TESTING

Attach to back of HS101, Drug & Alcohol Testing Program.

Questions/changes should be directed to:

Warren C. Houseman
Vice President, Health & Safety
Monroeville, PA

Issued: March 30, 1998
Revised: October 27, 2000

# Table of Contents

1. DOT Pipeline
2. Exxon Mobil
3. Monsanto
4. PPG - Lake Charles
5. SCE-San Onofre Sites
6. US EPA Region III
7. Torch Operating Company
8. Unocal
9. Westvaco
10. Rohm and Haas
11. TGPL
12. Chevron

## *General Instructions*

A list of Employees to be assigned to any client site where a specific agreement has been included herein must be submitted to the Vice President, Health & Safety in Monroeville. All Employees on that list must also complete a General Consent Form stating their understanding of and agreement to the client requirements for drug and alcohol testing (see Procedure HS101 for Consent Form).

Due to the specific disclosure requirements under the Star Enterprise, Torch Operating Company, and Exxon-Baytown, TX agreements, all Employees assigned these jobs **must** sign both the company General Consent Form and the client's form (see attached). Copies of both must be retained in the job file and in the Health & Safety office in Monroeville.

Many of our clients have rules which permanently bar any individual who has had a previous positive drug and/or alcohol test result (see attached to verify whether this applies to you). The local HS professional can obtain clearance on individuals to be assigned to such clients by contacting the Health & Safety office in Monroeville. All information is held in strictest confidence in accordance with state and federal regulations.

Some clients, (i.e., Exxon) allow their divisions/subsidiaries to set their own rules for drug and alcohol testing. Be sure you are referring to the correct section for your specific job (i.e., Exxon USA vs. Exxon Shipping vs. Exxon-Baytown).

In all client-specific agreements, the client program requirements are controlling by employee consent. Copies of these requirements shall be made available to Employees for their review. Key testing provisions are summarized in this document.

## 1. DOT PIPELINE

Most of Shaw E & I's pipeline clients use National Compliance Management Services (NCMS) to oversee/verify that contractor testing programs are fully compliant. The company's program is approved. We are classed as a "start/stop" program by NCMS, meaning our Employees remain in the testing pool only while performing regulated pipeline work. This means each new project team or team member must undergo "pre-employment" testing before starting work.

Under recently revised NCMS procedures, whenever we start a new pool or project team, we must notify NCMS regarding the employee name and date of test before NCMS will notify their/our client that we are cleared to start work.

Current company procedures require that the Health & Safety Office in Monroeville be notified whenever new Employees are added to the testing program (include employee name and social security number). When this notification is made, and you tell us it is for a pipeline operator, we will make the necessary notifications to NCMS and set-up the required random drug testing pool.

Remember, drug tests take 24-48 hours for results (assuming negative) from the time the specimen is collected.

## 2. EXXON MOBIL

Based on the level of compliance assigned at the time the contract was signed with Exxon, company employees will be working under Level II conditions which include: pre-assignment drug/alcohol testing, post-incident drug/alcohol testing, reasonable suspicion drug/alcohol testing, and searches/inspections. Details are described below. Both the Shaw E & I Generic Consent Form and the client's consent form (see attached) must be signed and copies forwarded to the Health & Safety office in Monroeville.

Any employee in violation of this policy or who refuses to cooperate with the search and testing provisions will be permanently removed from Exxon Mobil property and from performing work for Exxon Mobil.

**A. PRE-ASSIGNMENT DRUG/ALCOHOL TESTING** – Exxon Mobil requires that all employees assigned to work for Exxon Mobil receive a negative alcohol and drug test within the 12 months preceding the employee's first access to an Exxon Mobil job, and in any calendar year in which the employee performs work for Exxon Mobil (i.e. pre-access). Test results will be issued by Health Resources.

| *TEST PANEL: Exxon Mobil Panel + breathalyzer* |
|---|

Pre-assignment requirement may be fulfilled by those employees who have a current status of site access credentials at another Exxon Mobil site.

**B. POST-INCIDENT DRUG/ALCOHOL TESTING** - Immediately following any safety incident, Exxon Mobil will require the company to conduct drug and alcohol tests on any employees involved in the incident.

A safety incident is defined as an incident that caused personal injury requiring medical treatment beyond first aid or property damage of more than $100.00, or an incident that carried the potential for serious personal injury or significant property damage.

| *TEST PANEL: Exxon Mobil Panel + breathalyzer* |
|---|

Post-incident testing must be conducted immediately but in no event more than 3 hours following the incident.

Exxon Mobil may deny access to company employees pending test result certification. If access is denied, site access credentials must be immediately surrendered to Exxon Mobil Security by the employee(s) pending test results.

As soon as results of the test are known:

- Employees found to have a positive result must be removed immediately from the Exxon Mobil site (if access has not been denied as above), must surrender site access credentials to Exxon Mobil Security, and will be denied future access to Exxon Mobil properties.

- The company must submit a follow-up letter to Exxon Mobil (see Attachment I of Exxon Mobil Agreement) certifying the results of the test. This letter will be issued by Health Resources and faxed to the HS Manager. If the follow-up letter is not received within 7 calendar days, the employee required to test will be denied access and must surrender site access credentials to Exxon Mobil Security until a follow-up letter is received.

C. **REASONABLE SUSPICION DRUG/ALCOHOL TESTING** - Upon reasonable suspicion (i.e., observable actions, physical evidence or observable changes in established behavior patterns) that this Policy is being violated by company employees, Exxon Mobil will require that the company remove the employee from Exxon Mobil property, surrender site access credentials to Exxon Mobil Security, and will be denied future access to Exxon Mobil property.

| *TEST PANEL: Exxon Mobil Panel + breathalyzer* |
|---|

Employees will be allowed to return to work on Exxon Mobil property only after the following requirements are met:

i. Employee submits to drug and alcohol testing within 3 hours of removal from site.

ii. Health Resources certifies negative test results within 7 calendar days to Exxon (Health Resources must issue the clearance letter detailed above [see Attachment I of Exxon Agreement]).

The company must initiate testing without the intervention of Exxon Mobil, based on reasonable suspicion that this Policy is being violated.

D. **SEARCHES AND INSPECTIONS** – Exxon Mobil reserves the right, at all times, while employees are on Exxon Mobil property, to have Exxon Mobil, professional investigators, trained search dogs, or company supervisors at Exxon Mobil's request, to

conduct announced or unannounced searches and inspections of:

- Vehicle and their contents upon entering, leaving, and while on Exxon Mobil property.

- Exxon Mobil or contractor-owned/controlled property such as office desks, field areas, buildings, equipment, lockers, and/or toolboxes.

- Personal property such as briefcases, purses, clothing, and/or lunch boxes.

Any alcohol found during inspections or searches will be returned to the owner after the individual has been escorted off Exxon Mobil property.

Any illegal or controlled substances (other than prescription medication used as set forth in the Exxon Mobil Agreement) or drug paraphernalia found during inspections or searches will be destroyed or turned over to law enforcement authorities as appropriate.

Any employee(s) found in possession of alcohol, controlled substances, or drug paraphernalia will be denied future access to Exxon Mobil property.

E. **PROHIBITIONS** – Exxon Mobil prohibits all employees and subcontractors from the following

- Using, possessing, selling, manufacturing, distributing , concealing, or transporting any of the following items on Exxon Mobil property.

  - Any prohibited substance including (1) illicit or unprescribed drugs, controlled substances and mood or mind altering substances, (2) prescribed drugs used in a manner inconsistent with the prescription, and (3) alcoholic beverages.

  - Contraband, including firearms, ammunition, explosives, and weapons.

  - Illicit drug equipment or paraphenalia.

- Possessing or using prescription drugs or over-the-counter medication that may cause impairment except when all of the following conditions have been met:

  - Prescription drugs have been prescribed by a licensed physician for the person in possession of the drugs.

  - The prescription was filled by a licensed pharmacist for the person possessing the drug.

  - The individual notifies his supervisor, if he will be in possession of, or using, impairment causing prescription drugs or over-the-counter medication and appropriate steps are taken to accomodate the possibility of impairment, including, but not limited to removal from work for the period of possible impairment.

- Being under the influence of prohibited substances while performing any work for Exxon Mobil.

- Switching or adulterating any urine, blood or other sample used for testing.

- Performing work for Exxon Mobil if the person has tested positive, or refused testing in any employment-related test.

**F.** **SUBCONTRACTORS** - In all cases where the company is permitted to utilize a subcontractor, the company is responsible for ensuring that the subcontractor and its personnel are in compliance with the provisions of this Policy including pre-assignment drug/alcohol testing.

The company is responsible for ensuring that all subcontractor's personnel are informed of the provisions of this Policy and the consequences of failure to comply.

## 3. MONSANTO COMPANY

**A. PRE-ASSIGNMENT DRUG TESTING** - Monsanto requires a pre-assignment drug test, as well as written confirmation of same, for all personnel assigned to their sites. Test results can be no older than 24 months at the time of the assignment, and must be a SAMHSA drug screen. Confirmation of tests must be in the form of a letter providing the name of the employee, test date, and results (see Monsanto sample letter attached).

| *TEST PANEL: Shaw E & I #2* |
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**B. RANDOM DRUG SCREENING** - All Employees assigned to work on Monsanto property are subject to random drug testing. A list of employee names and social security numbers must be submitted to Corporate HS and should be updated as appropriate.

| *TEST PANEL: Shaw E & I #2* |
|---|

Health Resources will maintain the list and a random selection of names will be chosen for testing purposes, at an annualized rate of 50 percent of the covered Employees.

Refusals will be considered presumptive positives. Such Employees will be permanently denied site access.

Employees having completed the required random testing and receiving a positive result will be removed from his current duties on Monsanto property. However, they may be assigned to future Monsanto jobs once Monsanto's representative has received documentation verifying the employee has successfully completed a recognized substance abuse rehabilitation program. This must include a return-to-duty drug test with negative results.

**C. RIGHT TO SEARCH** - Monsanto reserves the right to search all personnel assigned to their sites. This includes the personnel, their vehicle, and their possessions. Personnel refusing to submit to searches will be removed and barred from Monsanto premises at the discretion of Monsanto.

**D. WAIVER** - In the event the company cannot adhere to this policy, a temporary waiver of requirements (see attached) must be approved by the Monsanto area superintendent

or shift superintendent. The Monsanto party responsible for the work involved will submit the waiver to include an explanation of the non-compliances with the policy and a plan for addressing the safety issues associated with the non-compliance.

E. **REASONABLE SUSPICION** - Upon reasonable suspicion by the supervisor or Monsanto that an employee on Monsanto premises is under the influence of or has consumed any substance or item prohibited by this policy he/she will be subject to reasonable suspicion testing.

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| *TEST PANEL: Shaw E & I #2* |

# 4. PPG - LAKE CHARLES

**A. PRE-ASSIGNMENT DRUG/ALCOHOL TESTING** - PPG requires drug and alcohol testing for all Employees to be assigned to PPG facilities. The minimum drug/alcohol screen acceptable is the substance panel required for DOT-regulated work. Pre-assignment testing must be less than 90 days old to qualify.

*TEST PANEL: Shaw E & I #2 + alcohol by breathalizer*

**B. ANNUAL DRUG/ALCOHOL TESTING**- Annual drug and alcohol testing is required for all Employees working or intended to work on PPG sites. The minimum drug/alcohol screen acceptable is the substance panel required for DOT-regulated work.

*TEST PANEL: Shaw E & I #2 + alcohol by breathalizer*

## 5. SCE-SAN ONOFRE

Southern California Edison has set specific policies for drug and alcohol testing which must be followed for continued access to the San Onofre site.

**A. UNESCORTED ACCESS CLEARANCE** - All Employees shall submit to a drug and alcohol test prior to being granted unescorted access.

**B. 5-HOUR ABSTINENCE** - Consumption of alcohol is prohibited for at least 5 hours preceding site access. Non-compliance shall result in access denial.

Emergency response participants must declare incidents of alcohol imbibing during 5 hours preceding access to site, and the employee will be required to produce evidence of "passing" an unscheduled alcohol screen or obtain the Station Manager's approval prior to access. This will not be considered a declared substance test failure.

Employees failing the test will be denied site access for at least 12 weeks, but may subsequently reapply for clearance. In accordance with SCE policy, post-positive random testing will continue for three (3) years (as opposed to the company's required two years).

**C. PRIOR VIOLATIONS** - Employees applying for site access shall declare past drug and alcohol test failures; these will be verified via "suitable inquiry". Access decisions are determined by the applicable provisions in effect at the time of the processing.

**D. REFUSAL TO PARTICIPATE IN DRUG/ALCOHOL TESTING** - Resigning during the process of obtaining access approval, refusing to submit to testing or committing other significant acts of uncooperativeness shall result in permanent denial of site access and shall be recorded as removal *for cause*.

**E. FOR CAUSE TESTING** - *For cause* testing shall be initiated under any of the following conditions:

- Unfit for Duty - when employee is observed to be unfit for duty
- Reasonable Cause
- If it is believed the employee's behavior contributed to:
- Personal injury
- Radiation exposure or radioactive release in excess of regulatory limits
- Significant incident/accident involving actual or potential degradation of level of safety of the plant

Failure to pass such a drug and alcohol test will result in permanent denial of site access.

F. **REPORTING OBSERVED POLICY VIOLATIONS** - All Employees are required to report any/all observed violations of the drug and alcohol rules. Failure to do so will result in permanent denial of site access.

## 6. US EPA REGION III

**A. PRE-ASSIGNMENT DRUG TESTING** – The US EPA Region III requires drug testing for all Employees directly engaged in clean-up or related activities. The minimum acceptable drug screen is the substance panel identified as Shaw E & I test panel #2. Employees must be tested within 90 calendar days prior to engaging in clean-up or related activities.

| *TEST PANEL: Shaw E & I #2* |
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**B. REINSTATEMENT AFTER POSITIVE TEST** - Reinstatement may be achieved after successful rehabilitation and a new negative pre-assignment test result.

| *TEST PANEL: Shaw E & I #2* |
|---|

Unsuccessful rehabilitation or failure to provide new negative pre-assignment test results will result in the permanent denial of entry to US EPA Region III clean-up activities.

**C. REASONABLE SUSPICION** - If the Shaw E & I supervisor on duty believes there to be "reasonable suspicion" of the presence of drugs and/or alcohol, a "reasonable cause" drug and alcohol test will be required as stipulated in Shaw E & I Procedure HS101.

| *TEST PANEL: Shaw E & I #2* |
|---|

**D. SUBCONTRACTORS** - In all cases where the company is permitted to engage a subcontractor, the company is responsible for insuring that the subcontractor and subcontractor's employees are in compliance with this policy.

**E. CONSENT TO DRUG TESTING** - All Employees assigned to US EPA Region III jobs must sign the company Consent To Testing Form. Copies of this form are to be retained in the job file and in the Corporate Health & Safety office in Monroeville, PA.

## 7. TORCH OPERATING COMPANY

As of March 11, 1996, Torch Operating Company has by default agreed to our drug and alcohol testing program. However, in accordance with the contract signed by Shaw E & I, Torch may opt for their own program at any time. This includes, but is not limited to:

A. **RANDOM DRUG/ALCOHOL TESTING** - All Employees working or intended to work on Torch sites may be selected for testing at any time, at the discretion of Torch.

> *TEST PANEL: Shaw E & I #2 + alcohol by breathalizer*
> or
> *Testing through Torch Programs*

B. **POST-ACCIDENT TESTING** - All such tests will be done by urinary drug test and breathalyzer. Tests will be conducted at your local Health Resources clinic, or a Health Resources-designated 24-hour collection facility, whichever is closer or open when the test is needed. Torch may also elect to conduct testing themselves.

> *TEST PANEL: Shaw E & I #2 + alcohol by breathalizer*
> or
> *Testing through Torch Programs*

C. **INDIVIDUAL TEST RESULTS** - Torch may require individual test results be submitted to them. By signing the Torch Consent Form, each employee assigned to Torch jobs has given his/her consent to such terms.

D. **CONSENT TO DRUG/ALCOHOL TESTING** - All employees assigned to Torch jobs must sign both the company General Consent Form for drug/alcohol testing as well as the Torch Operating Company Consent Form (attached). Copies of both are to be retained in the job file and in the Corporate Health & Safety office in Monroeville.

E. **RIGHT TO SEARCH** - Torch reserves the right to conduct searches of our employees and/or property when on Torch premises.

F. **REFUSAL TO PARTICIPATE IN DRUG/ALCOHOL TESTING** - Refusal to submit to testing or searches by Torch shall result in permanent denial of site access.

# 8. UNOCAL

A. Unocal has several requirements, as shown below, for personnel working in any operating area of their plants or facilities. All drug/alcohol tests will be performed at Health Resources clinics.

i. **PRE-ASSIGNMENT** - The company pre-hire drug screen meets this requirement for drug testing. However, required alcohol testing must be done before assignment to Unocal.

*TEST PANEL: Shaw E & I #1 + alcohol by breathalizer*

ii. **UNFIT CONDITION SCREENING** - Any employee found unable to perform their work in a safe and productive manner shall be subjected to search procedures and escorted to the off-site medical facility for drug and alcohol screening. Unocal is to be notified.

*TEST PANEL: Shaw E & I #1 + alcohol by breathalizer or blood test*

iii. **INCIDENT ON-DUTY SCREENING** - If an employee is involved in an incident affecting persons or property, the company and Unocal supervision shall determine if drug and alcohol screening is appropriate.

*TEST PANEL: Shaw E & I #2 + alcohol by breathalizer or blood test*

iv. **REASONABLE SUSPICION SCREENING** - Drug and alcohol screening is required when a supervisor identifies possible alcohol or drug related problems, poor productivity, deteriorating performance or poor safety performance.

*TEST PANEL: Shaw E & I #1 + alcohol by breathalizer or blood test*

v. **RANDOM** - All employees working for Unocal shall be in a random drug and alcohol screening pool. Tests shall be conducted monthly, such that 50 percent of the participants are tested annually. Once location management is notified by Corporate HS to have an employee tested, the employee must submit required samples within 48 hours or be considered a presumptive positive.

*TEST PANEL: Shaw E & I #2 + alcohol by breathalizer*

vi. **SEARCHES** - All employees are subject to searches of person or property whenever entering, leaving, or working at a Unocal facility.

vii. **SUPERVISOR TRAINING** - In addition to appropriate safety/operational training, supervisors must be trained in the recognition and handling of substance abuse.

viii. **SUBCONTRACTORS** - All subcontractor personnel shall meet the Unocal program requirements.

ix. **REINSTATEMENT AFTER POSITIVE TEST** - Reinstatement can be requested of Unocal after successful rehabilitation, a new negative pre-assignment test result, and a six month waiting period.

B. Shaw E & I procedures for complying with Unocal requirements are described below.

1. **LIST OF EMPLOYEES** - Provide the Corporate HS office with the list of Employees (or later additions) to be "Unocal qualified", and obtain signed consent forms from all employees. The consent form is to be placed in the employee's medical file, with copies to the Corporate HS office.

1. **RANDOM TESTS** - The employee must be scheduled for a SAMHSA/DOT drug and Breathalyzer test at your local Health Resources clinic as described in item 2 above.

1. **UNFIT FOR DUTY, POST-ACCIDENT, REASONABLE SUSPICION TESTS, BREATHALIZER CONFIRMATION** - All such tests will be done by urinary drug test and blood alcohol test, except breathalizer confirmation which will include blood alcohol only. Tests will be conducted either at your local Health Resources clinic, or a Health Resources-designated 24-hour collection facility, whichever is closer or open when the test is needed.

**NOTE:** **UNOCAL PROJECT SUPERVISORS WILL BE PROVIDED WITH A BLOOD ALCOHOL SAMPLE KIT WITH AUTHORIZATION FOR TREATMENT (AF) WHICH THEY MUST GIVE TO THE COLLECTION SITE.**

Based on indicated need, a 24-hour collection facility is being arranged only for the Martinez area. Should another location want to do work covered by this program, Health Resources must be notified to arrange for the 24-hour facility and provide blood alcohol kits.

Whenever a test is run in this category, the local HS Assistant must be given the AF no later than the beginning of the next business day so that Health Resources can be notified.

# 9. WESTVACO - CHEMICAL DIVISION

A special protocol has been set up for Westvaco testing. HS Assistants should specify "Westvaco Protocol" whenever drug/alcohol testing is required. The Westvaco Protocol will include a breathalyzer test for alcohol.

**A. PRE-ASSIGNMENT TESTING** - All employees who will or may be assigned to Westvaco jobs are required to be tested within 90 days immediately preceding access to Westvaco premises.

Short notice jobs, where prior testing and report are not possible, may be permitted to begin work on-site pending receipt of the results of pre-access testing. Such clearance must be within 30 days of access to Westvaco premises or access will be thereafter denied. This provision allows work to begin on an emergency or short notice situation only. This provision covers only employees needed for initial staffing and does not extend to those hired with sufficient time for pre-access testing.

*TEST PANEL: Specify "Westvaco Protocol" + breathalyzer*

**B. ANNUAL DRUG/ALCOHOL TESTING** - All employees who will or may be assigned to Westvaco jobs on a continuing basis must be substance tested at least once every 12 months with no more than 24 hours notice prior to testing.

*TEST PANEL: Specify "Westvaco Protocol" + breathalyzer*

**C. REASONABLE SUSPICION** - Upon reasonable suspicion by the supervisor or Westvaco that an employee on Westvaco premises is under the influence of or has consumed any substance or item prohibited by this policy will be subject to reasonable suspicion testing.

*TEST PANEL: Specify "Westvaco Protocol" + breathalyzer*

**D. POST-INCIDENT TESTING** - When designated by the supervisor or the Westvaco management, immediately following any incident which results in a recordable bodily injury as defined by OSHA, or damage to Westvaco or company-owned property the employee will be subject to drug/alcohol testing. (NOTE: Substance testing may also be required by the company following a near-miss incident.)

*TEST PANEL: Specify "Westvaco Protocol" + breathalyzer*

E. **SEARCHES AND INSPECTIONS** - Westvaco reserves the right to carry out unannounced searches of Individuals, their vehicles and personal effects when entering, while on, or when leaving Westvaco property. Such searches may be initiated without prior announcement and will be conducted at such times and locations as deemed appropriate by Westvaco.

F. **REFUSAL TO TEST** - The refusal of any employee to sign a General Consent Form or submit to any testing in order to enter Westvaco premises will be denied access to Westvaco premises.

G. **REINSTATEMENT OF ACCESS PRIVILEGES** - Reinstatement of access privileges may be made after three months upon request of the company to Westvaco. Access may be obtained once the employee has successfully passed a substance test.

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| *TEST PANEL: Specify "Westvaco Protocol" + breathalyzer* |

## 10. *ROHM AND HAAS*

**A. PRE-ASSIGNMENT DRUG/ALCOHOL TESTING** - Rohm and Haas requires drug and alcohol testing for all employees assigned to the Rohm and Haas Deer Park plant. Pre-assignment testing must be less than 60 days to qualify.

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| *TEST PANEL: Shaw E & I #1 + alcohol* |

**B. RANDOM DRUG/ALCOHOL TESTING** - All employees working or intended to work at Rohm and Haas sites are required to be in a random drug and alcohol testing pool. Tests shall be conducted so that 50% of the participants are tested annually. Once location management is notified by Corporate HS to have an employee tested, the local office has 48 hours in which to have the employee(s) complete the test. However, the employee(s) to be tested must have no more than 8 hours advance notice of testing.

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| *TEST PANEL: Shaw E & I #1 + alcohol* |

**C. REASONABLE SUSPICION** - If the supervisor on duty believes there to be "reasonable suspicion" of the presence of drugs and/or alcohol, a "reasonable cause" drug and alcohol test will be required as stipulated in Procedure HS101.

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| *TEST PANEL: Shaw E & I #1 + alcohol (by blood, urine, or breathalyser)* |

**D. DRUG/ALCOHOL TESTING OF EMPLOYEES INVOLVED IN ACCIDENTS OR NEAR-MISS ACCIDENTS** - All employees involved in accidents where injuries occurred or near-miss accidents where more serious injuries could have occurred will be subject to drug and alcohol testing.

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| *TEST PANEL: Shaw E & I #1 + alcohol (by blood, urine, or breathalyzer)* |

**E. SUBCONTRACTORS** - In all cases where the company is permitted to engage a subcontractor, the company is responsible for insuring that the subcontractor and subcontractor's employees are in compliance with this policy including, without limitation, obtaining the consent forms and audit rights.

**F. CONSENT TO DRUG/ALCOHOL TESTING** - All employees assigned to Rohm and Haas jobs must sign both the company General Consent Form for drug/alcohol testing as well as the Rohm and Haas Consent Form (attached). Copies of both are to be retained in the job file and in the Corporate Health & Safety office in Monroeville.

# 11. TGPL

## *General Instructions*

A list of employees to be assigned to safety sensitive positions on the TGPL Program is included herein and has been submitted to the Corporate Health & Safety office in Monroeville, PA. All employees on that list must complete a General Consent Form stating their understanding of, and agreement to, TGPL requirements for drug and alcohol testing (see Attachment A). A copy of the form will be retained in the Corporate Health & Safety office in Monroeville, PA.

Clearance for additional individuals to be assigned to the TGPL program will be initiated by contacting Amy O'Connor in the Health & Safety office in Monroeville. All information is held in strictest confidence in accordance with state and federal regulations.

TGPL's requirements are included in Exhibit "J" of the Base Corporation Agreement. Copies shall be made available to Employees for their review upon request. Key testing provisions are summarized in this document.

The company will provide initial and follow-up reports to EL Paso Energy using forms that are included in the Base Corporation Agreement, Exhibit "J", Paragraph "F". Such Reports shall cover the blind results of pre-assignment testing, post-incident testing, reasonable suspicion testing, and random testing as required by El Paso Energy (Attachment B). The reports are to be mailed to:

Doug Greer
El Paso Energy Corporation
P.0. Box 2511
Houston, Texas 77252-2511

A. **PRE-ASSIGNMENT DRUG/ALCOHOL TESTING** -All employees who are assigned to the TGPL program in safety sensitive positions are required to be tested prior to regulated assignments. This includes all program personnel with the exception of secretaries, file clerks, data management, and data entry personnel. This certification will be issued by Health Resources (The company's Medical Management Provider) and faxed to the HS Manager. The results of the pre-assignment results will be reported to TGPL in blind form for both employees and associated subcontractors.

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| *TEST PANEL: Protocol 1 (see attachment C for specific parameters)* |

The pre-assignment requirement may be fulfilled by those employees who have taken a drug/alcohol test within the last twelve months that meet the requirements of the Protocol 1 test panel.

The results of pre-assignment testing will be submitted to TGPL before regulated activities are commenced.

**B. POST-INCIDENT DRUG/ALCOHOL TESTING** - Immediately following any safety incident which results in an injury or property damage, the company will conduct drug and alcohol tests on any employees involved in the incident.

| *TEST PANEL: Protocol 1* |
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Post-incident testing must be conducted immediately but in no event more than 3 hours following the incident.

Employees found to have a positive result must be removed immediately from the TGPL program and will be denied future access to TGPL properties.

The results of post incident testing will be reported to TGPL when and if testing is performed.

**C. REASONABLE SUSPICION DRUG/ALCOHOL TESTING** - Upon reasonable suspicion (i.e., observable actions, physical evidence or observable changes in established behavior patterns) that this Policy is being violated by company employees, the company will remove the employee from the TGPL project, and the employee will be denied future access to TGPL property.

| *TEST PANEL: Protocol 1* |
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Employees will be allowed to return to work on the TGPL program only after the following requirements are met:

1. Employee submits to drug and alcohol testing within 3 hours of removal from site.

2. Health Resources certifies negative test results within 7 calendar days to TGPL (Health Resources) must issue the clearance letter.

The company must initiate testing without the intervention of TGPL, based on reasonable suspicion that this Policy is being violated. Reasonable suspension test results will be submitted to TGPL when and if a test is performed.

D. **RANDOM TESTING** - All Employees scheduled to work in safety sensitive positions on regulated activities on the TGPL program are subject to random drug and alcohol testing. A list of employee names must be submitted to Corporate HS and should be updated as appropriate.

Health Resources will maintain the list and a random selection of names will be chosen for testing purposes, at an annualized rate of 50 percent of the covered employees.

Refusals will be considered presumptive positives. Such employees will be permanently removed from the TGPL program.

Employees having completed the required random testing and receiving a positive result will be removed from his current duties on the TGPL program.

The results of random testing will be reported to TGPL as they are performed equally over the year.

E. **SUBCONTRACTORS** - In most cases where the company is permitted to utilize a subcontractor, the company is responsible for ensuring that the subcontractor and its personnel are in compliance with the provisions of this Policy.

The company is responsible for ensuring that all subcontractor's personnel are informed of the provisions of this Policy and the consequences of failure to comply.

The company will utilize the same forms for subcontractors as are used to report drug test reports for its own testing results as permitted by El Paso Energy.

F. **GENERAL** - The company certifies that it is in compliance with Department of Transportation (DOT) record keeping requirements regarding drug and alcohol testing (49 CFR 199.23 and 49 CFR, Parts 382, 391, and 394) and will continue to comply with such regulations. TGPL, Research and Special Programs Administration (RSPA) of the DOT or any other authorized state agency, may upon request, inspect the company's records relating to drug and alcohol testing, confirm or audit the company's compliance with DOT drug and alcohol testing regulations and that the company will provide TGPL or the Applicable State or Federal agency copies of the company's Drug and Alcohol Testing Plan and Procedures and any requested results of Drug and Alcohol testing. This provision

will apply even after termination of the Base Cooperation Agreement or up to the time the applicable statute of limitations expires for such Drug and Alcohol testing and/or reports.

## 12. CHEVRON

A copy of Chevron's NOTICE TO CONTRACTOR EMPLOYEES (MFG-7206) must be provided to all employees before they enter Chevron premises. This notice includes specific Chevron requirements for: pre-assignment drug/alcohol testing, post-incident drug/alcohol testing, reasonable suspicion drug/alcohol testing, and searches/inspections. Details are described below. Employees must sign the Chevron Consent Form which indicates that the employee consented to the drug and alcohol testing and a Chevron acknowledgement form verifying that they received a copy of Chevron's NOTICE TO CONTRACTOR EMPLOYEES, (see attached). Signed copies must be forwarded to the Health & Safety department in the Monroeville office.

Any employee who has either refused or failed to complete a required test, or tested positive for drugs and/or alcohol will be prohibited from being assigned to Chevron, or its affiliates. The Chevron facility office will be notified if the employee has been previously disqualified from performing services for Chevron or its affiliated companies for violation of drug and alcohol policies and whether that employee has participated in or has completed a substance abuse rehabilitation program. If Chevron gives written consent, the employee may then be returned to work.

A. **PRE-ASSIGNMENT DRUG/ALCOHOL TESTING** - Chevron requires that all employees assigned to work for Chevron receive a negative alcohol and drug test within six months preceding the employee's first access to a Chevron job, and in any calendar year in which the employee performs work for Chevron (i.e. pre-access). Employees who have tested positive in the six month period prior to starting work will not be assigned to perform work for Chevron without Chevron's written consent. Test results will be issued by Health Resources.

| *TEST PANEL: Protocol 2 + Breathalyzer* |
|---|

B. **RANDOM TESTING** - All employees working in safety sensitive positions while on Chevron premises, engaged on Chevron business or operating Chevron equipment are subject to random drug testing. A list of employee names and social security numbers must be submitted to Amy O'Connor in the Corporate Health & Safety Department in the Monroeville office.

| *TEST PANEL: Protocol 2 + Breathalyzer* |
|---|

Health Resources will maintain the list and a random selection of names will be chosen for testing purposes, at an annualized rate of 50 percent of the covered

employees. Refusals will be considered presumptive positives. Such Employees will be denied access to Chevron premises.

C. **POST-INCIDENT DRUG/ALCOHOL TESTING** - Immediately following any safety incident which results in an injury, property damage or near miss, Chevron will require the company to conduct an investigation to determine whether the incident could have been caused by or contributed to by drug and/or alcohol abuse of the individual(s) involved. If drug/alcohol misuse is indicated a controlled substance and alcohol test must be conducted.

NOTE: A near miss is any incident which, if it had proceeded to a reasonably possible and a more serious level of development, would have had the potential of personal injuries, property damage, or liability claims.

| *TEST PANEL: Protocol 2 + Breathalyzer* |
|---|

D. **REASONABLE SUSPICION DRUG/ALCOHOL TESTING** - Upon reasonable suspicion (i.e., observable actions, physical evidence or observable changes in established behavior patterns) that this Policy is being violated by company employees, Chevron has the right to require a contractor employee to take a "for-cause" test for controlled substances and/or alcohol. Upon request by Chevron for testing the employee must be immediately removed from Chevron property.

| *TEST PANEL: Protocol 2 + Breathalyzer* |
|---|

Employees will be allowed to return to work on Chevron property only after the following requirements are met:

A request for reinstatement has been provided and a written consent to reinstate the individual has been received from Chevron. The request for reinstatement must include the following:

a. The date and time the specimen was collected and certification that the individual tested negative;

b. If the individual was not tested and explanation of the reasons;

c. A certification that the individual is participating in or has completed a rehabiliation program for substance abuse; and

d. Any additional information the company wishes Chevron to consider.

**E. SEARCHES AND INSPECTIONS** - Chevron reserves the right to conduct unannounced reasonable searches of individuals and their personal effects when entering Chevron premises, while on Chevron premises and when leaving Chevron premises. This includes searches and inspections of:

- Personal vehicles and their content while on Chevron property.
- Personal property such as briefcases, purses, clothing, and/or lunch boxes.

Entry onto Chevron premises constitutes consent to a search of the person and his/her personal effects as listed above. Employees who decline to cooperate with the search will result in not being allowed on the premises of Chevron or its affiliates.

The local Chevron facility manager will be notified prior to the company conducting its own search on Chevron premises.

**F. TRAINING** - Employees have access to the corporate Drug and Alcohol policy via the corporate intranet information system called "The Loop" or through hard copy policy and procedures located in each office. This policy covers the consequences for failing to comply with Chevron's Drug, Alcohol, and Search policy. It also refers to the Human Resources policy on Employee Assistance. Training on the manifestation and behavioral causes that may indicate controlled substance abuse or use will be provided to supervisors and employees on a biannual basis through the distribution of two video tapes (one covering drug abuse and one covering alcohol abuse). A hard copy publication for each subject will also be distributed.

*CLIENT-SPECIFIC*

*DRUG/ALCOHOL CONSENT FORMS*

# US EPA REGION III
# CONSENT TO TESTING

I understand that I am subject to drug testing within 90 days of being directly engaged in clean-up or related activities.

I understand that I am now being asked to provide a specimen of my urine for the purpose of determining the presence of drugs in my body system(s).

I understand that I cannot be compelled to provide specimens for drug analysis; however, I also understand if I test positive for drugs or refuse to be tested, I will be removed from and/or prevented from entering US EPA Region III jobsites.

I hereby consent to provide a specimen of my urine.

I also authorize my employer to have continued access to the specimen in case further analysis is required, to obtain the results of all tests made of the specimen, and to communicate concerning these results with the testing agency, and US EPA Region III.

_____ _____

Employee Signature Date

_____ _____

Name of Employee (Print) Employee Social Security Number

# INDEPENDENT CONTRACTORS
# OPERATING ON TORCH OPERATING COMPANY PREMISES
# CONSENT TO DRUG/ALCOHOL TESTING AND
# CONTRABAND SEARCHES

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I certify that I have read and understand Torch Operating Company's Drug-Free Workplace Policy. I understand that if I violate this policy I will be removed from and not be allowed to return to any premises of Torch Operating Company. I understand that unannounced searches may be conducted of my person, my personal effects, belongings, quarters, locker and/or my vehicle, for the purpose of determining whether illegal and unauthorized items, drugs, narcotics, controlled and/or dangerous substances, and alcoholic beverages, are in my possession while on Torch Operating Company property, Company controlled property, in Company vehicles, or while on Company business. I understand that Torch Operating Company may include the collecting of blood, urine, saliva and/or breath samples for the purpose of determining the use of drugs, narcotics, controlled and/or dangerous substances, and alcoholic beverages.

I hereby give my consent to Torch Operating Company or its authorized representative to search my person, vehicle, and/or personal effects and to perform the collection of blood, urine, saliva and/or breath samples.

I authorize the physician, nurse, or laboratory technician who conducts the urinalysis to release the results of my tests to Torch Operating Company.

_____ _____Employee

Signature Date

_____

Name of Employee (Print) Employee Social Security Number

# EXXONMOBIL
# CONSENT AND AUTHORIZATION FOR ALCOHOL AND CONTROLLED SUBSTANCE TESTING

At the request of my employer, and as a condition of my assignment for Exxon Mobil, I consent to take any physical and/or medical examination, including the collection of blood, urine, or saliva samples and to submit to any other necessary medical tests to determine the presence or use of alcohol, drugs, or controlled substances by me.

I hereby consent to my employer and its agents, including, but not limited to, any collecting and testing agencies, to disclose and discuss the results of such testing and any other relevant information with Exxon Mobil and/or Exxon Mobil authorized agents, assigns, representatives.

_____ _____Employee

Signature Date

_____

Name of Employee (Print) Employee Social Security Number

# TGPL
# CONSENT TO TESTING

I understand that I am subject to drug and/or alcohol testing.

I understand that I am now being asked to provide a specimen of my breath, blood or urine for the purpose of determining the presence of drugs and/or alcohol in my body system(s).

I understand that I cannot be compelled to provide specimens for drug and/or alcohol analysis; however, I also understand if I test positive for drugs or alcohol or refuse to be tested, I will be removed from and/or prevented from working on the TGPL program.

I hereby consent to provide specimens of my breath, blood or urine.

I also authorize my employer and employer's agents to have continued access to the specimens in case further analysis is required, to obtain the results of all tests made of the specimens, and to communicate concerning these results with the testing agency, governmental agencies having jurisdiction, and TGPL.

_____ _____Employee

Signature Date

_____

Name of Employee (Print) Employee Social Security Number

# CHEVRON
# CONSENT AND AUTHORIZATION FOR ALCOHOL AND CONTROLLED SUBSTANCE TESTING

At the request of my employer, and as a condition of my assignment for Chevron, I consent to take any physical and/or medical examination, including the collection of blood, urine, or saliva samples and to submit to any other necessary medical tests to determine the presence or use of alcohol, drugs, or controlled substances by me.

I hereby consent to my employer and its agents, including, but not limited to, any collecting and testing agencies, to disclose and discuss the results of such testing and any other relevant information with Chevron or its representative.

_____ _____Employee

Signature Date

_____

Name of Employee (Print) Employee Social Security Number

# ACKNOWLEGEMENT OF THE RECEIPT OF CHEVRON'S NOTICE TO CONTRACTOR EMPLOYEES

My signature below signifies that I have been provided Chevron's Notice to Contractor Employees document prior to performing any work at a Chevron facility.

_____ _____ Employee

Signature Date

_____

Name of Employee (Print) Employee Social Security Number

# PROCEDURE

Subject: **LADDER SAFETY**

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for the inspection, setup, and proper use of portable step, straight, and extension ladders. It is intended to address the elements of OSHA Standards 29 CFR 1910.25 *Portable Wood Ladders*, 29 CFR 1910.26 *Portable Metal Ladders*, and 29 CFR 1926.1053 *Ladders*. Some of our clients may establish ladder safety requirements that exceed those discussed within this procedure (i.e., USACE EM 385-1-1). In these situations, the more protective safety requirements and practices will be followed.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

## 5.0 TEXT

This procedure establishes the minimum safety standards required for the inspection, setup, and use of portable step, straight, and extension ladders. It is not intended to address the requirements for fixed ladders as specified in 29 CFR 1910.25 *Fixed Ladders*, or for scaffolds as specified in Subpart L of 1926.

### 5.1 Inspection

The ladder user is required to perform an inspection of the ladder prior to use and after any event that could result in ladder damage. Ladders which have been determined to be defective will be tagged "out of service" and will either be repaired to a condition meeting their original design or destroyed. A supervisor will be immediately informed of the condition of any defective ladder. The following guidelines will be followed during ladder inspections.

#### 5.1.1 Stepladders

- The joint between the steps and side rails must be tight and movable parts must operate freely without binding or undue play.
- Verify that all rivets, nuts, and bolts are tight and that the spreader mechanism and pail shelf function properly.
- Wood stepladders will not be coated with any opaque covering, except for identification or warning labels which may be placed on the outside face of a side rail.
- Stepladders with broken or missing steps, side rails, or other faulty components are not to be used.
- Stepladders are to be clean, free from grease, oil, mud, snow, wet paint, and other slippery materials.

### 5.1.2 Straight and Extension Ladders

- Make sure all rivets, joints, rungs, nuts, and bolts are tight. Ladder extension locks and slip-resistant feet will be in good condition and functioning properly.
- Ropes, cables, and pulleys will be checked to ensure that they operate properly and will be replaced if they are worn or defective.
- Wood ladders will not be coated with any opaque covering, except for identification or warning labels which may be placed on only one face of a side rail.
- Inspect for damaged or bent rungs, side rails, and extension locks.
- Ladders are to be clean, free from grease, oil, mud, snow, wet paint, and other slippery materials.

## 5.2 Storage

Ladders will be stored in such a manner as to provide for ease of access or inspection, and to prevent danger of an accident when withdrawing a ladder for use. Ladders are to be stored on racks designed to protect the ladder from damage. These racks must have sufficient support points to prevent any possibility of excessive sagging. Wood ladders will be stored in a location where there is good ventilation, but where they will not be exposed to the elements. Ladders carried on vehicles will be adequately supported to avoid sagging and securely fastened in position to minimize chafing and the effects of road vibration.

## 5.3 Setup

### 5.3.1 Stepladders

- Make sure ladder is fully open, spreaders are secure, and pail shelf is in position.
- Do not place ladder in front of door opening.
- Place on firm, level, non-slippery surface that provides a secure footing. Do not place on boxes, unstable bases, or on scaffolds to gain additional height.
- Portable metal ladders are not to be used in places where they may come in contact with energized parts.

### 5.3.2 Straight and Extension Ladders

- The correct angle for using straight and extension ladders is for the foot of the ladder to be placed from the wall a distance equal to one-fourth (1/4) the effective length of the ladder. (Effective length = length of ladder from base to point of support.)

- A ladder is not to be used to gain access to a roof or other elevated working surface unless the top of the ladder extends at least three (3) feet above the point of support at eaves, gutter, edge, or roof line.

- Ladders must not be placed on boxes, barrels, or other unstable bases to obtain additional height.

- Secure ladder base when raising and never set up a ladder when it is extended. Top section should only be extended from the ground level. Where possible, use second employee to hold the ladder while it is being extended. Ladders will not be repositioned or extended while occupied.

- Place on a firm level surface with a secure footing. Do not use on slippery surfaces. Do not place on boxes, unstable bases, or on scaffolds to gain additional height. Do not place ladder in front of door opening.

- The ladder must be positioned with both top rails supported unless equipped with a single support attachment.

- On two-section extension ladders, the minimum overlap for the two sections is to be at least three (3) feet.

- Portable metal ladders are not to be used in places where they may come in contact with energized parts.

## 5.4 Use

Only employees who have been trained in accordance with Section 4.5 of this procedure will be permitted to use portable step, straight, or extension ladders. Only Type 1 "Industrial" and Type 1A "Heavy Duty Industrial" wooden, composite, or metal ladders will be authorized for use. The following operational rules will be observed by company employees.

### 5.4.1 Stepladders

- Follow all manufacturer hazard warnings and safety use instructions affixed to ladder.

- Do not use stepladders in high winds.

- The top two steps of stepladders are not to be used as steps.

- Personnel using stepladders must:
  - Face the ladder while climbing up or down and keep body centered between side rails.
  - Work only within arm's length of the ladder.
  - Use both hands when ascending or descending while maintaining a firm grip.
  - Allow no other person on the ladder.
  - Use rope to raise or lower materials and tools.
- A portable stepladder is designed as a one-person working ladder. The ladder base sections are to be placed with a secure footing.

### 5.4.2 Straight and Extension Ladders

- Follow all manufacturer hazard warnings and safety use instructions affixed to ladder.
- Ladders must be attended by either another employee, or tied off when in use.
- Do not use ladders in high winds.
- Employees using ladders must:
  - Face the ladder while climbing up or down and keep body centered between side rails.
  - Work only within arm's length of the ladder.
  - Use both hands when ascending or descending while maintaining a firm grip.
  - Allow no other person on the ladder.
  - Use rope to raise or lower materials and tools.
- Portable ladders are designed as a one-person working ladder. The ladder base section is to be placed with a secure footing. Safety shoes or feet of good substantial design are to be installed on all ladders.

### 5.5 Training

Employees will be trained to recognize hazards related to ladder use and the procedures to follow to minimize these hazards. Training on the safe use of ladders will be conducted prior to an employee being allowed to use a ladder. This training will be conducted by a local health and safety representative or supervisor familiar with safe ladder use and will consist of a review of this procedure, applicable OSHA standards, and a demonstration of correct ladder usage. The evaluation of correct usage will be tailored to the employee's anticipated work situation. The employee will have to demonstrate that he/she knows and understands how to safely use a ladder, is familiar with the content of this procedure, and can demonstrate overall ladder use skills. Employees will acknowledge receiving this training by signing the ladder training record provided as Attachment 2.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Employee and Subcontractor Training Requirements
29 CFR 1910.25 *Portable Wood Ladders*
29 CFR 1910.26 *Portable Metal Ladders*
29 CFR 1926.1053 *Ladders*
ANSI A14.1, A14.2, A14.3, and A14.5

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Training Record, Ladder Training

## ATTACHMENT 1

## LADDER SAFETY RESPONSIBILITY MATRIX

| Action | Procedure Section | *Responsible Party* | | |
|---|---|---|---|---|
| | | Ladder User | Local Health and Safety Representative or Supervisor | Vice President, Health and Safety |
| Issuance, Revision, and Maintenance of Procedure | 3.1 | | | X |
| Ladder Inspection | 5.1 | X | | |
| Inform Supervisor of Defective Ladder | 5.1 | X | | |
| Properly Store Ladder After Use | 5.2 | X | | |
| Provide Ladder Training | 5.5 | | X | |
| Receive Ladder Training | 5.5 | X | | |
| Acknowledge Receipt of Training | 5.5 | X | | |
| Forward Copy of Attachment 2 to Knoxville Health and Safety Training Office | 5.5 | | X | |

ATTACHMENT 2

## EMPLOYEE TRAINING RECORD: LADDER TRAINING*

NAME _____ EMPLOYEE NUMBER _____

LOCATION _____ SUPERVISOR _____

1. I have reviewed, understand, and agree to abide by the ladder procedures described in Procedure HS302.

2. I acknowledge that it is my responsibility to inspect ladders prior to their use and after any event that could result in ladder damage.

SIGNATURE _____ DATE _____

1. I have observed a demonstration of the ladder usage skills for the above employee and feel that he or she understands how to correctly use a ladder; is familiar with safety rules and regulatory requirements; and has demonstrated satisfactory ladder skills.

INSTRUCTOR SIGNATURE _____ DATE _____

*** Place original completed form in the project health and safety file and forward a copy to the Knoxville Health and Safety Training Office.**

# PROCEDURE

Subject: **EXCAVATION AND TRENCHING**

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to describe the company requirements for excavation and trenching safety. These requirements are based on the federal Occupational Safety and Health Administration (OSHA) excavation standard found in 29 Code of Federal Regulations (CFR) 1926, Subpart P.

Some company activities are likely to occur in states or localities that either currently have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

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  - 5.2.8 Hazardous Atmospheres
  - 5.2.9 Water Accumulation Hazards
  - 5.2.10 Stability of Adjacent Structures
  - 5.2.11 Protection from Loose Rock or Soil
  - 5.2.12 Inspections

5.2.13 Fall Protection
6.0 Exception Provisions
7.0 Cross Reference
8.0 Attachments

## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Accepted Engineering Practices**
Those requirements or practices which are compatible with standards required by a registered professional engineer.

**Angle of Repose**
The greatest angle above the horizontal plane at which a material will lie without sliding.

**Benching**
A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

**Competent Person**
An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate them.

**Company**
All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Excavation**
Any man-made cut, cavity, trench or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.

**Registered Professional Engineer**
An individual currently registered as a professional engineer (preferably civil) in the state where work is to be performed.

**Sheeting**
Members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

**Shield**
A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

**Shoring**
Structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

**Sloping**
A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

**Support System**
A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

**Tabulated Data**
Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

**Trench**
A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

**Type A Soil**
Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured;
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects;

- The soil has been previously disturbed;
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- The material is subjected to other factors that would require it to be classified as a less stable material.

**Type B Soil**
This classification refers to:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa)
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam.
- Previously disturbed soils except those which would otherwise be classified Type C soil;
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration;
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

**Type C Soil**
This classification refers to:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;
- Granular soils including gravel, sand, and loamy sand;
- Submerged soil or soil from which water is freely seeping;
- Submerged rock that is not stable; or
- Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

## 5.0 TEXT

### 5.1 Pre-Excavation Requirements

**5.1.1 Underground Utilities.** Prior to opening an excavation, the estimated location of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installation that may be reasonably expected to be encountered during the excavation work shall be determined.

Utility companies or a utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to deliniate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3 foot area will be conducted manually.

**5.1.2 Surface Encumbrances.** All surface encumbrances (trees, poles, boulders, etc.) that may create a hazard to employees shall be removed or supported.

**5.1.3 Vehicular Traffic.** Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (i.e., barricades, signs, cones, flagpersons, etc.) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

**5.1.4 Training.** Those who supervise the entry of personnel into an excavation must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations;
- Safe work practices and techniques;
- A review of applicable Federal, state and local regulations; and
- A review of this procedure.

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project file with a copy forwarded to the Knoxville Training Department.

As part of standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to assure compliance with this procedure and all other applicable regulations.

## 5.2 Excavation Work Practices

**5.2.1 General.** Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926 Subpart P, except when the excavation is made entirely in stable rock or when the excavation is less that 5 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person shall ensure that protective systems, when required, are installed and maintained per the design specifications.

No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

**5.2.2 Supervision.** Work in an excavation shall at all times be supervised by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement.

**5.2.3 Soil Classification.** Based on the results of tests described in Attachment 3, the competent person will classify each soil/rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil/rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil/rock deposit change in any way, re-evaluation will be required.

**5.2.4 Access and Egress.** Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 or more feet in depth so as to require no more than 25 feet of lateral travel for employees.

**5.2.5 Protective Systems.** Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

**5.2.6 Exposure to Falling Loads.** No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being

loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

5.2.7 **Warning System for Mobil Equipment.** When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

5.2.8 **Hazardous Atmospheres.** Where an oxygen deficient (less that 19.5% $O_2$) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter. Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. Some excavations may be considered confined spaces which require compliance with Shaw E & I Procedure HS300.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used.

5.2.9 **Water Accumulation Hazards.** Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.

If the excavation work interrupts the natural drainage of surface water (streams, run-off channels), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains shall be regularly inspected by a competent person.

5.2.10 **Stability of Adjacent Structures.** Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to ensure the safety of employees and the stability of the structure;
- The excavation is in stable rock;
- A registered professional engineer has determined that the structure will be unaffected by the excavation; or
- A registered professional engineer has determined that such excavation will not pose a hazard to employees.

Sidewalks, pavements and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

**5.2.11 Protection from Loose Rock or Soil.** Employees shall be protected from loose rock or soil which could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

**5.2.12 Inspections.** The competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event and will be documented using Attachment (2).

Where the inspection finds evidence of any hazardous condition, exposed employees shall be immediately removed from the hazardous area until necessary precautions have been taken.

**5.2.13 Fall Protection.** Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guardrails shall be provided where walkways are 6 feet or more above lower levels.

Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered and shall be backfilled as soon as possible.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS300 Confined Spaces
29 CFR 1926 Subpart P - Excavations

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Excavation Inspection
3. Soil Classification Worksheet
4. Selection of Protective Systems for Excavations 20 Feet or Less in Depth
5. Sloping Options
6. Shoring or Shielding Options

# ATTACHMENT 1
# EXCAVATION AND TRENCHING

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | | |
|---|---|---|---|---|---|---|---|
| | | Employee | Supervisor | Registered Professional Engineer | VP Health and Safety | Local H&S Representative | Competent Person |
| Incorporate state, local, or client-specific excavation requirements into project plans. | 1.0 | | | | | X | |
| Issue, revise, and maintain procedure | 3.1 | | | | X | | |
| Coordinate identification of underground utilities. | 5.1.1 | | X | | | | |
| Determine need for traffic control devices. | 5.1.3 | | X | | | | |
| Participate in excavation training. | 5.1.4 | X | X | | | X | X |
| Ensure that protective systems are installed and maintained. | 5.2.1 | | | | | | X |
| Classify Soil Type | 5.2.3 | | | | | | X |
| Design Structural Ramps | 5.2.4 | | | | | | X |
| Selection and design of protective system(s) | 5.2.5 | | | X | | | |
| Determine stability of adjacent structures. | 5.2.10 | | | X | | | |
| Inspecting excavation for hazardous conditions | 5.2.12 | X | X | | | | X |

## ATTACHMENT 2
## EXCAVATION INSPECTION

**THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSON EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION.**

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

| | ☒ | | |
|---|---|---|---|
| | YES | NO | N/A |
| **1 GENERAL:** | | | |
| Surface encumbrances removed or supported | | | |
| Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the | | | |
| Hard hats, steel-toed boots, and safety glasses worn by all employees. | | | |
| Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation. | | | |
| Walkways over excavations 6 feet or more above lower levels are equipped with standard guardrails. | | | |
| Warning vest or other highly visible clothing provided and worn by all employees exposed to public | | | |
| Employees required to stand away from vehicles being loaded or unloaded. | | | |
| Warning system established and utilized when mobile equipment is operating near excavation edge. | | | |
| Employees prohibited from going under suspended loads. | | | |
| **2 UTILITIES:** | | | |
| Utility companies contacted and/or utility locations delineated. | | | |
| Underground installations protected, supported, or removed while excavation is open. | | | |
| **3. MEANS OF ACCESS AND EGRESS:** | | | |
| Lateral travel to means of egress no greater that 25 feet in trench excavations 4 feet or more in depth. | | | |
| Ladders used in excavations secured and extended 3 feet above the edge of the trench. | | | |
| Structural ramps used by employees designed by a competent person. | | | |
| Structural ramps used for equipment designed by a registered professional engineer. | | | |
| **4. WET CONDITIONS:** | | | |
| Precautions taken to protect from the accumulation of water. | | | |

| | | | |
|---|---|---|---|
| Water removal equipment monitored by a competent person. | | | |
| Surface water or runoff diverted or controlled to prevent accumulation in the excavation. | | | |
| Inspections made after every rainstorm or other hazard-increasing occurrence. | | | |
| **5. HAZARDOUS ATMOSPHERE:** | | | |
| Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere. | | | |
| Adequate precautions taken to protect employee from exposure to a hazardous atmosphere. | | | |
| Testing conducted to ensure that the atmosphere remains safe. | | | |
| Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist. | | | |
| **6. SUPPORT SYSTEMS:** | | | |
| Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads. | | | |
| Materials and equipment used for protective systems inspected and in good condition. | | | |
| Damaged materials and equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service. | | | |
| Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment. | | | |
| Members of support systems securely fastened to prevent failure. | | | |
| Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc. | | | |
| Excavations below the level of the base or footings approved by a registered professional engineer. | | | |
| Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure. | | | |
| Excavation of material to a level of greater that 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth. | | | |
| Shield system placed to prevent lateral movement. | | | |
| Employees are prohibited from remaining in shield system during vertical movement. | | | |

**7. REMARKS:**

_____

_____

## ATTACHMENT 3
## SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name:_____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

**I. VISUAL TESTS:** *One or more visual tests are required for each classification and each time conditions change.*

| | | | |
|---|---|---|---|
| 1. | Estimate range of particle sizes: | a. primarily fine-grained = cohesive material<br>b. primarily coarse-grained = granular material | |
| 2. | Observe excavated soil: | a. clumps = cohesive material<br>b. breaks up easily = granular material | |
| 3. | Observe sides and adjacent surface area of opened excavation: | a. crack like openings = fissured material<br>b. soil spalls off vertical sides = possible fissured material | |
| 4. | Previous excavation activities: | a. previously disturbed soil | b. not previously disturbed soil |
| 5. | Observe opened side of excavation: | a. layered systems<br>c. estimate degree of slope of layers: | b. layers sloped towards excavation<br>_____ |
| 6. | Water condition: | a. evidence of surface water<br>c. depth of water table : | b. water seeping from sides<br>_____ |
| 7. | Vibration present: | a. area adjacent to excavation | b. area within excavation |

**II. MANUAL TESTS-** *One or more manual tests are required for classification and each time soil conditions change.*

| | | |
|---|---|---|
| 1. | Plastically- soil is cohesive if following is true: | a. mold soil samples into a small ball<br>b. roll ball into thread ⅛" diameter<br>c. pick up 2" length of ⅛" thread by one end without breaking |
| 2. | Dry Soil Strength: | a. crumbles on its own or with moderate pressure = granular<br>b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt.<br>c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured. |
| 3. | Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated.)* | a. can be easily indented by the thumb but penetrated by thumb only with great effortType A<br>b. easily penetrated several inches by thumb and molded by light finger pressure = Type C |
| 4. | Unconfined Compressive Strength:<br>*(Saturated Soil Needed)* | a. Pocket Penetrometer reading (take 10 readings and average) 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A<br>b. Shear Vane reading X2: 0 - 0.5 = Type C, 0.5 - 1.5 = Type B,1.5 - 2.0 = Type A |
| 5. | Drying Test:<br>*(A dry soil sample 1" thick X 6' diameter is needed)* | a. develops cracks = fissured material<br>b. dries without cracks and breaks by hand with considerable force significant cohesive content = unfissured cohesive material.<br>c. sample breaks easily by hand = fissured cohesive or granular material<br>d. easily pulverize dry clumps by hand or by stepping on them = granular<br>e. don't pulverize easily = fissured cohesive. |

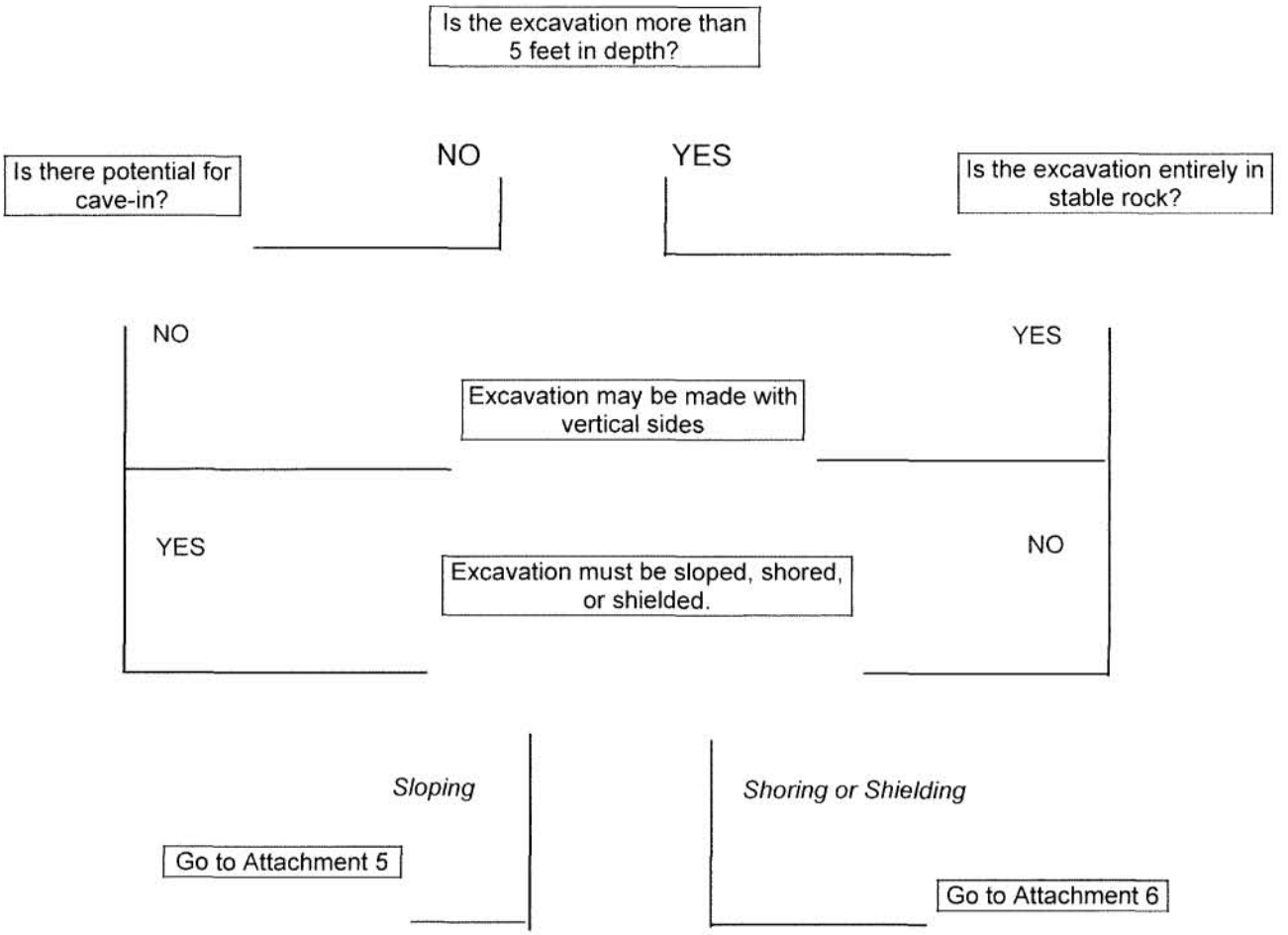
SOIL CLASSIFICATION: Type A Type B Type C Stable Rock Other _____

COMPETENT PERSON: _____ _____ _____

Print Name Signature Date

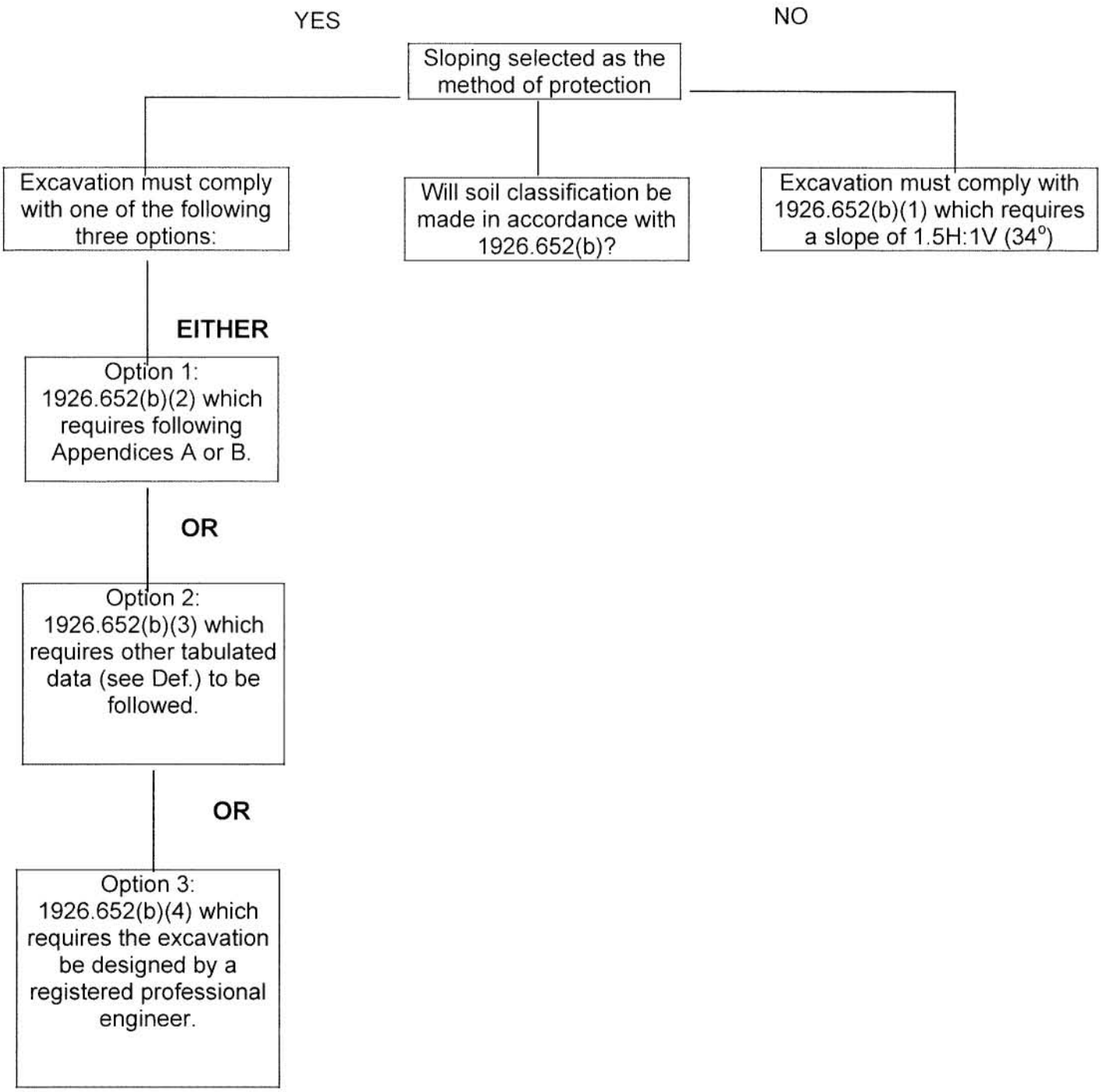
## ATTACHMENT 4

## SELECTION OF PROTECTIVE SYSTEMS FOR EXCAVATIONS 20 FEET OR LESS IN DEPTH




For excavations greater than 20 feet in depth, design by a registered professional engineer in compliance with 1926.652 (b) and (c) is required.

## ATTACHMENT 5
## SLOPING OPTIONS



## ATTACHMENT 6
## SHORING OR SHIELDING OPTIONS

Shoring or shielding selected as the method of protection.

Soil Classification is required. The excavation must comply with one of the four options below.

**EITHER**

Option 1:
1926.652(c)(1) which requires Appendices A and C to be followed (Timber Shoring).

**OR**

Option 2:
1926.652(c)(2) which requires manufacturer's data to be followed (trench jacks, etc.).

**OR**

Option 3:
1926.652(c)(3) which requires tabulated data (see Def.) to be followed.

**OR**

Option 4:
1926.652(c)(4) which requires the excavation be designed by a registered professional engineer.

# PROCEDURE

**Subject: UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION**

## 1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

## 2.0 TABLE OF CONTENTS


1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
- 3.1 Procedure Responsibility
- 3.2 Action/Approval Responsibilities

4.0 Definitions
5.0 Text
- 5.1 Preliminary Requirements
- 5.2 Operating Requirements
  - 5.2.1 Underground Utilities Requirements
  - 5.2.2 Overhead Utilities Requirements
  - 5.2.3 Other Requirements
- 5.3 Training Requirements
- 5.4 Incident Reporting Requirements
- 5.5 Local Jurisdiction Requirements

6.0 Exception Provisions
7.0 Cross References
8.0 Attachments


## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 1 for matrix of responsibilities.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

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## 4.0 DEFINITIONS

**Company**

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Competent Person – Drilling Oversight (CPDO) Training**

When drilling activity is to take place the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to stop the job if need be.

**NOTE: The CPDO training requirement will become effective September 1st 2006. This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.**

**Competent Person - Excavation and Trenching**

A person who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e. spoil piles, use of three foot (3') or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.

**Excavation**

Any manmade cut, cavity, trench or depression in an earth surface formed by earth removal.

**Underground Utility**

Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Electric power lines
- Natural gas lines
- Telephone lines
- Telephone cables and fiber optic lines
- Water lines
- Steam and pneumatic lines
- Sewer lines
- Drain lines
- Underground storage tanks
- Septic tanks
- Process or product lines

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**Overhead Utility**
Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Overhead power lines
- Overhead telephone lines
- Overhead fiber optic lines
- Overhead cables
- Overhead supports
- Overhead piping
- Traffic lights
- Utility Bridges

**One Call Center**
Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

**As-Built Drawings**
As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications which have been made.

**Private Utility Locating Service**
A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

**Fiber Optic Service Lines**
Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

**Field Team Leader (FTL)**
The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the project manager, senior geologist, staff geologist, etc. This individual must have the sufficient experience, training and, field knowledge to ensure all site configuration information is collected and analyzed.

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**Site Survey**

A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

## 5.0 TEXT

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local or other required practices, but requires that the practice which most limits the liability to Shaw for damaged utilities is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or work plan shall fully document these more protective procedures.

.

### 5.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring/excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

### 5.2 Operating Requirements

5.2.1 Underground Utilities Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (Attachment 3). No boring/excavation work is to be performed until all utility mark-outs are verified.

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While on-site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Markout Documentation form (Attachment 3). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work..

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug to a minimum of five feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5' bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5' bgs, and a variance request must be submitted for review.

5.2.2 Overhead Utilities Requirements

Overhead utility locations must be marked (warning tape, flags, etc.) where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.

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Maintain at least 10 feet from overhead power lines, up to 50 kV. For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines.

As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

5.2.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product or gas lines. Once the line is exposed heavy equipment can be used but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due the sensitivity and costs associated with damage to fiber optic cables the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50' of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASP's. Contact your division Health and Safety Professional for specific information on this subject.

## 5.3 Training Requirements

Competent Person Drilling Oversight (CPDO) Training

The FTL (at least one onsite Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal Competent Person Drilling Oversight (CPDO) training.

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

Trenching/Excavation Training

The Field Team Leader or at least one onsite Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when trenching excavation hazards (i.e. spoil piles, use of 3' diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required

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### 5.4 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in H&S Procedure HS020.

In addition, Attachment 5 provides a "Tip Sheet" to help properly assess and investigate the incident causes and recommendations or requirements.

### 5.5 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

## 6.0 EXCEPTION PROVISIONS

Anytime a minimum of a 5' clearance cannot be obtained by either hand digging or by using geophysical means, the FTL must obtain a variance from the Regional VP (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional VP (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project and, a record of the approval or denial will be placed in the project file.

A variance form can be obtained in HS 013. A flowchart to assist one in determining how and when a variance should be obtained can be found immediately following this section.

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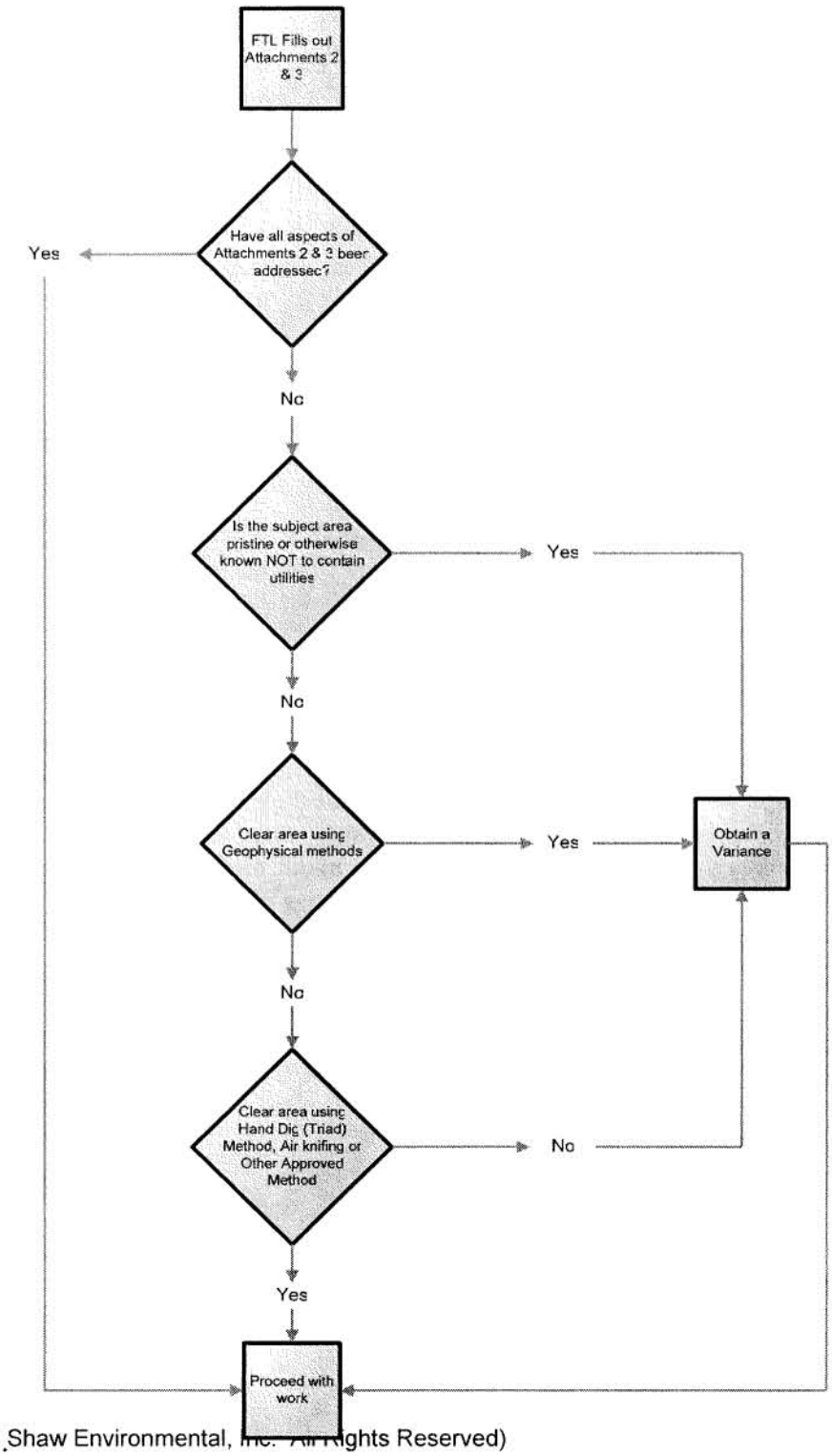
HS 308 Flow Chart

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## 7.0 CROSS REFERENCES

| | |
|---|---|
| HS013 | Health and Safety Procedure Variances |
| HS020 | Accident Prevention Program: Reporting, Investigation, and Review |
| HS050 | Training Requirements |
| HS307 | Excavation and Trenching |

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Pre Drilling Checklist
3. Utility Markout Documentation
4. Underground Utility Hits – Tip Sheet for Incident Investigations
5. Frequently Asked Questions

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## ATTACHMENT 1 - UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION
### Responsibility Matrix

| Action | Procedure Section | Vice President | Project Manager | Field Team Leader | HS Representative |
|---|---|---|---|---|---|
| Project-specific HASP or Work Plan shall document the practices to be used at a particular site. | 1.0 | | X | X | X |
| Contact the One Call Center for mark out of utilities at the site | 5.1 | | X | | |
| Complete Utility Markout Documentation Form | 5.2 | | X | X | |
| As-built drawings shall be reviewed | 5.2 | | | X | |
| Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc. | 5.3 | | | X | |
| Provide training* | 5.3 | | | | |
| Incident Investigation and Reporting | 5.4 | | X | X | X |
| Exceptions to Procedure | 6.0 | X | X | X | X |

*Provided by Shaw's Training Department

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ATTACHMENT 2 - PRE - DRILLING/BORING/GEOPROBE Checklist

Purpose: This form is designed to help the FTL make decisions drilling/boreholing/geoprobing around underground/overhead utilities.

DATE_____ PROJECT NAME/NUMBER_____
Field Team Leader Name: _____
DURATION/SUMMARY OF WORK TO BE PERFORMED: _____
_____

| Consideration | Check | Check | Explanation | Initial |
|---|---|---|---|---|
| Has the state one-call been contacted? | □ Yes | □ No | | |
| Are any as-built drawings available? If so, do they show any utilities? | □ Yes | □ No | | |
| Has a visual inspection of the work area(s) been completed? | □ Yes | □ No | | |
| If one-call not available has a private locating service or Shaw S&T group been contacted? | □ Yes | □ No | | |
| Were any utilities identified through private locating service? If so, indicate on site drawings. | □ Yes | □ No | | |
| Are there any fiber optic cables within 50 feet of hole locations? | □ Yes | □ No | | |
| If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established? | □ Yes | □ No | | |
| Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs? | □ Yes | □ No | | |
| If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why? | □ Yes | □ No | | |
| Are you comfortable with approving this authorization? | □ Yes | □ No | | |
| Other considerations: | | | | |

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## ATTACHMENT 3 - UTILITY MARK-OUT DOCUMENTATION

Project Name:_____ Location:_____
FTL Name: _____ Date:_____
Utility Called:_____ Confirmation #:_____
Subcontractor:_____ Task/Activity:_____
County of work:_____ Municipality of work:_____
_____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____ Confirmation No:_____.

List utility firms (public and private) and the utility they will mark.

| Utility Marker Emergency Telephone Numbers<br>Major Utilities Marked by Color Code | | | |
|---|---|---|---|
| **Name of Utility Company** | **Utility** | **Color Code** | **Emergency Telephone Number** |
| | Water | Blue | |
| | Gas | Yellow | |
| | Electric | Red | |
| | Telephone/ Cable/ Communication | Orange | |
| | Sewer | Green | |
| "ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE". Accordingly, you must list other known utilities in the area that the "One Call" service will not contact: | | | |

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:
NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

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Completed by:_____ _____ _____
Name Signature Date

## ATTACHMENT 3 – UNDERGROUND UTILITY HITS TIP SHEET FOR INCIDENT INVESTIGATIONS

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the "One Call" number on the Incident Investigation Follow-up report.
7. Attach the "One Call" record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

    _____ Site time in hours (not billed to the job)
    _____ PM time hours (not billed to the job)
    _____ H&S time in hours (not billed to the job)
    _____ BLM Time in hours (not billed to the job)
    _____ Rework/non-billable time (estimate)
    _____ Subcontractor rework/non-billable costs (estimate)
    _____ Repair costs to company (estimate)
    _____ Repair cost to customer (estimate)

20. Has the FTL completed Shaw's in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the "hit" area?

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## ATTACHMENT 5 – Frequently Asked Questions (FAQs)

During the roll-out of this revision of HS 308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

1. *No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true "industry standard". However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

2. *Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a "black eye" for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from "hitting" an underground utility, the contract should be written to reflect this

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and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be finalized will provide project manager's examples of wording to be used in proposals and contracts.

*3. Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

*4. What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E & I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.

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5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe ® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/ Geoprobing ®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging and others.

7. *Hand diggings creates heat stress, tripping hazards, back injuries, and other hazards and is unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a 1" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities

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exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

*9. Who needs to sign off on a variance?*

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that HS308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to HS308 impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

*10. What constitutes a "probe"? I assume a Geoprobe® is not valid?*

Response: A Geoprobe® is NOT a valid probe in that Geoprobes® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

*11. Under 5.1, is a subcontractor a designee?*

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer's perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

*12. Does ground surface include concrete, asphalt or other man-made coverings?*

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15" in depth. Manmade surfaces do NOT count in the 5' hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used. Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this HS 308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee's belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.

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# PROCEDURE

**Subject: CONTROL OF HAZARDOUS ENERGY AND HAZARDOUS MATERIAL SOURCES (LOCKOUT/TAGOUT)**

## 1.0 PURPOSE AND SUMMARY

This procedure establishes the minimum requirements for the lockout and tagout of energy and hazardous material sources and must be used to:

- Ensure that all machinery, equipment, or confined spaces are isolated from all potential hazard sources (mechanical, electric, chemical hazards, etc.) and are locked out and tagged out prior to employees performing any servicing, maintenance, or entry activities.
- Ensure that field projects where hazardous energy/material sources are present develop a site-specific Lockout/Tagout procedure.
- Ensure that equipment can accommodate locks. Additional means such as a tagout program may be used to ensure safety when locks are not used.
- Establish procedures for release of the Lockout/Tagout that include machine inspections, notification and safe positioning of workers, and removal of the Lock/Tag.
- Ensure the use of standardized locks and tags that identify the worker using them, making sure that locks and tags are of sufficient quality and durability to ensure their effectiveness.
- Provide the necessary employee training.

For a basic overview of the Lockout/Tagout System refer to the "Flow Diagram - Overview: Lockout/Tagout System" (Attachment 2).

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedures Responsibility

The Corporate Director of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Affected Employee** - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout, or whose job requires the employee to work in an area in which isolation of hazards is necessary to provide a safe workplace.

**Authorized Employee** - A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance.

**Blanking or Blinding** - The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or skillet blind) that completely covers the bore, and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Capable of Being Locked Out** - An energy/hazard isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy/hazard isolating device or permanently alter its energy control capability.

**Double Valve and Vent** - A valve arrangement in a piping system in which three valves are arranged in conjunction with a vent line. One valve is upstream of the vent, another downstream, and one is on the vent itself. To isolate the downstream system, the vent valve is opened, the other two are closed, and all three valves are locked in this position.

**Energized** - Connected to an energy source or containing residual or stored energy.

**Energy Isolating Device** - A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

**Energy Source** - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

**Group Lock Box** - A device capable of holding and securing the key or other release mechanism for a group lock, which can accomodate the individual locks from all members of the work crew.

**Hot Tap** - A procedure used in repair, maintenance, and service activities which involves welding on a piece of equipment (pipeline, vessel or tank) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

**Lockout** - The placement of an energy/hazard isolating device, in accordance with an established procedure, which ensures that the equipment being controlled cannot be operated until the device is removed.

**Lockout Device** - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy/hazard isolating device in the safe position and prevent the energization of a machine or equipment. This includes blank flanges and bolted slip blinds.

**Normal Production Operations** - The utilization of a machine or equipment to perform its intended production function.

**Qualified Employee** - An employee whose skills and training meet or exceed 29 CFR 1910.332(b)(3) for work on or near exposed energized parts must, at a minimum, be trained in and familiar with the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment; to determine the nominal voltage of exposed lines; and the clearance distances to which the qualified persons will be exposed.

**Servicing and/or Maintenance** - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming machines or equipment, making adjustments or tool changes, where the employee may be exposed to an unexpected energization or start-up of the equipment, or release of hazardous energy/or material.

**Setting-up** - Any work performed to prepare a machine or equipment to perform its normal production operation.

**Tagout** - The placement of a tagout device on an energy/hazard isolation device, in accordance with an established procedure, to indicate that the device and the equipment being controlled may not be operated until the tagout device is removed.

**Tagout Device** - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolation device in accordance with an established procedure, that indicates that the device and the equipment being controlled may not be operated until the tagout device is removed.

## 5.0 TEXT

### 5.1 Scope/Application

This procedure covers any activity which requires isolation of a source of energy or hazardous material, such as, the servicing and maintenance of equipment and confined space entry. It outlines methods to prevent the unexpected energization or start-up of the equipment, or release of stored energy or material that could cause injury to employees. For any projects planned for more than 30 days with lockout/tagout planned for more than seven calendar days or when locking/tagging out specialized equipment having its own lockout requirements, a site-specific/equipment specific plan must be developed and incorporated as part of the Site-Specific Health and Safety Plan. Otherwise Attachments 4-7 (discussed later in text) must be utilized to document lockout/tagout.

In situations where our client has specific lockout/tagout requirements, Shaw Environmental & Infrastructure, Inc. (Shaw E & I) personnel can follow client procedures after an Shaw E & I health and safety professional has approved them as being at least as protective as Shaw E & I procedures. In such cases, the client procedures shall be incorporated into the Shaw E & I health and safety plan and all affected employees trained on these procedures.

5.1.1 **Exclusions.** Normal operations including repetitive, routine minor adjustments that do not require removal of equipment guarding.

When work is conducted on equipment where an employee has direct control over the cord(s) or plug(s) connected to the associated equipment.

5.1.2 **References.** OSHA General Industry Standard, 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), 29 CFR 1910.146, Permit-Required Confined Spaces, and 29 CFR1910.331-335, Safety-Related Work Practices.

## 5.2 Responsibility

Each new, transferred, authorized or affected employee and other employees whose work operations are or may be in an area where lockout/tagout procedures are utilized must be instructed in the purpose and use of this lockout/tagout procedure.

- **All Personnel**
  All site personnel will be responsible for continuous adherence to the health and safety procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the intent of this procedure.

- **Authorized Employee**
  The authorized employee, or his/her designee, is responsible for reviewing the planned activities prior to commencement of work and confirming that the maintenance manager or his designee of the particular facility where the work is to be accomplished is made aware of the nature and extent of the work and when it is to commence.

- **Site Supervisor**
  The site supervisor is responsible for verifying that all proper lockout/tagout procedures have been followed. The site supervisor must ensure that the power disconnects, appropriate attachment of locks and tags, and proper documentation of the procedure are implemented. He/she is also the designated custodian and controller for all locks, tags, and group lock boxes issued to authorized employees.

- **Subcontractors, Visitors and Other On-Site Personnel**
  Subcontractors are responsible for the health and safety of their employees and for complying with the requirements established by the site Health & Safety Plan. All Shaw E & I subcontractors and visitors are responsible to the Shaw E & I site supervisor.

- **Site Health and Safety Coordinator**
  The health and safety coordinator will assist in compliance with the other applicable company policies and procedures, and the Health and Safety Plan.

## 5.3 Procedures for Lockout/Tagout

Lockout and tagout devices must be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

Locks are to be used when a machine, equipment, or piping system is capable of being locked out. All locks must be accompanied by a tag to indicate the name of the employee applying the lockout device and warn against the hazard if the valve is opened, or the machine/equipment is energized. A legend such as "This lock and tag to be removed only by authorized personnel" with an additional message: "Do Not Start," "Do Not Open," "Do Not Close," "Do Not Energize," or "Do Not Operate" must be utilized.

All tags and their means of attachment must be sturdy enough to prevent inadvertent removal. The tag attachment will be attachable by hand, self-locking, non-releasable, and non-reusable, with a minimum unlocking strength of not less than 50 pounds. Tags must be durable and not deteriorate from exposure to weather conditions and corrosive environments or cause the message on the tag (hand-written or pre-existing) to become illegible. Lockout and tagout devices must be singularly identified; must be the only device(s) used for controlling energy; and must not be used for other purposes.

All equipment must be designed with a hazardous energy/material isolating device as a means of protection for the employee against injury during repairs. **All new equipment installed must be designed to accept a lockout device**.

Authorized padlocks will be assigned to each authorized employee. Each group's lock will be individually keyed and the supervisor on each shift will maintain possession of the master key for these padlocks. The specific project must provide a sufficient number of locks for each employee on site.

All tags must contain the authorized employee name, date of application of the lock, equipment name or number and the reason for lockout. The tag must be attached to the lockout device.

On any equipment that can start automatically, the main disconnect must be switched to the "off" position, locked, and tagged by the authorized employee. This switch must be turned off before opening the main power disconnect and remain off until the disconnect is closed. Locking out 220v, 440v and other equipment must always be done at the main feed or starter panel.

All hazardous material lines must be blanked, blinded, or double valve and vent locked to prevent release of hazardous material.

Blanking or blinding of hazardous material lines are preferable to the double valve and vent technique. All blanks and blinds must be identified with tags in the same manner as locks.

A "Lockout Log" (Attachment 3) must be maintained by the site supervisor. This log must be included in the Health and Safety Plan.

### 5.3.1 Lockout/Tagout Overview

- Check equipment file for specific lockout/tagout procedures.
- Determine the requirements for lockout. If there is more than one energy source to the equipment, document each source.
- Conduct a survey to locate and identify all energy isolation devices that apply to the equipment.
- Use the equipment type-specific procedures as outlined in Attachments 4-7, if applicable. Complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) logging all data and return to the site-supervisor.
- Shut off energy source(s) to affected equipment.
- Affix lock(s) and tag(s) to each energy source controlling device.
- Identify work on process lines or vessels and determine isolation requirements.
- Blind, blank, disconnect, or double valve and vent all hazardous material lines, including steam, and identify the isolation points with tags.
- When only tag is used because machine or equipment can't be locked out, the following steps must be taken: Remove fuses, block machine, etc. and complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) and give to the site supervisor for the record.
- Stored energy - Relieve all stored energy from capacitor banks, springs, compressed air, hydraulic, steam, etc.
- Verify isolation of energy has occurred by attempting to activate equipment by using the on/off switch.
- Return control switch to "off" position before proceeding with work.

### 5.3.2 Removal of Lockout/Tagout

- Ensure that nonessential items, such as tools, etc., are removed from equipment.
- Ensure that equipment components are intact.
- Check work area to ensure that all employees are safely positioned or removed from the area.
- Notify all affected employees and site supervisor before re-energizing the equipment.
- Remove lockout/tagout device.
- Re-energize equipment or open valves and restore flow in process line, place back in into service.

### 5.3.3 Preparation for Confined Space Entry

1. Refer to Shaw E & I Procedures HS300, HS301, or HS302 for Confined Space Entry.
2. Blank or blind piping, identify with tags.
3. Misalign or remove sections of lines, pipes, or ducts, identify with tags.
4. Double valve and vent system, identify with tags.
5. Lockout or tagout all sources of energy.
6. Block or disconnect all mechanical linkages.

If it is impossible or impractical to lockout a piece of equipment, the site supervisor, H&S Professional, and the Maintenance Engineer of the facility must approve a method to make the equipment safe before any activities beyond normal operations of the equipment are performed. This can be done by disconnecting wiring, removing fuses, disconnecting or blanking supply lines, etc. "Danger - Do Not Operate" tags must be used to describe the condition.

The practice of permitting a person to place or remove a lock for someone else is prohibited. No employee can be sure he/she is safe until he/she places their own lock correctly.

## 5.4 Safety Audit

**5.4.1 Verification Audit.** A periodic audit of the lockout/tagout system must be performed to ensure that the requirements of this procedure are being implemented. The audit will be conducted by authorized and qualified employees other than the ones(s) utilizing the procedurebeing inspected. Any deficiencies that are observed must be corrected immediately. For each project, the site-supervisor will be responsible for daily audits of lockout/tagout systems to

ensure proper installation of locks and tags to the equipment and adherence to the appropriate procedures.

Where lockout or tagout is used for energy control, the periodic inspection must include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

**5.4.2 Follow-up Audit.** A follow-up audit must be conducted to ensure that all deficiencies noted have been corrected.

**5.4.3 Documentation.** Audit documentation must identify the machine or equipment on which the lockout procedure is being utilized, the date of the inspection, employees interviewed and employee(s) performing the inspection. The audit results must be provided to the Health & Safety Department to be documented as being performed.

## 5.5 Training

Training must be provided to ensure that the purpose and function of the energy control program are understood by employees, and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees.

- Each authorized employee must receive training in the recognition of applicable hazardous energy/material sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for isolation and control.

- All affected employees must be instructed in the purpose and use of the lock and tag system.

- All other employees (including new hires) whose work operations are or may be in an area where lockout/tagout may be utilized, must be instructed about the procedure, and the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out or tagged out.

- Retraining must be conducted for all authorized and affected employees whenever there is a change in job assignment, change in equipment, changes in a process that presents a new hazard or there is a change in the lockout/tagout procedure. Retraining must also be conducted whenever there is significant evidence, based on the periodic audits, indicating employee deviation from, or lack of understanding of, the lockout/tagout procedure.

- Employee site-specific training must be documented to ensure that it has been accomplished and is being kept up to date. The documentation must contain each employee's name and dates of training.

Documentation of employee training and retraining must be maintained and kept up to date by the Shaw E & I H&S representative and forwarded to the Shaw E & I Training Department.

### 5.6 Shift or Personnel Changes

Specific procedures must be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. These must include provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment or the release of stored energy. All site-specific locks in place must be covered in the tailgate safety meetings on each shift.

All individual lock(s) of the outgoing shift working on equipment will be removed and replaced by the on-coming shift's individual lock(s). The authorized employees of the on-coming shift must inspect and "try" the system to ensure de-energization.

The site supervisor must re-audit the system as necessary.

### 5.7 Troubleshooting

Special precautions must be observed when the authorized employee must perform maintenance troubleshooting tasks with energized equipment. This function requires added caution and communications between all other affected employees to ensure employee protection.

An authorized employee must identify all start-stop locations and circuit breakers for disconnecting equipment. All other affected employees must be kept informed throughout the testing and troubleshooting. If the job is left incomplete, the authorized employee must install his/her individual lock and tag before leaving the job.

The following sequence must be followed when troubleshooting any equipment:

1. Written approval including detailed work plan, must be obtained from the site supervisor and H&S Professional to ensure that troubleshooting can be performed safely.

2. Inspect and clear machine or equipment of all tools and unnecessary materials.

3. Ensure that all affected employees are positioned out of the way of machine activation. Instruct all affected employees in the procedures that must be followed, the potential hazards that may exist, and the safety precautions that have been taken. Document this training on the Tailgate Safety meeting form.
4. Remove the lockout and tagout devices.

5. Energize and proceed with the troubleshooting, testing or positioning of the machine or equipment.

6. De-energize, reapply all lockout and tagout devices and "try" the system to ensure de-energization or place machine back into service.

**5.8 Group Lockout/Tagout**

When servicing and/or maintenance is performed by a crew, craft, department or other group, the work crew must use a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

- Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device.

- Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment; and

- When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee to coordinate affected work forces and ensure continuity of protection; and

- Each authorized employee must affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and must remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

The following procedure applies to distribution and utilities systems. The employee authorized to "Group Lockout" will lock and tag out the system. Using the "group lockout" locks and tags. The "Group Lockout" must be signed by the authorized employee.

1. Use of personal tags and locks on the "Group Lock Box" must follow the normal lockout/tagout procedure.

2. The authorized employee must verify that all energy sources are in a neutral state.

3. The authorized employee places the group lock and tags on the hazard isolation device.

4. The authorized employee then places the "Group Lock Key" in the "Group Lock Box", and tag the box with a "DANGER DO NOT OPERATE" tag stating which system is locked out and why.

5. Each employee, prior to working on the "Group Lockout" system, must attach his/her personal tag and lock to the "Group Lockout Box."

6. Upon completion of work, all employees must remove their personal lock and tag.

7. The authorized employee must them remove the "Group Lock" locks and tags and follow normal procedures for restoring energy.

8. If repairs take more than the initiating shift, and the authorized employee is not remaining on the job for the completion, he/she may transfer "Authorization" to another employee by stating so on the "DANGER DO NOT OPERATE" tag. The employee identified then becomes the authorized employee. He/she is now authorized to remove the "Group Lockout" locks and tags installed by the original authorized employee if the work is completed on that shift. The follow-up shift must them follow normal procedures for "Group Lock/Tagout."

**5.9 Outside Personnel (Contractors, etc.)**

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer must inform each other of their respective lockout or tagout procedures.

All subcontractor's lockout/tagout procedures must be reviewed and approved by Shaw E & I prior to the project.

**5.10 Special Situations**

If lockout/tagout lasts for more than one shift, the appropriate protection must not be interrupted. No lock is to be removed until the next shift is ready to lockout the equipment.

When the employee(s) who originally applied a lock(s) is not at the site to remove it, the lock can be removed only in an emergency and only under the direction of an authorized employee, the site-supervisor, and if applicable the site-safety and health coordinator. Such actions and associated personnel safeguards shall be documented on the Field Activity Daily Log and the Lockout Log.

## 6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCE

HS050 Training Requirements
HS052 Health and Safety Plans
HS300 Confined Spaces
HS301 Confined Spaces, Marine
HS302 Confined Spaces, Leaded Product
HS310 Hazardous Waste Operations
HS311 Emergency Response Operations
HS312 Hazardous Waste Operations at TSD Facilities

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Flow Diagram - Overview: Lockout/Tagout System
3. Lockout Log
4. Lockout/Tagout for Electrical Equipment
5. Lockout/Tagout for Compressed Air and Gases
6. Lockout/Tagout for Steam, Water, and Fluid Lines
7. Lockout/Tagout for Hydraulic Equipment
8. Lockout/Tagout Procedure for Specific Equipment

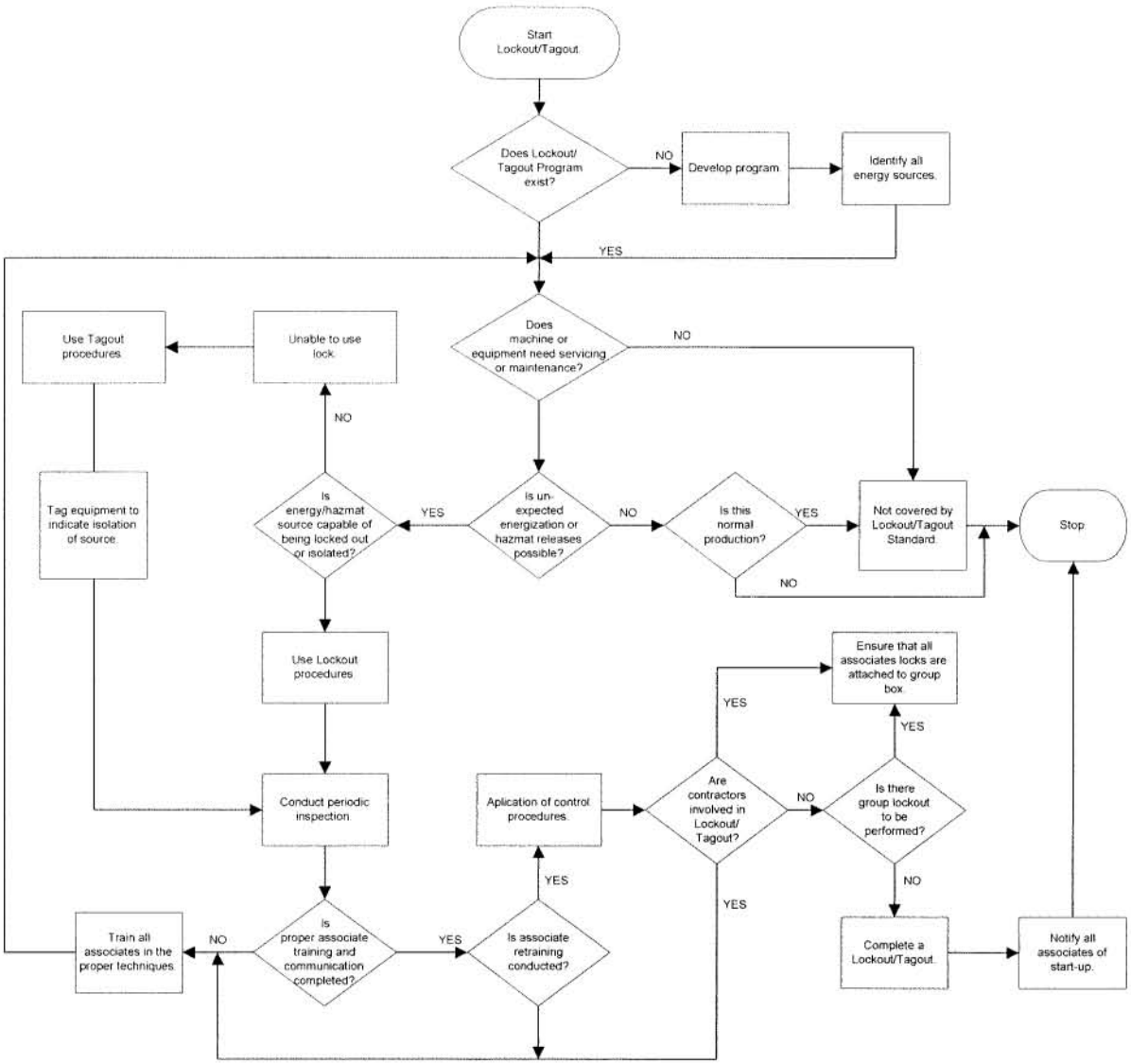
# ATTACHMENT 1
# CONTROL OF HAZARDOUS ENERGY SOURCE (LOCKOUT/TAGOUT)

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Location Mgr. | Authorized Associate | Site Supervisor | Sub-contractor | HS | All | Training Dept. |
| Comply with procedure | 5.2 | | | | X | | X | |
| Review plan & notify maintenance | 5.2 | | X | | | | | |
| Verify proper procedures followed | 5.2` | X | | X | | X | | |
| Verification audit - daily | 5.4.1 | | | X | | | | |
| Provide training to associates | 5.5 | X | | | | | | |
| Attend appropriate training | 5.5 | | | | | | X | |
| Maintain training records | 5.5 | | | | | | | X |
| Write/approve location lockout plan, if required | 5.1 | | X | | | X | | |

# ATTACHMENT 2

## FLO DIAGRAM:
## OVERVIEW of the LOCKOUT/TAGOUT SYSTEM




HS3152/VISIO

## ATTACHMENT 3

## LOCKOUT LOG

| AUTHORIZED EMPLOYEE | DATE | EQUIPMENT NAME | EQUIPMENT NUMBER | REASON FOR LOCKOUT |
|---|---|---|---|---|
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# ATTACHMENT 4
# LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:

## PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of power (voltage)
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff power sources to machine.

## LOCKOUT/TAGOUT

6. Lock and tag main power switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

## RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

# ATTACHMENT 5
# LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:

## PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

## LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

## RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operation.
12. Remove tag.
13. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

# ATTACHMENT 6
# LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor:_____

## PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Disconnect/shutoff main steam, water or fluid lines to equipment.

## LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

## RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor: _____

# ATTACHMENT 7
# LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Job:_____

Device:_____

Location:_____

Authorized Person:_____

Site Supervisor: _____

## PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff main hydraulic to equipment.

## LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

## RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person:_____

Site Supervisor:_____

## ATTACHMENT 8
## LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Equipment:

Cat. No. and Location:

Serial Number (if available):

Electrical: Voltage: Location:

Describe:

Air (Type): Location:

Describe:

Gases (Type): Location:

Describe:

Steam (Type): Location:

Describe:

Water: Location:

Describe:

Fluids: Location:

Describe:

Hydraulic: Location:

Describe:

Stored Energy- Capacitors, Springs, Etc.:

Describe:

**LOG DATA AND RETURN TO SITE-SUPERVISOR**

# PROCEDURE

**Subject: HEAT STRESS**

## 1.0 PURPOSE AND SUMMARY

This procedure establishes the guidelines to protect employees from the effects of heat related illness. It describes the four major types of heat-induced illnesses, methods of prevention, types of treatment, and includes discussions on the monitoring of heat stress situations.

Some clients may have monitoring requirements that differ from those contained in this procedure. In such circumstances, the more protective monitoring requirements will be followed.

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2.0 Table of Contents
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- 3.1 Procedure Responsibility
- 3.2 Action/Approval Responsibilities

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5.0 Text
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  - 5.1.1 Heat Rash
  - 5.1.2 Heat Cramps
  - 5.1.3 Heat Exhaustion
  - 5.1.4 Heat Stroke
- 5.2 Prevention
- 5.3 Monitoring
  - 5.3.1 Wet Bulb Globe Temperature
  - 5.3.2 Physiological
- 5.4 Training

6.0 Exception Provisions
7.0 Cross References
8.0 Attachments


## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Acclimatization** - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Maximum Heart Rate** - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

## 5.0 TEXT

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment places employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

### 5.1 Signs, Symptoms, and Treatment

#### 5.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

### 5.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

Treatment: Remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

### 5.1.3 Heat Exhaustion

Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.

Treatment: Remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. CAUTION: Do not allow the affected person to become chilled ☞ treat for shock if necessary.

### 5.1.4 Heat Stroke

Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!**

Signs and Symptoms: Red, hot, dry skin (skin may be wet from previous perspiration particularly when evaporation-preventing clothing is worn); body temperature of 105 degrees Fahrenheit (☛F) or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse.

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102☛F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

## 5.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1 percent salt water solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50 degrees F to 60 degree F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress and the harmful effects of excessive alcohol and caffeine consumption.

## 5.3 Monitoring

The initiation of heat stress monitoring will be required when employees are working in environments exceeding 90 degree F ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78 degree F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. Attachment 2 will be used to record the results of heat stress monitoring.

### 5.3.1 Wet Bulb Globe Temperature

The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9 degree C (78 degree F), the work regiment in Table 2 of the section "Heat Stress" in the latest edition of the American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet should be followed.

### 5.3.2 Physiological

Physiological monitoring can be used in lieu of or in addition to WBGT. It is anticipated that this monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- Heart Rate - Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.

- Temperature - Each individual will measure his/her oral temperature with a disposable thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6 degrees F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.

- An individual is not permitted to return to work if his/her temperature exceeds 100.4 degrees F

### 5.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS051 Tailgate Safety Meetings

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Heat Stress Monitoring Record

# ATTACHMENT 1
# HEAT STRESS

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | |
|---|---|---|---|---|
| | | **Vice President, Health and Safety** | **Project Supervisor** | **Health and Safety Representative** |
| Issuance, Revision, and Maintenance of Procedure | 3.1 | X | | |
| Conduct Monitoring | 5.3 | | | X |
| Inform Employees About Procedure | 5.4 | | X | X |

# ATTACHMENT 2
## HEAT STRESS MONITORING RECORD

Project/Location _____ Date _____

| Employee Name | Initial Reading Time | First Work Period Time | | Second Work Period Time | | Third Work Period Time | | Fourth Work Period Time | | Fifth Work Period Time | | Sixth Work Period Time | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| | WBGT (°F) | WBGT (°F) | | WBGT (°F) | | WBGT (°F) | | WBGT (°F) | | WBGT (°F) | | WBGT (°F) | |
| | | | | | | | | | | | | | |
| | Air Temp. (°F) | Air Temp. (°F) | | Air Temp. (°F) | | Air Temp. (°F) | | Air Temp. (°F) | | Air Temp. (°F) | | Air Temp. (°F) | |
| | | | | | | | | | | | | | |
| | Initial Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. |
| | | | | | | | | | | | | | |
| | Initial H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. |
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| | Initial Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. |
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| | Initial H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. |
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| | Initial Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. | Initial Temp. | Final Temp. |
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| | Initial H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. | Initial H.R. | Final H.R. |
| | | | | | | | | | | | | | |

# PROCEDURE

**Subject: COLD STRESS**

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines necessary to protect employees from the adverse health effects caused by exposure to low temperature environments.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

## 4.0 TEXT

Most cold related worker fatalities have resulted from failure to escape low air temperatures, or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8 degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

### 4.1 Signs and Symptoms of Cold Stress

Several factors increase the harmful effects of cold including, being very young or old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress and certain diseases and medications. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. Treatment for cold related injuries should be administered by a person qualified in first aid or a professional medical provider.

**4.1.1 Frostbite.** Frostbite is the most common injury caused by exposure to cold temperatures. It occurs when cells of the body freeze restricting blood flow and causing tissue damage. The first sign of frostbite is slightly flushed skin which then changes to white or grayish yellow and finally grayish blue. Pain is sometimes initially felt but is often followed by a cold numb feeling.

**4.1.2 Hypothermia**. Hypothermia is the most severe form of cold stress and results from a drop in the body's core temperature. The initial signs include; shivering, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia victims typically progress through five stages of the condition including; (1) shivering, (2) apathy, (3) loss of consciousness, (4) decreasing pulse and breathing rate, and (5)death.

**4.2 Precautionary Measures**

It is recommended that employees wear insulated clothing to maintain core temperatures above 96.8 degrees F when working in air temperatures below 40 degrees F. This protective clothing may include but is not limited to:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks
- Insulated gloves and boots
- Insulated head cover, such as knit caps, hard hat liners, etc.

When conducting work in air temperatures below 35 degrees F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water.

- If an employees underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.

- Employees will be provided a warm area (65 degrees F or above) to change from work clothing into street clothing and for breaks.
- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects.

- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc.

- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area.

- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.

- Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could potentially lead to heat stress situations.

- Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.

- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling.

- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.

- If the air temperature is 20 degrees F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of –25 degrees F of less. The wind chill table provided in attachment two can be used to help assess hazardous conditions attributable to wind chill effects.

### 4.3 Training

Training on the contents of this procedure will be conducted during tailgate safety meetings held at project or office locations where employees are exposed to cold temperatures. Topics to be discussed during this training will include:

- Proper rewarming procedures and first aid treatment of cold related cases
- Proper clothing practices
- Eating and drinking habits
- Recognition of signs and symptoms of cold stress
- Safe cold weather work practices.

## 5.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

## 6.0 CROSS REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS051-Tailgate Safety Meetings

Shaw E & I Procedure HS600-Personal Protective Equipment

Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

Standard First Aid Workbook, American Red Cross

## 7.0 ATTACHMENTS

1. Responsibility Matrix
2. Windchill Table

# ATTACHMENT 1
# COLD STRESS

## Responsibility Matrix

| Action | Procedure Section | Employee | Local HS Representative | Vice President Health and Safety |
|---|---|---|---|---|
| Issuance, revision and maintenance of this procedure | 3.1 | | | X |
| Provide training | 4.2 | | X | |
| Receive training | 4.2 | X | | |

## ATTACHMENT 2

### Windchill Table

| 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<br>In under an hour with dry skin. Maximum danger is false sense of security. | | | | INCREASING DANGER<br>Danger from freezing of exposed flesh within one minute. | | | GREAT DANGER<br>Flesh may freeze within 30 seconds. | | | | |
| | Trenchfoot and immersion foot may occur at any point on this chart. | | | | | | | | | | | |

# PROCEDURE

Subject: **HEARING CONSERVATION PROGRAM**

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for the company hearing conservation program. Regulatory requirements mandate that the company administer a hearing conservation program whenever employee sound exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB).

Evidence is well established that worker exposure to sound of sufficient intensity and duration can result in hearing damage. This procedure prescribes the control measures required to prevent employee exposure to excessive sound levels and includes provisions for:

- Monitoring of the workplace to determine employee exposures.
- An audiometric testing program which includes baseline and annual audiograms.
- An employee training and information program.
- Description of various control measures that can be used to decrease exposures.
- Providing hearing protection to all affected employees when administrative or engineering controls fail to reduce sound levels to below the action level.
- Recordkeeping requirements.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Action Level** - An 8-hour TWA of 85 dB or a dose of 50 percent.

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Standard Threshold Shift (STS)** - Change in hearing threshold relative to the baseline audiogram of 10 dB or more at 2,000, 3,000, and 4,000 hertz (Hz) in either ear.

## 5.0 TEXT

### 5.1 General

The company hearing conservation program will be implemented and protection against the effects of sound exposure will be provided whenever sound levels exceed the action level.

### 5.2 Monitoring

Monitoring of employee exposures to sound will be conducted whenever it is anticipated that exposure may exceed the action level. This monitoring will be conducted by a qualified individual who, through professional credentials, training, or experience, has the necessary qualifications to specify and use the type of monitoring equipment (area or personal) that will best represent employee exposures. This monitoring will be repeated whenever changes in the work environment lead to the possibility of additional exposures or inadequacy of selected hearing protection. Employees will be provided the opportunity to observe monitoring and will be notified when the results exceed the action level.

Sound level monitoring instrumentation will be operated on the A-weighted scale in slow response mode. Employee sound exposures will be computed in accordance with Attachment 2 and without regard to any attenuation provided by the use of hearing protection.

## 5.3 Audiometric Testing

Audiometric testing will be provided to all employees exposed at or above the action level. Testing will be in accordance with Procedure HS100, Medical Policies and Procedures.

**5.3.1 Baseline Audiogram.** Audiometric test results obtained from the pre-hire medical examination will be used as the baseline audiogram. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace sound. Employees will also be notified of the need to avoid high levels of non-occupational sound exposure during this 14-hour period.

**5.3.2 Annual Audiograms.** Annual audiograms will be conducted for all employees exposed at or above the action level during the preceding year. Each annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a STS has occurred.

## 5.4 Employee Training and Information

All employees who are exposed to sound levels above the action level are required to participate in a formal training program. This program will be presented by a health and safety representative and include, as a minimum, the following information:

- The effects of sound on hearing.
- The purpose of hearing protection; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care.
- The specific nature of operations which could result in exposure to excessive sound levels.
- The purpose of audiometric testing and an explanation of the test procedures.
- The engineering controls and administrative practices associated with the employee's job assignment.

This training program will be repeated annually. Participating employees are required to complete the Hearing Protection Training Completion Record (Attachment 3). This record will be maintained by the company Training Department in Knoxville. In addition, tailgate safety meetings will be periodically used to instruct employees on the need for hearing protection in designated areas.

The project/location manager will make available to affected employees or their authorized representatives a copy of 29 Code of Federal Regulations (CFR) 1910.95 and will also post a copy in the workplace.

## 5.5 Control Measures

A straightforward method of controlling sound exposure is to examine the problem in terms of its three basic elements including:

- Sound arises from a source;
- Travels over a path; and
- Affects a receiver or listener.

The solution to a given sound problem might require alteration or modification of any or all of these three basic elements including:

- Modifying the source to reduce its sound output;
- Altering or controlling the transmission path to reduce the sound level reaching the listener; or
- Providing the receiver with hearing protection (but only if the sound source or path cannot be controlled).

**5.5.1 Sound Control at the Source.** Perhaps the best method for controlling sound at its source is the initial equipment selection process. The following summarizes those features that the buyer should look for and steps to be taken in selecting equipment:

- Low-sound certification.
- Advertisement of "quiet" operation, evidence of sound control design.
- Evidence of "lower" and "slower" operating characteristics.
- Conductance of side-by-side sound tests of equipment.
- Request an "on-site" or "in operation" inspection of mechanical equipment before purchase.

Most mechanical devices are complex sound generators. Though it is impractical to discuss all possible solutions to all sound problems, some general control measures and methods have been provided below:

- Reduce impact or impulse sound by reducing the weight, size, or height of fall of impacting mass.

- Reduce speed in machines and flow velocities and pressure in fluid conveyance systems.

- Balance rotating parts to control machinery sound and vibration of fans, fly wheels, pulleys, cams, shafts, etc.

- Reduce frictional resistance between rotating, sliding, or moving parts by frequent lubrication and proper alignment; static and dynamic balancing of rotating parts; and/or correction of eccentricity or "out-of-roundness" of wheels, gears, rollers, pulleys, etc.

- Reduce resistance in air or fluid systems by use of low flow velocities, smooth surfaces of duct or pipe systems, and long-radius turns and flared sections in pipes, etc., to reduce turbulence.

- Isolate vibration elements in machinery; install motors, pumps, etc., on most massive part of machine; use belt or roller drives in place of gear trains; use flexible hoses and wiring instead of rigid piping and stiff wiring; etc.

- Apply vibration damping materials such as liquid mastics; pads of rubber, felt, foam, or fibrous blankets; or sheet metal viscoelastic laminates or composites to vibrating machine surface.

- Reduce sound leakage from the interior of machines such as compressors by sealing or covering all openings or applying acoustical materials to machine interiors.

5.5.2 **Sound Control in the Transmission Path.** Another effective way to limit employee exposure to sound is through the use of transmission path controls. These controls may include, but are not necessarily limited to:

- Separation of the sound source and receiver.

- Use of sound absorbing materials on ceiling, floor, or wall surfaces.

- Use of sound barriers and deflectors in the sound path.

- Use of acoustical lining on inside surfaces of passageways, ducts, pipe chases, or electrical channels.

- Use of mufflers or silencers on all gasoline or diesel engines, regardless of size, and particularly on equipment when large quantities of high-pressure, high-velocity gases, liquids, steam, or air are discharged.

- Use vibration isolators and flexible couplers where the sound transmission path is structural in character.

**5.5.3 Protection for the Receiver.** When engineering controls fail to reduce sound levels to below the action level, hearing protection will be provided. Hearing protection will be provided at no cost to employees and will be replaced as necessary.

Supervisors will ensure that hearing protection is worn by all employees who are exposed at or above the action level. Employees will be given the opportunity to select their hearing protection from a variety of suitable protection devices that attenuate their exposure to the action level or below. Attenuations are determined by subtracting 7 dB from the noise reduction rating (NRR) of the protector and subtracting the remainder from the TWA sound level.

### 5.6 Recordkeeping

The company will maintain records of all audiometric test records required by this procedure and retain them for at least the following periods:

- Sound exposure measurement records will be retained for two (2) years.

- Audiometric test records will be retained for the duration of the affected employee's employment.

All records required by this procedure will be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government representative.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS100 Medical Policies and Procedures

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Sound Exposure Computation
3. Hearing Protection Training Completion Record

# ATTACHMENT 1
# HEARING CONSERVATION PROGRAM

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | |
|---|---|---|---|---|
| | | **Health and Safety Representative** | **Project/Location Manager** | **Vice President, Health and Safety** |
| Issue, Revise, and Maintain Procedure | 3.1 | | | X |
| Monitor Employee Exposures | 5.2 | X | | |
| Provide Training | 5.4 | X | | |
| Make Available/Post 29 CFR 1910.95 | 5.4 | | X | |

# ATTACHMENT 2

## SOUND EXPOSURE COMPUTATION

### Computation of Employee Sound Exposure

A. Sound dose is computed using Table 1 as follows:

When the sound level is constant over the entire work shift, the sound dose (D), in percent, is given by:

$$D = 100\ C/T$$

Where C is the total length of the work day, in hours, and T is given in Table 1.

B. When the work shift sound exposure is composed of two or more periods of sound at different levels, the total sound dose over the work day is given by:

$$D = 100\ (C_1/T_1 + C_2/T_2 \ldots + C_n/T_n)$$

Where $C_n$ indicates the total time of exposure at a specific sound level and $T_n$ indicates the reference duration for that level as given by Table 1.

C. The eight-hour TWA sound level, in decibels, may be computed from the dose, in percent, by means of the formula:

$$TWA = 16.61\ \log_{10}(D/100) + 90$$

For an eight-hour work shift with the sound level constant over the entire shift, the TWA is equal to the measured sound level.

### Conversion Between "Dose" and "8-Hour TWA" Sound Level

Sound exposure is usually measured with an audio dosimeter which gives a readout in terms of "dose." Dosimeter readings can be converted to an 8-hour TWA sound level.

In order to convert the reading of a dosimeter into TWA, use Table 2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table 1. So, for example, a dose of 91 percent over an 8-hour day results in a TWA of 89.3 decibels and a dose of 50 percent corresponds to a TWA of 85 decibels.

If the dose as read on the dosimeter is less than or greater than the values found in Table 2, the TWA may be calculated by using the formula:

$$TWA = 16.61\ \log_{10}(D/100) + 90$$

Where TWA equals 8-hour TWA sound level and D equals accumulated dose in percent exposure.

**Table 1**
**Permissible Sound Exposure**

| A-Weighted Sound Level (decibels) | Permitted Duration Per Workday (T) (hours) | A-Weighted Sound Level (decibels) | Permitted Duration Per Workday (T) (hours) |
|---|---|---|---|
| 80 | 32.0 | 106 | 0.87 |
| 81 | 27.9 | 107 | 0.76 |
| 82 | 24.3 | 108 | 0.66 |
| 83 | 21.1 | 109 | 0.57 |
| 84 | 18.4 | 110 | 0.50 |
| 85 | 16.0 | 111 | 0.44 |
| 86 | 13.9 | 112 | 0.38 |
| 87 | 12.1 | 113 | 0.33 |
| 88 | 10.6 | 114 | 0.29 |
| 89 | 9.2 | 115 | 0.25 |
| 90 | 8.0 | 116 | 0.22 |
| 91 | 7.0 | 117 | 0.19 |
| 92 | 6.1 | 118 | 0.16 |
| 93 | 5.3 | 119 | 0.14 |
| 94 | 4.6 | 120 | 0.125 |
| 95 | 4.0 | 121 | 0.11 |
| 96 | 3.5 | 122 | 0.095 |
| 97 | 3.0 | 123 | 0.082 |
| 98 | 2.6 | 124 | 0.072 |
| 99 | 2.3 | 125 | 0.063 |
| 100 | 2.0 | 126 | 0.054 |
| 101 | 1.7 | 127 | 0.047 |
| 102 | 1.5 | 128 | 0.041 |
| 103 | 1.3 | 129 | 0.036 |
| 104 | 1.1 | 130 | 0.031 |
| 105 | 1.0 | | |

## Table 2
## Conversion From ←Percent Sound Exposure→ or ←Dose→ To ←8-Hour TWA Sound Level→

| Dose or Percent Sound Exposure (D) | TWA | Dose or Percent Sound Exposure (D) | TWA | Dose or Percent Sound Exposure (D) | TWA | Dose or Percent Sound Exposure (D) | TWA |
|---|---|---|---|---|---|---|---|
| 10 | 73.4 | 104 | 90.3 | 260 | 96.9 | 640 | 103.4 |
| 15 | 76.3 | 105 | 90.4 | 270 | 97.2 | 650 | 103.5 |
| 20 | 78.4 | 106 | 90.4 | 280 | 97.4 | 660 | 103.6 |
| 25 | 80.0 | 107 | 90.5 | 290 | 97.7 | 670 | 103.7 |
| 30 | 81.3 | 108 | 90.6 | 300 | 97.9 | 680 | 103.8 |
| 35 | 82.4 | 109 | 90.6 | 310 | 98.2 | 690 | 103.9 |
| 40 | 83.4 | 110 | 90.7 | 320 | 98.4 | 700 | 104.0 |
| 45 | 84.2 | 111 | 90.8 | 330 | 98.6 | 710 | 104.1 |
| 50 | 85.0 | 112 | 90.8 | 340 | 98.8 | 720 | 104.2 |
| 55 | 85.7 | 113 | 90.9 | 350 | 99.0 | 730 | 104.3 |
| 60 | 86.3 | 114 | 90.9 | 360 | 99.2 | 740 | 104.4 |
| 65 | 86.9 | 115 | 91.1 | 370 | 99.4 | 750 | 104.5 |
| 70 | 87.4 | 116 | 91.1 | 380 | 99.6 | 760 | 104.6 |
| 75 | 87.9 | 117 | 91.1 | 390 | 99.8 | 770 | 104.7 |
| 80 | 88.4 | 118 | 91.2 | 400 | 100.0 | 780 | 104.8 |
| 81 | 88.5 | 119 | 91.3 | 410 | 100.2 | 790 | 104.9 |
| 82 | 88.6 | 120 | 91.3 | 420 | 100.4 | 800 | 105.0 |
| 83 | 88.7 | 125 | 91.6 | 430 | 100.5 | 810 | 105.1 |
| 84 | 88.7 | 130 | 91.9 | 440 | 100.7 | 820 | 105.2 |
| 85 | 88.8 | 135 | 92.2 | 450 | 100.8 | 830 | 105.3 |
| 86 | 88.9 | 140 | 92.4 | 460 | 101.0 | 840 | 105.4 |
| 87 | 89.0 | 145 | 92.7 | 470 | 101.2 | 850 | 105.4 |
| 88 | 89.1 | 150 | 92.9 | 480 | 101.3 | 860 | 105.5 |
| 89 | 89.2 | 155 | 93.2 | 490 | 101.5 | 870 | 105.6 |
| 90 | 89.2 | 160 | 93.2 | 500 | 101.6 | 880 | 105.7 |
| 91 | 89.3 | 165 | 93.6 | 510 | 101.8 | 890 | 105.8 |
| 92 | 89.4 | 170 | 93.8 | 520 | 101.9 | 900 | 105.8 |
| 93 | 89.5 | 175 | 94.0 | 530 | 102.0 | 910 | 105.9 |
| 94 | 89.6 | 180 | 94.2 | 540 | 102.2 | 920 | 106.0 |
| 95 | 89.6 | 185 | 94.4 | 550 | 102.3 | 930 | 106.1 |
| 96 | 89.7 | 190 | 94.6 | 560 | 102.4 | 940 | 106.2 |
| 97 | 89.8 | 195 | 94.8 | 570 | 102.6 | 950 | 106.2 |
| 98 | 89.9 | 200 | 95.0 | 580 | 102.7 | 960 | 106.3 |
| 99 | 89.9 | 210 | 95.4 | 590 | 102.8 | 970 | 106.4 |
| 100 | 90.0 | 220 | 95.7 | 600 | 102.9 | 980 | 106.5 |
| 101 | 90.1 | 230 | 96.0 | 610 | 103.0 | 990 | 106.5 |
| 102 | 90.1 | 240 | 96.3 | 620 | 103.2 | 999 | 106.6 |
| 103 | 90.2 | 250 | 96.6 | 630 | 103.3 | | |

ATTACHMENT 3

## HEARING PROTECTION TRAINING COMPLETION RECORD

| | INITIAL |
|---|---|
| 1. I have been informed about the health hazards associated with exposure to excessive sound levels and its potential effect on hearing. | |
| 2. I have been informed about the types of work that may result in exposure to excessive sound levels, and the necessary protective steps to prevent excessive exposure, including engineering controls and administrative practices. | |
| 3. I understand the purpose for, proper use, and limitations of hearing protection devices, and I have received instructions on selection, fitting, use, and care of such devices. | |
| 4. I have been informed about the purpose of audiometric testing and an explanation of the test procedures. | |
| 5. Copies of the applicable regulations governing occupational exposure to excessive sound have been made available to me. | |

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

**Please File Completed Forms and Forward a Copy to the Knoxville Training Department**

# PROCEDURE

Subject: **HANDLING OF BLOOD OR OTHER POTENTIALLY INFECTIOUS MATERIAL**

## 1.0 PURPOSE AND SUMMARY

The potential for accidental transmission of infectious agents to persons handling infectious materials in the workplace has prompted various governmental agencies to adopt recommended work practices and regulations to govern this area. Shaw Environmental & Infrastructure, Inc. (Shaw E & I) encounters potentially infectious agents in various types of work, including:

- Packaging, handling, and disposal of biological wastes at clandestine and legal laboratory operations:
- Work in areas with exposed human or animal excrement, or where materials contaminated with body fluids are found; and
- Emergency response operations involving infectious wastes or other potentially infectious materials.

Exposure control programs must address at least the following:

- Exposure determination,
- Exposure control plan,
- Medical surveillance and prophylactic measures,
- Personal protective equipment,
- Training,
- Work practices, and
- Accidental exposure follow-up

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1 in Section 8.0.

## 4.0 DEFINITIONS

**Blood**- Human blood, human blood components and products made from human blood.

**Blood-borne Pathogens**- Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

**Disinfect**- To inactivate all recognized pathogenic microorganisms but not necessarily all microbial forms (e.g. bacterial endospores) on inanimate objects.

**Exposure Incident**- A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

**Infectious Waste**- Blood and blood products, contaminated sharps, pathological wastes and microbiological wastes.

**Occupational Exposure**- Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. This definition excludes incidental exposures that may take place on the job, and that are neither reasonably nor routinely expected and that the worker is not required to incur in the normal course of employment.

**Other Potentially Infectious Materials**- (1) The following body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood. (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead). (3) HIV- or HBV-containing cell or tissue cultures, organ cultures, and culture medium or other solutions; and blood, organs or other tissues from experimental animals infected with HIV or HBV. (4) Any experimental animal tissue or cultures.

**Parenteral**- Exposure occurring as a result of piercing the skin barrier (e.g. subcutaneous, intramuscular, intravenous routes).

**Patient**- Any individual, living or dead, whose blood, body fluids, tissues, or organs may be a source of exposure to the employee. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the mentally impaired or mentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains prior to embalming; and individuals who donate or sell blood or blood components.

**Personal Protective Equipment**- Specialized clothing or equipment worn by an employee to protect him/her from a hazard.

**Sharps**- Any object that can penetrate the skin including, but not limited to, needles, scalpels, and broken capillary tubes.

**Sterilize**- The use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

**Universal Precautions**- A method of infection control in which all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other blood-borne pathogens.

**Work Practice Controls**- Controls that reduce the likelihood of exposure by altering the manner in which a task is performed.

## 5.0 TEXT

### 5.1 Exposure Control Plan

Each project, including emergency response, involving potential for occupational exposure shall have, as part of the site-specific health and safety plan, a written exposure control plan designed to minimize or eliminate employee exposure. This plan shall be prepared prior to the commencement of work, and shall contain as a minimum:

**5.1.1 Exposure Determination.** Each task or procedure where occupational exposure may take place must be identified and documented. Such determination of potential exposure shall be made without regard to the use of personal protective equipment.

**5.1.2 Schedule of Implementation.** The schedule and method of implementation of the Exposure Control Plan must be specified.

**5.1.3 Exposure Evaluation.** Each plan shall reflect the requirements in 29CFR1910.1030(c)(2) and (f)(3), covering evaluations of an exposure incident.

**5.1.4 Review and Update.** Provision must be made for the review and update of the Exposure Control Plan.

**5.1.5 Protective Measures.** Work practices and personal protective equipment shall be specified for each task or procedure where an occupational exposure may occur.

## 5.2 Methods of Compliance

**5.2.1 General.** Universal Precautions as described below shall be observed to prevent contact with blood and other potentially infectious materials.

**Universal Precautions**

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or non-intact skin for handling items or surfaces soiled with blood or body fluids. Masks (as selected and approved by health and safety) and protective eye wear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other body fluids.

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.

- All workers shall take precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices during handling. To prevent needle stick injuries, needles should not be recapped, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. Disposable syringes and needles, scalpels, blades, and other sharp items shall be placed in puncture-resistant containers for disposal.

- Mouthpieces, resuscitation bags, or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.

- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.

- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

**5.2.2 Engineering and Work Practice Controls.** Universal precautions shall be supplemented by the following work practice controls:

- All personal protective equipment shall be removed immediately upon leaving the work area, or as soon as possible if overtly contaminated, placed in an appropriately designed area or container for storage, decontamination or disposal.

- Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a potential for occupational exposure.

- Food and drink shall not be stored in refrigerators, freezers, or cabinets where blood or other potentially infectious materials are stored or in other areas of possible contamination.

- All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, and aerosolization of these substances.

- Mouth pipetting is prohibited.

**5.2.3 Housekeeping**

- A written schedule of routine cleaning and disinfection shall be established, as appropriate, for each facility or operation.

- Work surfaces shall be decontaminated immediately after any spill of potentially infectious materials, and at the end of the work shift. An effective disinfection solution can be prepared by diluting household chlorine bleach with water to make a 10% bleach solution (1 part bleach + 9 parts water).

- Reusable items contaminated with potentially infectious materials shall be decontaminated prior to washing and/or reuse.

- All bins, pails, cans, and similar receptacles intended for reuse which have a potential for becoming contaminated with blood or other potentially infections materials shall be inspected, cleaned, and disinfected on a regularly scheduled basis and cleaned and disinfected immediately or as soon as possible upon visible contamination.

- Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means.

### 5.2.4 Personal Protective Equipment

- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.

- Gloves shall be worn when employee has the potential for the hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, non-intact skin, and when handling items or surfaces soiled with blood or other potentially infectious materials.

- Disposable (single use) gloves, such as surgical or examination gloves, shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. They shall not be washed or disinfected for re-use.

- Utility gloves may be disinfected for re-use if the integrity of the glove is not compromised; however, they must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of deterioration.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials.

- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.

- Fluid-proof clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.

- Fluid-proof shoe covering shall be worn if there is a potential for shoes to become contaminated and/or soaked with blood or other potentially infectious materials.

- **Emergency Response.** During emergency operations involving potentially infectious materials 29CFR1910.120 is controlling. This regulation requires the use of NIOSH approved respirators for aerosol protection, not "masks".

### 5.2.5 Infectious Waste Disposal

- All infectious waste destined for disposal shall be placed in closable, leakproof containers or bags that are color coded or labeled as required by paragraph 5.2.7 of this procedure.

  If outside contamination of the container or bag is likely to occur then a second leakproof container or bag which is closable and labeled or color-coded as described in paragraph 5.2.7 shall be placed over the outside of the first and closed to prevent leakage during handling, storage, and transport.

  Disposal of all infectious waste shall be in accordance with applicable Federal, State and local regulations.

- Sharps shall be disposed of in closable, puncture resistant, disposable containers which are leakproof on the sides and bottom and that are labeled or color-coded according to paragraph 5.2.7.

  These containers shall be easily accessible to personnel and located in the immediate area of use.

  These containers shall be replaced and not allowed to overfill.

**5.2.6 Laundry.** Laundry from workplaces with employees covered under this policy that is contaminated with blood or other potentially infectious materials or may contain contaminated sharps shall be treated as if it were contaminated and shall be handled as little as possible and with minimum of agitation.

Contaminated laundry shall be bagged at the location where it is used and shall not be sorted or rinsed.

Contaminated laundry shall be placed and transported in bags that are labeled or color-coded as described in paragraph 5.2.7. Whenever this laundry is wet and presents the potential for soak-through or leakage from the bag, it shall be placed and transported in leakproof bags.

### 5.2.7 Communication of Hazards

**5.2.7.1 Signs and Labels**

- All work areas where potentially infectious agents are present shall be posted with signs bearing the following legend:

*[Name of the Infectious Agent]*
*[Special requirements for entering area]*
*[Name, telephone number of the laboratory director or other responsible person]*

- Warning labels shall be affixed to containers of infectious waste; refrigerators and freezers containing blood and other potentially infectious materials; and other containers used to store or transport blood or other potentially infectious materials.

Labels shall include the following legend:

These labels shall be fluorescent orange or orange-red or a similar predominant color, with lettering or symbols in a contrasting color.

Labels shall either be an integral part of the container or shall be affixed as close as safely possible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.

- Red bags or red containers may be substituted for labels on containers of infectious waste.

**5.2.8 Training.** All employees assigned to jobs with occupational exposure to potentially infectious materials shall receive specialized training prior to commencement of work and at least annually thereafter, covering the following elements:

- A copy of 29CFR1910.1030 and this procedure including an explanation of the contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment;
- Information of the types, proper use, location, removal, handling, decontamination and/or disposal of personal protective equipment;
- An explanation of the basis for selection of personal protective equipment;
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated;
- Information on the appropriate actions to take and persons to contact in an emergency;
- An explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available. Also information on the medical counseling that is provided for exposed individuals; and
- An explanation of required signs and labels.

**5.2.9 Training Records.** Training records shall include the following information and be maintained for five (5) years:

- The date of the training sessions;
- The contents or a summary of the training sessions;
- The names of persons conducting the training; and
- The names of all persons attending the training sessions.

**5.2.10 Medical Requirements**

**5.2.10.1 Medical Evaluations.** All employees will receive medical evaluations in accordance with Shaw E & I Procedure HS100, and records will be maintained per Shaw E & I Procedure HS102.

**5.2.10.2 Vaccinations.** All employees with occupational exposure shall receive the hepatitis B vaccination (HBV) and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination Form (Attachment 3).

- Hepatitis B Vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has received the HBV previously and/or antibody testing reveals that the employee is immune, a new vaccination is not required.

  Employees may be subjected to occupational exposure after receiving the first shot in the HBV series. Antibody testing shall be performed 30 days after completing the HBV series. Employees unable to develop immunity shall be precluded from further occupational exposure.

  Should a booster dose(s) be recommended by a physician, they shall be provided according to standard recommendations for medical practice.

- Tetanus Vaccination. Current status for tetanus vaccination is within 5 years. Documentation of current status shall be maintained for all employees subject to this policy.

- Post-exposure evaluation and follow-up. All exposure incidents shall be reported as an industrial injury. The Corporate Medical Director shall be advised immediately via the Corporate H&S office. Following a report of an exposure incident, the employer shall make available to each employee a confidential medical evaluation and follow-up including at least the following elements:

- Documentation of the route(s) of exposure, HBV and HIV antibody status of the source patient(s) (if known), and how the exposure occurred. The medical confidentiality rights of the source patient shall be preserved at all times.

- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.

- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or at a later date if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.

- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the Corporate Medical Director.

**5.2.10.3 Physician Information.** Information provided to the physician. The employer shall provide the following information to the evaluating physician:

- A copy of 29CFR1910.1030 and its appendices, and

- A description of the affected employee's duties as they relate to the employee's occupational exposure.

**5.2.10.4 Physician Opinion.** Physician's written opinion. For each evaluation, obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive hepatitis B vaccination.

- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

- Specific findings or diagnoses, which are related to the employee's ability to receive HBV vaccination. Any other findings and diagnoses shall remain confidential.

### 5.3 First Aid/CPR Trained Personnel

This procedure is applicable to personnel designated as first aid/CPR providers when it is determined that the facility or project location cannot comply with the requirement to be in "close proximity" to professional medical aid under 29CFR1910.151. (NOTE: This requirement is generally met if a "911" paramedic response system or equivalent serves the area.)

Except where Shaw E & I is required to provide designated first aid/CPR providers under 29CFR1910.151, it is our policy to train a broad base of employees who render emergency assistance on a voluntary basis. Where designated responders are required, a minimum of two persons per shift shall be qualified in accordance with this procedure. Small locations or projects may reduce this number to one per shift with the prior approval of the regional or divisional HS Manager.

When voluntary or non-designated first aid/CPR providers are used, the special provisions listed below shall be followed.

- The Exposure Control Plan shall provide for offering the hepatitis B vaccination, within twenty-four hours, to any unvaccinated first aid/CPR provider rendering aid in an incident involving the presence of blood or other potentially infectious materials.

- A Supervisor's Employee Injury Report (SEIR) shall be completed for all first aid/CPR providers involved in an incident with blood or other potentially infectious materials. The manager or HS professional MUST specifically indicate whether an "exposure incident" as defined in section 4.4 of this procedure took place, and what protective equipment was used.

- Each location shall maintain a list of all such first aid incidents as an attachment to their OSHA Log of Occupational Injuries and Illnesses. The log and first aid incident list (or copies) shall be forwarded to the corporate HS office on February 1 of the following year.

- All associates who are first aid/CPR trained and may provide assistance, shall be trained in these requirements for voluntary providers and the general provisions of this procedure.

## 6.0 EXCEPTION PROVISIONS

All exceptions to established policy shall follow the provisions of Shaw E & I Procedure HS013: Health and Safety Procedure Variance.

## 7.0 CROSS REFERENCES

HS101 Management of Employee Exposure & Medical Records
HS102 Drug & Alcohol Testing

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Personal Protection Equipment Matrix
3. Hepatitis B Vaccination Declination Form

# ATTACHMENT 1
# HANDLING OF BLOOD OR OTHER POTENTIALLY INFECTIOUS MATERIALS

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | |
|---|---|---|---|---|
| | | **Manager** | **HS** | **Associates** |
| Develop and implement Exposure Control Plans | 5.1 | X | X | X |
| Require use of work practices and other controls | 5.2-5.6 | X | | |
| Use proper work practices and controls, as described | 5.2-5.6, 5.8, 5.10 | | | X |
| Post areas | 5.7 | X | | |
| Provide and attend training | 5.8 | X | X | X |
| Maintain training and medical records | 5.9-5.10 | | X | |
| Coordinate medical requirements | 5.10 | | X | |

## ATTACHMENT 2

## BIOWASTE PPE MATRIX

| | Minimal[1] Exposure Potential | Slight[2] Exposure Potential | Moderate[3] Exposure Potential |
|---|---|---|---|
| Respirator Protection | None | Surgical mask or half mask with HEPA filters | Full facepiece APR with HEPA filters |
| Eye Protection | Glasses or safety glasses | Goggles | N/A |
| Face Protection | None | Face shield | N/A |
| Head Protection | Hardhat | Hardhat | Hardhat and fluid resistant hood |
| Hand Protection | Fluid resistant[4] gloves | Cut resistant[5] outer glove and fluid resistant inner glove | Cut resistant outer glove and fluid resistant inner glove |
| Body Protection | Work uniform or coveralls | Work uniform and Tyvek[6] coveralls | Work uniform and poly-Tyvek type coveralls |
| Footwear | PVC or Nitrile boots | PVC or Nitrile boots | PVC or Nitrile boots |

1 Minimal Exposure: Handling boxed wastes, not cut or splash potential.

2 Slight Exposure: Handling bagged wastes, slight cut or splash potential.

3 Moderate Exposure: Handling loose wastes, slight cut and moderate to high splash potential.

4 Fluid resistant means able to prevent penetration of undamaged glove by liquids likely to be encountered. NOTE: Surgical or exam gloves alone **do not** meet this requirement.

5 Cut resistant means able to resist mechanical damage from accidental contact with sharps and from routing work activities. Leather or heavy canvas gloves will usually be acceptable; specialized gloves (Kelvar, knitted steel, etc.) may be required for specific tasks.

6 Mention of a specific trade name does not require the use of the product; it is intended only for illustrative reasons.

# ATTACHMENT 3
## HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide and encourages you to accept, vaccination for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- A bacterial disease causing muscle spasms, seizures, and "lockjaw".
- This single injection vaccination has few side effects.
- There is minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance.

Hepatitis B

- A viral infection of the liver.
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths.
- This three injection vaccination has few side effects.
- Vaccination is 90% effective for at least seven years when given prior to exposure.
- Vaccination is 70-88% effective when given within one week of exposure.
- Hepatitis B can survive in the environment for 24-48 hours after drying.
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B Virus 6-30%
  - Human Immunodeficiency Virus (AIDS) 0.5%

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety department to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

Elayne Theriault, M.D.

Warren Houseman
Vice President, Health & Safety

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to be vaccinated by hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

# PROCEDURE

**Subject: PERSONAL PROTECTIVE EQUIPMENT**

## 1.0 PURPOSE AND SUMMARY

This procedure stipulates that the company will provide the personal protective equipment necessary for employees to perform their work safely, as established by the Health & Safety Department. Special purchasing programs for prescription safety glasses and safety shoes are also described. Head, eye, body, and foot protection are discussed in this procedure. Respiratory and hearing protection are cross referenced to the appropriate company procedures.

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- 5.7 Providing Personal Protective Equipment to Non-Company Personnel
- 5.8 Management Duties

6.0 Exception Provisions
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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The EH&S Operations Manager, is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc (Shaw E & I).

## 5.0 TEXT

The company will provide suitable personal protective equipment as required for the nature of the job being performed, such as, but not limited to, boots, protective clothing, respirators, face shields, safety eyewear, respirator ophthalmic hanger devices, hard hats, and gloves. This personal protective equipment will be specified by the Health & Safety Department prior to use, subject to an assessment of the hazards to which employees will be potentially exposed. Documentation shall be in the project-specific Health and Safety Plan (HASP) or equivalent document.

Employees shall use HS-approved protective equipment on any task where there is potential exposure to: physical hazards such as equipment operation, objects dropping from above, or flying particles; or exposure to toxic or irritating gases, fumes, vapors, liquids, or other materials which might cause respiratory distress or skin irritation.

Employees shall be trained in the proper use, maintenance, and limitations of protective equipment. Safety equipment shall be replaced when it is damaged, contaminated, or has worn out. Training requirements are summarized in company Procedure HS050.

**Employees shall wear hard hats, eye protection, and steel-toed foot protection (chemical resistant when required) at all job sites (excluding field offices) and industrial facilities, unless HASP/site rules provide exemption. It is the responsibility of all employees to report to any work site prepared to work in Level D PPE. All other protective equipment is the responsibility of the project.**

### 5.1 Eye Protection

All employees engaged in or working in areas adjacent to eye-hazardous activities or operations shall wear appropriate eye protection.

- Safety glasses are required for impact protection, and shall meet ANSI Standard Z87.1 requirements.
- Chemical goggles are required for protection against chemical splash.
- Face shields are required for face protection from chemical splash and are not a substitute for eye protection.
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.

**5.1.1 Prescription Eye Protection.** The company will provide prescription safety glasses (meeting ANSI Standard Z87.1) for field/shop/lab personnel, and computer glasses for computer users, as required by their individual vision status and job. Glasses will be provided every two years unless damaged on-the-job, or the employee exhibits a significant change of prescription.

Lenses shall be clear polycarbonate or plastic. Special tints or dark lenses can be obtained for special applications (e.g., extended outdoor work) with prior written approval from the Health & Safety Department.

Employees requiring corrective lenses inside of respirator face-pieces will be provided with safety lenses and frames sized for respirators and the respirator insert, in addition to conventional prescription safety glasses.

Employees will arrange and pay for the eye examination through the company-provided vision care program. The company will pay for fitting services and the safety glasses.

The company has established a national contract with a protective eyewear provider. Employees should contact the local HS representative (with current lens prescription), who will coordinate with the local purchasing representative to order eyewear. Employees choosing to use another provider will be reimbursed up to $65 for safety or computer glasses, after the Health & Safety Department has verified that the glasses meet the ANSI Standard requirements.

## 5.2 Foot Protection

Basic foot protection is required for all job sites and industrial locations. Specialized footwear shall be provided as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

**5.2.1 Leather Safety Shoes.** Safety shoes may be used in place of chemical resistant footwear when an employee will be working in a clean or uncontaminated work areas. Generally, when the employee desires to use safety footwear other than standard chemical resistant footwear provided, the company considers it the responsibility of the employee to provide such footwear and ensure that it meets ANSI Standard Z41. Company supervision will enforce the use of appropriate protective footwear per the requirements of the site-specific Health and Safety Plan. Where state or local regulations require (i.e., California and Connecticut), the company will provide all necessary safety equipment.

Employees can purchase safety shoes through national purchasing agreements established by the company. Under the limited circumstances where the company will provide safety shoes, such purchases must be approved by the project or appropriate department/local manager. After the Health & Safety Department has verified that the safety shoes meet ANSI requirements, the employee will be reimbursed for the actual purchase price of the shoes up to a maximum of $90.00.

**Athletic-style safety shoes ("safety sneakers") are prohibited for all field operations due to the difficulties created by these styles in supervising proper use of protective footwear. Employees in fixed laboratory operations may wear athletic-style safety shoes with the prior approval of the Lab Director or HS Coordinator.**

### 5.3 Head Protection

Hard hats meeting ANSI Z89.1 shall be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards.

### 5.4 Respiratory Protection

Respirators shall be provided, in accordance with Procedure HS601, Respiratory Protection Program.

### 5.5 Hearing Protection

Hearing protection shall be provided, in accordance with Procedure HS402, Hearing Conservation Program.

### 5.6 Body Protection

Protective clothing, gloves, boots, and other protective equipment shall be provided as appropriate for the hazards associated with the tasks being performed.

### 5.7 Providing Personal Protective Equipment to Non-Company Personnel

The following personal protective equipment may be provided to non-company personnel:

- Hard hats
- Chemical goggles
- Safety glasses (non-prescription)
- Face shields
- Chemical resistant boots
- Chemical resistant gloves
- Hearing protectors
- Disposable chemical resistant personal protective clothing

### 5.8 Management Duties

It is the responsibility of the Health & Safety Department to specify safety equipment requirements for each job.

It is the responsibility of project managers or location managers to provide adequate quantities of safety equipment required for their job(s) or project(s).

It is the responsibility of supervisors to verify that required safety equipment is properly used and to ensure that any employee provided protective equipment is adequate, properly maintained and in a sanitary condition.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions shall be permitted pursuant to the provisions of Procedure HS013, "Health & Safety Procedure Variances".

## 7.0 CROSS REFERENCES

HS050 Training Requirements
HS402 Hearing Conservation Program
HS601 Respiratory Protection Program
ANSI Standard Z41, *Personal Protection - Protective Footwear*
ANSI Standard Z87.0, *Practice for Occupational and Educational Eye and Face Protection*
ANSI Standard Z89.1, *Protective Headwear for Industrial Workers*

## 8.0 ATTACHMENTS

1. Responsibility Matrix

# ATTACHMENT 1
# PERSONAL PROTECTIVE EQUIPMENT

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | |
|---|---|---|---|---|---|
| | | EH&S Operations Manager | Local HS Department | Project/ Location Managers | Supervisors |
| Issue, revise, and maintain this procedure. | 3.1 | X | | | |
| Approve all personal protective equipment prior to use. | 5.0 | | X | | |
| Coordinate reimbursement to employee for PPE purchases. | 5.1.1, 5.2.1 | | X | | |
| Provide adequate quantities of safety equipment as required. | 5.8 | | | X | |
| Verify that required safety equipment is properly used. | 5.8 | | | | X |

# PROCEDURE

**Subject:** RESPIRATORY PROTECTION PROGRAM

## 1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements of the company Respiratory Protection Program (RPP). This procedure provides information and guidance on the proper selection, medical evaluation, training, use, and care of respiratory protective equipment and complies with the requirements of 29 CFR 1910.134 (1998).

All operations which require the use of respiratory protection are subject to the provisions of this procedure.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

Program responsibilities are detailed throughout this procedure. The Responsibility Matrix summarizes these items and can be found as Attachment 1.

## 4.0 DEFINITIONS

**Action Level (AL)** - Airborne contaminant concentration which is one-half of the Permissible Exposure Guideline (PEG).

**Air Purifying Respirator (APR)** - Negative pressure respirator (also referred to as a cartridge respirator) which filters contaminated air through chemical or mechanical filter elements. APRs include: cartridge, canister, gas masks, and single-use respirators (single-use respirators are not approved for use by the company).

**Approved Respirator** - Any respirator, identified by manufacturer and model, that has been approved by NIOSH 42 CFR Part 84 and has been incorporated into the List of Approved Respiratory Protective Equipment (Attachment 2).

**Assigned Protection Factor (APF)** - A term that is reserved in the OSHA Standard 1910.134 (January, 1998). Attachment 3 provided PFs for the respiratory protective equipment based upon type of device and method of fit testing. The company will continue to use the PFs established by NIOSH until OSHA issues their definition of APF.

**Company** - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

**Contractor Personnel** - A group of persons hired to perform a specific activity based on their expertise and ability to operate independent of direct supervision. Contractor personnel are supervised by their management group which reports to an employee of the company for project direction.

**End-of-Service-Life Indicator (ESLI)** - A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

**Emergency** - Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

**Exposure Limit** - Several published airborne contaminant concentration values exist which are used in establishing acceptable personnel exposures to contaminants. OSHA publishes the Permissible Exposure Limit (PEL), NIOSH publishes the Recommended Exposure Limit (REL), and the ACGIH publishes the Threshold Limit Value (TLV). All of these exposure limits are based on an 8-hour work shift, 40-hour work week, and 40-year work life. The values may vary from contaminant to contaminant as well as between publishing bodies.

**Field Office** - Any office or satellite office performing field activities which may require the use of respiratory protection.

**Filtering Facepiece (Dust Mask)** - A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

**Fit Factor (FF)** - This term means a quantitative estimate of the fit of a particular respirator to a specific individual and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn. The FF incorporates a safety factor of 10 because protection factors in the workplace tend to be much lower than the fit factors achieved during fit testing. Acceptable fit factors are 100 for a tight-fitting half facepiece and 500 for a tight-fitting full facepiece respirators.

**HASP** - Health and Safety Plan.

**Health and Safety Representative** - A member of the company Health and Safety Functional Resource Group who, through credentials, training, or experience, has the necessary qualifications and authority to specify respiratory protection and evaluate respiratory protection program elements.

**Immediately Dangerous to Life or Health (IDLH)** - An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

**Labor Pool Personnel** - Temporary personnel hired for a given expertise or ability. Labor pool personnel report directly to an employee of the company.

**Nuisance Level** - Level of airborne contaminants which is below one-half the action level for that contaminant and presents no other health or safety hazard.

**Permissible Exposure Guideline (PEG)** - This term designates a specific exposure limit and is based on the best available information. The PEG will be the lower (more protective) of the values for the PEL and TLV. However, the REL shall take precedence for Hazardous Waste Operations (subject to 29 CFR 1910.120 or 1926.65) if no PEL exists, or for contaminants where no PEL or TLV exists. If there is no PEL, TLV, or REL, a Health and Safety Representative shall determine an appropriate permissible exposure guideline.

**Permissible Exposure Limit (PEL)** - An occupational exposure index promulgated by OSHA which carries the force of law. This value represents the allowable concentration to which it is believed an employee may be exposed to 8 hours a day, 40 days a week, for a 40-year working life without experiencing adverse health effects.

**Positive Pressure Respirator** - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

**Powered Air Purifying Respirator (PAPR)** - A positive pressure APR which incorporates a fan an battery pack unit. The system pulls contaminated air through the filter elements before delivery to the facepiece under positive pressure. Air pressure in the mask must remain above ambient pressure.

**Qualitative Fit Test** - A procedure for assuring that the respirator provides adequate protection based on a pass/fail fit test that relies on the individual's response to the test agent. Standard fit test protocol will utilize the irritant smoke methods as described in Attachment 4.

**Quantitative Fit Test** - A fit test that provides an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

**Respiratory Protection Program Coordinator (RPP Coordinator)** - A person designated by the Health and Safety Representative to administer and supervise the respiratory program at a local facility or project location. This person will have the necessary training or credentials to execute this task.

**Recommended Exposure Limit (REL)** - An occupational exposure index published by NIOSH which is a recommended guideline for employee protection. This value represents the allowable concentration to which it is believed an employee may be exposed to 10 hours a day, 40 hours a week, for a 40-year working life without experiencing health effects.

**Supplied Air Respirator (SAR)** - Positive pressure respirator which supplies an independent source of breathing air to the user. Two types of SARs are available: self-contained breathing apparatus (SCBA) and airline.

**Threshold Limit Value (TLV)** - An occupational exposure index published by ACGIH which is recognized as an industry guideline and represents the concentration to which it is believed that nearly all employees may be exposed to 8 hours a day, 40 hours a week without experiencing adverse health effects.

## 5.0 TEXT

The company will employ engineering controls (e.g., enclosure, ventilation, material substitution, etc.) as the primary method to limit employee exposure. However, for those situations where engineering and administrative controls are ineffective at controlling employee exposure, the use of respiratory protective equipment may be required.

This RPP provides specific requirements for selection, assignment, training, and medical evaluation for persons expected to wear respiratory protection.

## 5.1 Assignment of Equipment to Contractor/Labor Pool Personnel

Contractor personnel shall provide their own respiratory protective equipment and shall also confirm meeting all other requirements of their own RPP and that of the company's RPP (i.e., medical clearance, training, etc.).

The company may provide the following respiratory protective equipment to Contractor Personnel:

- Disposable equipment such as filter elements.
- Hardware for airline systems (up to, but not including, the airline and facepiece) which employees are sharing.

The company will not provide the following respiratory protective equipment to Contractor Personnel:

- APR or PAPR facepieces.
- SCBAs, SAR respirators, or airline.

The company may provide respiratory protective equipment to Labor Pool Personnel if the following have been established:

- The labor pool personnel have successfully completed training as required by 29 CFR 1910.134 and other applicable regulations.
- The labor pool personnel have been fit tested in relation to projected exposure levels and contaminants to be encountered.
- The labor pool personnel have been medically approved to wear respirators.
- All other RPP requirements have been met.

## 5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment

The following requirements are designed to guide correct selection of respiratory protective equipment.

**5.2.1 Approval.** The Vice President, Health and Safety has approved respirators manufactured by Survivair as the primary respirators for use by employees. For employees who cannot achieve a satisfactory fit or comfort factor in Survivair respirator, Mine Safety Appliance (MSA) respirators will be selected. The list of approved model respirators is included in Attachment 2. Contractor personnel may select any respiratory protective equipment that has received approval from NIOSH.

**5.2.2 Selection.** The Health and Safety Representative shall base the selection of respiratory protective equipment upon an assessment of potential respiratory hazards that may be encountered. This assessment may utilize a variety of written information such as the NIOSH Pocket Guide to Chemical Hazards, Material Safety Data Sheets, analytical data, air monitoring results, or other applicable information. The selection process shall incorporate the following guidelines:

- Respiratory protection is to be selected by Health and Safety Representatives only. Full facepiece respirators are the usual preference because of superior protection factor and the face/eye protection afforded. Half facepiece respirators can only be used in situations where less than one-half the PEG is expected. The type of respirator selected will be documented in the Project HASP.

- Selection of the appropriate respiratory protective equipment shall include factors such as the chemical state and physical form of the chemical contaminant, atmospheric concentration during routine and emergency events, potential physical hazards, expected job task requirements, and the performance of the respirator in providing the appropriate level of protection against these hazards.

- Consideration shall be given to the nature of the hazardous operation, location of the hazardous area relative to nonhazardous breathing air supply, duration of wear, activities to be performed, and characteristics and function of the respiratory protective equipment to be worn.

- Selected respirators (i.e., Survivair or MSA) shall be NIOSH certified and used in compliance with the conditions of its certification when employees are exposed to toxic materials or other hazardous atmospheres.

- Respirators must provide adequate face and eye protection for the expected task.

- If an APR or PAPR is used, the respirator shall be equipped with an end-of-service life-indicator (ESLI) certified by NIOSH for the contaminant. If an ESLI is not available for the contaminant, a cartridge element change schedule shall be implemented which is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. This information will be described in the HASP.

- The PF for the respirator selected (Attachment 3) shall be used according to the following relationship with the PEG to establish justification for selection:

***PF x PEG > Maximum anticipated contaminant concentration***

If this equation is false, a respirator with a greater PF must be selected. Also review Attachment 3 to determine the required fit testing for the expected maximum anticipated contaminant concentration. The Health and Safety Representative may determine that a more conservative approach (e.g., 50 percent PF) may be needed. Decision to do so should be documented in the Project HASP.

- Manufacturer-established limitations of the APR filter elements relative to the contaminants of concern shall be used to establish further justification for the selected respirator should the APR's FF not disqualify its use (e.g., maximum anticipated contaminant concentration).

**5.2.3 Purchase.** The purchase request of respiratory protective equipment (including cartridges, airlines, compressed air) should be reviewed by a Health and Safety Representative to indicate that the ordered material meets established requirements. **Under no circumstances may anyone (purchasing, warehouse, project manager, etc.) purchase or provide other than the specific respiratory protection equipment selected by the Health and Safety Representative.**

## 5.3 Medical Evaluation

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator. The medical evaluation must be conducted prior to fit testing and work requiring the use of respiratory equipment.

The medical evaluation shall be performed by a physician typically in conjunction with a physical examination meeting the requirements of 29 CFR 1910.120 (f) *Medical Surveillance*. The physician will be informed of the type of work expected of the employee, the types of respiratory protection and personal protective equipment required, and other information indicating the expected stresses of the task. The company medical director shall be given a copy of the company RPP and a copy of 1910.134 (e) *Medical Evaluation*.

The company medical director shall provide a written recommendation regarding the employee's ability to use respiratory protection. The company shall ensure that the company medical director supplies the employee with a copy of this recommendation.

Additional medical evaluations will be provided to the employee if:

- Any medical signs or symptoms due to respirator use are reported by the employee, supervisory, or health and safety personnel.

- A change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

## 5.4 General Program Requirements

**5.4.1 Responsibilities.** The following information describes the responsibilities for the selection, use, and maintenance of respiratory protective equipment based upon job function:

Management

- Management shall take necessary and cost-effective measures to reduce, where possible, the need for respiratory protective equipment (e.g., enclosed cabs on heavy equipment to reduce airborne dust, operations performed upwind, etc.)

- Respiratory protective equipment shall be provided by management whenever it is determined that such equipment is necessary to protect the health of the employee or when requested by an employee and approved by the Health and Safety Representative.

- Management shall assign work tasks requiring the use of respiratory protective equipment to only those employees who are medically qualified to wear respiratory protective equipment.

- Management shall ensure that employees are trained in the use of respiratory protection prior to being assigned to an activity that requires its use.

- Management shall provide the means for the maintenance of respiratory protection as required.

Health and Safety Representative

- Health and Safety Representatives shall determine appropriate respiratory protection for each job. The decision logic for this selection shall be documented in the Project HASP.

- Health and Safety Representatives shall monitor compliance with the various aspects of this program, provide technical assistance regarding respirator selection and use, evaluate the effectiveness of the RPP, and support respirator training and fit testing at locations under their control.

- Health and Safety Representatives shall conduct regular audits to determine compliance with this procedure. This audit can include a review of maintenance, training, medical and air monitoring records, and review the status of this procedure with regard to current regulatory requirements.

- Health and Safety Representatives shall maintain or oversee maintenance of all other records required by this RPP and shall provide for the training and fit testing of personnel assigned respiratory protective equipment.

- Health and Safety Representatives shall appoint a RPP Coordinator for each location which uses or may have a need to use respiratory protection. The Health and Safety Representative must assure the RPP Coordinator has the necessary training to fulfill his/her responsibilities.

RPP Coordinator

- The RPP Coordinator shall be responsible for cleaning, maintenance, and storage of all respirators not routinely used or not individually assigned.

- The RPP Coordinator shall maintain respirator supplies, including spare parts; submit purchase requests for new equipment; and assure that sufficient quantities of cartridges are available for each field office/project.

- The RPP Coordinator shall assure that air supply and emergency respiratory protection is properly inspected and maintained.

- Respirators shall be repaired by either qualified personnel under the direction of the RPP Coordinator, or by contracted supplier.

- The RPP Coordinator shall maintain models and sizes of respirators available for selection and fitting.

- The RPP Coordinator shall conduct fit testing.

Training Department

- Records pertaining to training and fit testing will be maintained by the Training Department.

Employee

- The employee shall use the provided respiratory protective equipment when instructed to do so in accordance with training received.

- The employee shall clean, disinfect, and properly store the assigned respirator, unless other arrangements are made on a project level.

- The employee shall guard against damage to the assigned respirator.

- The employee shall inspect the respirator before each use and after cleaning.

- The employee shall report any malfunction of the respirator immediately to their supervisor and/or the RPP Coordinator.

- The employee shall report to their supervisor any change in their medical status that may impact their ability to wear a respirator safely.

**5.4.2 Use of Corrective Lens Eyewear.** In general, contact lenses are permitted to be worn when respiratory protection is used. Although in certain instances, client- or project-specific rules may not allow for their use.

If an employee chooses not to wear contact lenses, management shall assure that the appropriate frames or ophthalmic device attachments are obtained and provided at no cost to the employee.

**5.4.3 Obstruction of Face Seal.** Employees who wear respirators are required to be clean shaven to the extent that there is no obstruction between the wearer's skin and the facepiece. Trimmed mustaches and facial hair which does not interfere with the seal are allowable.

In addition, respirators shall not be worn when conditions prevent a good face-to-facepiece seal such as corrective lenses or goggles, or other personal protective equipment.

## 5.5 Instruction, Training, and Fit Test

**5.5.1 Instruction and Training.** The Training Department shall provide a standard respiratory protective equipment training program for use by qualified personnel such as the Health and Safety Representative or RPP Coordinator. The Training Department will support training at the project location if the project does not have the qualified personnel and/or the equipment to support its own program. As an alternative, the project location may use a respiratory manufacturer's training program if the program meets company requirements, a competent person conducts the training, adequate equipment is available for demonstration, and fit testing is conducted along guidelines established in this procedure. The Training Department must approve all alternative training methods.

The basic respirator training program shall include, as a minimum, the following:

- Training and annual retraining of employees in the selection, use, maintenance, and limitation of each respirator type used.

- Instruction on the nature of the respiratory hazards and potential health effects resulting from exposure.

- Opportunity for "hands on" experience with the respiratory protective equipment.

- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.

- Instruction on how to test the face-to-facepiece seal.

- A familiarization period of wear in ambient air.

- For APRs, wearing the respirator in a test atmosphere (typically irritant smoke) for qualitative fit testing. The qualitative fit test shall follow the guidelines outlined in Section 5.5.2.

- Training to recognize and cope with emergency situations (including respirator failure)

- Training and fit testing shall be repeated annually, unless specific OSHA regulations require a more frequent time period (e.g., asbestos, lead operations). Each person receiving training shall complete the Respirator Fit Test Form (Attachment 5).

- Training records will be maintained by the Training Department and the location Health and Safety Representative. On-site records of training and fit testing will be maintained as required by specific regulation (e.g., asbestos work) (refer to Section 5.8).

- It is the responsibility of the RPP Coordinator to verify that all project personnel meet the requirements of this RPP.

**5.5.2 Fit Testing.** Prior to the use of any negative or positive pressure tight-fitting facepiece, the employee must be fit tested.

- All employees assigned to operations requiring the use of respiratory protective equipment shall have been fit tested within 12 months, or as required by specific regulations (e.g., asbestos, lead operations). Fit test and qualification cards (or a copy of the completed Attachment 5) must be available during operations.

- The employee shall be fit tested with the same size and model as they are expected to wear.

- Qualitative fit test (QLFT) shall be used when a protection factor of 10 or less is required for a negative pressure respirator.

- Quantitative fit test (QNFT) shall be used when a protection factor of greater than 10 is required for a negative pressure respirator. When

executing the QNFT, the acceptable test result is 100 for tight fitting half-facepiece respirators and 500 for full-facepiece respirators.

- Fit testing for tight-fitting atmosphere supplying respirators and tight-fitting APRs shall be in a negative pressure mode regardless of the mode of operation that is used for respiratory protection.

- Assessment of comfort shall be made after allowing adequate time for this evaluation. This evaluation shall include reviewing the following points with the employee: positioning of the mask on nose, room for eye protection if required, room to talk, and positioning of the mask on the face and cheeks.

- The following criteria shall be used to help determine the adequacy of the respirator fit: chin properly placed, strap tension, fit across the nose bridge, and tendency to slip.

- If physical obstruction (e.g., facial hair, eyeglasses) interferes with the face-to-facepiece seal, then it shall be altered or removed so as to eliminate any interference and allow for a satisfactory fit. If the employee refuses to alter the physical obstruction, then they shall be denied a satisfactory fit report and referred to his/her supervisor for consideration.

- The fit test protocol (Attachment 4) shall be followed. The Health and Safety Representative and Training Department shall determine which fit test protocol shall be followed depending upon the situation.

### 5.6 Maintenance Program

Each RPP Coordinator is responsible for verifying the respirator maintenance program is implemented in an effective manner for the facility or project site, the working conditions, and the potential hazards involved. As a minimum, the following aspects must be implemented:

- Inspection
- Cleaning and sanitizing
- Repair
- Respirator storage
- Inspection and repair documentation, as required
- Compliance with manufacturer recommendations.

Detailed information regarding cleaning, inspection, maintenance, and storage is found in Attachment 7. The RPP Coordinator shall verify compliance with the maintenance program by periodic inspections and field audits.

### 5.6.1 Inspection

- All respiratory protective equipment systems shall be inspected by the wearer for defects and/or deterioration immediately prior to and after each use.

- Any defects shall be reported to their supervisor immediately and the respirator removed from use until it can be repaired or replaced.

- Respiratory protective equipment systems not used routinely (including all SCBAs and equipment designated only for emergency use) shall be inspected before and after each use and at least every 30 days. Cylinders shall be recharged whenever the pressure falls below 90 percent of the manufacturer's recommended pressure level. This inspection shall be documented by some method on the unit (i.e., tag). Records of inspections shall be kept through appropriate documentation. Attachment 6 provides an example of inspection documentation for SCBAs. At a minimum, these records will include: date, inspector, and any unusual finding or condition. Any repairs or modifications shall be documented in detail.

- General field inspection shall include a check of the following: tightness of all connections, facepiece, valves, and any connecting tubes or filtering elements.

- Employees who are manufacturer-qualified repair technicians shall be used for all maintenance beyond field inspections, tests, and user-performed cleaning.

- Air supplied respiratory systems shall be inspected by a manufacturer's authorized representative at the manufacturer's recommended schedule. Manufacturers typically require an annual flow test and a complete overhaul every 5 to 7 years.

- **Specific inspection procedures are outlined in Attachment 7.**

**5.6.2 Cleaning and Sanitizing.** Employees maintaining their own respirators shall be thoroughly briefed on how to clean and disinfect them. On projects where employees clean their own respirator, the generally accepted procedure involves washing with detergent and warm water using a soft brush, submersion in sanitizing agent, thoroughly rinsing in clean water, drying in a clean place, and storage in sealed plastic bags or equivalent. Precautions to be taken to prevent damage from rough handling during this procedure are detailed in Attachment 7.

At locations where employees share respirators, a centralized cleaning and maintenance facility with specialized equipment and/or materials and personnel

trained in respirator maintenance must be established. Cleaning and inspection is primarily the responsibility of the user.

**5.6.3 Repair.** The company will only use respiratory protective equipment that is physically sound.

- If defects are found during any inspection, two remedies are possible. If parts and trained personnel are available, repair and/or adjustment may be made immediately. If parts or trained repair people are unavailable, the device shall be removed from service until it can be repaired. Under no circumstances shall a device that is known to be defective remain in service.

- Replacement or repair shall be done by adequately trained personnel. For negative pressure respirators, the Health and Safety Representative or RPP Coordinator may train or supervise personnel in the replacement of items such as inhalation/exhalation valves, head harness, cartridge adapters, and lenses. For air-supplied respirators, field repairs are limited to replacement of head harness and lenses. All other work must be completed by a factory-certified repair person.

Repair shall only be made with parts designed for the respirator. Substitution of parts from a different brand or type invalidates the respirator's approval and is prohibited.

**5.6.4 Storage.** Respirators must be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

- Respirators shall be stored in such a manner that the facepiece, exhalation valve, and straps are not distorted.

- Respirators shall be stored in sealable containers (e.g., ziplock bags) after cleaning and disinfecting.

- The storage location of emergency respiratory protection shall be readily accessible and prominently identified.

- Respirators shall be stored in an area free of contamination.

## 5.7 Field Use

The following guidelines for the use of respirators (or equivalent) shall be incorporated into the Project HASP as appropriate. Additional guidelines may be required based on working conditions and hazards involved. Each location where respiratory protective equipment is required or worn shall include in the Project HASP justification for the selected respiratory protective equipment systems worn as outlined in Section 5.2 of this procedure.

**5.7.1 General Requirements.** The following general requirements shall be followed whenever respiratory protection is used:

- Employees shall be allowed to leave the regulated area to readjust the facepiece or to wash their faces and to wipe clean the facepieces of their respirators in order to minimize potential skin irritation associated with respirator use.

- Respiratory protective equipment shall not be passed on from one person to another until it has been cleaned and sanitized, per program requirements.

- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.

- Entry into oxygen-deficient (< 19.5 percent $O_2$) atmospheres, Immediately Dangerous to Life and Health (IDLH) atmospheres, or areas requiring EPA Level A protection is prohibited without the prior approval of the Vice President, Health and Safety or the CIH assigned to the business line.

- Head coverings such as Tyvek hoods shall not be allowed to pass between the face-to-facepiece seal.

- The harness straps of tight-fitting respirators shall not be positioned or worn over hard hats.

**5.7.2 Specific Requirements.** The following information details specific requirements by respirator class:

Air Purifying Systems

- When APRs are worn, new filter elements shall be installed at the beginning of operations. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or whenever an increase in breathing resistance is detected. In most cases, the cartridges will be replaced a minimum of once daily, usually at the end of the work shift.

Powered Air Purifying Systems

- When PAPRs are worn, employees shall change filter elements after each day's activities. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury

cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "break-through" is perceived or when airflow through filter elements decreases to an unacceptable level as indicated by the manufacturer's test device.

Compressed Air

- Compressed air used for breathing shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G; not A, K, or L) as described in the American National Standard Commodity Specification for Air, ANSI/CGA G-7.1-1989. Further information is provided in Attachment 7, Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage.

- Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as previously referenced for each cylinder and/or air lot.

- Air delivered in bulk, e.g., tube trailers, shall have each tube or unit, or a representative number of tubes or units verified as to oxygen content prior to using that tube.

- Pure oxygen shall NOT be used at any time in open-circuit SCBAs or airline respirators.

- Breathing air cylinders shall be legibly identified with the word "AIR" by means of stenciling, stamping, or labeling as near to the valve end as practical.

- Breathing air cylinders may be stored on their sides provided the valve caps are in place.

Supplied Air Breathing Systems

- Airline couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of airline respirators with nonrespirable gases or oxygen.

- Standard airline couplings for breathing air systems are Foster quick connect fittings with locking dots. Hansen quick connect fitting may also be used, but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection, but not on the airline unless protected from disconnection by some other means.

- The hose line length shall not exceed 300 feet from the air bank regulator to the user.

- No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.

- Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.

- The breathing air regulator shall be adjusted to provide air pressure as per the manufacturer's recommendations. For Survivair units, this pressure shall be between 80 to 125 psi pressure.

- Cascade systems shall be equipped with low pressure warning alarms or similar warning devices to indicate air pressure in the manifold below 500 psi.

- When a cascade system is used to supply breathing air, a worker outside the Exclusion Zone shall be assigned as safety standby within audible range of the low pressure alarm.

- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi. The supply hose and coupling shall be relatively short ($\leq$ 3 feet) and secured to prevent whipping when pressurized.

- Large supplied air cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for the purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125 degrees F. Cylinders with visible external damage, evidence of corrosion, or exposure to fire shall not be accepted or used.

- Only cylinders within current hydrostatic test periods shall be used. For fiber wrapped bottles designated by the DOT-E label, hydrostatic testing shall be completed every 3 years. Maximum service life for these cylinders is 15 years. Steel or aluminum cylinders shall be

hydrostatically tested every 5 years. No maximum service life is established for steel or aluminum cylinders.

- SCBAs shall only be used in the positive pressure mode when in the Exclusion Zone.

- Standby SCBA equipment must be present when air supply systems are used in IDLH or potentially IDLH atmospheres.

Escape/Egress Units

- These respirators are intended for use in areas where escape with a short-term (5 minute) air supply is necessary. They may be used as adjuncts to airline respirators as a backup air supply, or as independent emergency devices in areas where respiratory protective equipment is not normally required.

- Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.

- Escape/egress units (5-minute air supply) shall never be used as primary standby respirators for confined space entry.

- Escape/egress units shall never be used to enter, or continue working in, a hazardous atmosphere.

**5.7.3 IDLH Atmospheres.** For all IDLH atmospheres, the company shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.

- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.

- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.

- The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.

- The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation.

- Employee(s) located outside the IDLH atmosphere are equipped with:

- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied air respirator with escape/egress unit.

- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry. Equivalent means of rescue can be considered.

### 5.8 Recordkeeping

The following documents must be part of the site recordkeeping program:

- Employees' medical clearances for respirator use
- Respirator training and fit testing forms.

### 5.9 Program Evaluation

This RPP shall be reviewed annually at the direction of the Vice President, Health and Safety.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

## 7.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Section 1910.134.

AIHA, ***Respiratory Protection, A Manual and Guideline***, 1980.

American National Standards Institute Practices for Respiratory Protection Z88.2-1992 (or most recent publication)

NIOSH, ***Certified Equipment List*** (most recent version)

Company Health and Safety Procedures:

HS013 Health and Safety Procedure Variances
HS040 Stop Work Authority
HS050 Training Requirement
HS052 Health and Safety Plans
HS102 Management of Employee Exposure and Medical Records
HS104 Employee Notification of Industrial Hygiene Monitoring Records
HS300 Confined Spaces
HS304 Compressed Gas Cylinders
HS600 Personal Protective Equipment

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. List of Approved Respiratory Protective Equipment
3. Respirator Type, Protection Factor, and Fit Testing Method
4. Mandatory Respirator Fit Test Protocol
5. Respirator Fit Test Form
6. Emergency Respiratory Protective Equipment Monthly Inspection Checklist
7. Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage

## ATTACHMENT 1
## RESPIRATORY PROTECTION PROGRAM

### Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | | | |
|---|---|---|---|---|---|---|---|
| | | Employee | Health and Safety Representative | Project/ Location Management | VP, Health and Safety | Training | RPP Coordinator |
| Issue, Revise, and Maintain Procedure | 3.1 | | | | X | | |
| Assure Proper Selection of Respirators | 5.2.2 | | X | | | | |
| Review Purchase Requests for Respiratory Equipment | 5.2.3 | | X | | | | |
| Conduct Fit Testing | 5.4 | | X | | | | X |
| Assure Compliance with RPP | 5.4 | | X | X | | | X |
| Assure Training | 5.4 | | X | X | | | X |
| Audit Program Compliance | 5.4 | | X | | X | | X |
| Assist/Approve Local Training Program | 5.4 | | | | | X | |
| Maintenance Program | 5.6 | X | X | X | | | X |
| Field Use | 5.7 | X | X | X | | | X |
| Recordkeeping | 5.8 | X | X | | | X | X |
| Program Evaluation | 5.9 | | | | X | | |

## ATTACHMENT 2

## LIST OF APPROVED RESPIRATORY PROTECTIVE EQUIPMENT

| *AIR PURIFYING RESPIRATORS (APR)* | | | | | |
|---|---|---|---|---|---|
| **Respirator Class** | **Respirator Type** | **Respiratory Performance** | **Manufacturer** | **Model Name** | **Model Number** |
| Standard APR | Half-Face | Negative Pressure | Survivair | Blue 1 | 2100-10 S<br>2200-10 M<br>2300-10 L |
| | | | MSA | Comfo II | 479529 S<br>479428 M<br>479530 L |
| | Full-Face | Negative Pressure | Survivair | 20/20 | 202062 S<br>202072 M<br>202082 L |
| | | | MSA | Ultra Twin | 480263 S<br>480259 M<br>480267 L |
| Powered APR | Hood | Continuous Positive Pressure | Survivair | PAPR | 5200-15 |
| | | | MSA | Optimair 6 | 480251 S<br>480247 M<br>480255 L |

| *SUPPLIED AIR RESPIRATORS (SAR)* | | | | | |
|---|---|---|---|---|---|
| **Respirator Class** | **Respirator Type** | **Respiratory Performance** | **Manufacturer** | **Model Name** | **Model Number** |
| Airline SAR | Full-Face | Positive Pressure Demand | Survivair | Panther | P968455 |
| | | | MSA | Premaire | 497291 |
| SCBA SAR | Full-Face | Positive Pressure Demand | Survivair | Cougar | P 9643310 |
| | | | MSA | MMR WorkMask 2216 | Varies on Components |
| Emergency | Escape/Egress Unit | Continuous Flow | Survivair | 5 min. EEGA | 9750870 |
| | | | MSA | Custom Air V | 484353 |

## ATTACHMENT 3

## RESPIRATOR TYPE, PROTECTION FACTOR, AND FIT TESTING METHOD

| Respirator Type | Protection Factor | QLFT | QNFT |
|---|---|---|---|
| Half-Face, Negative Pressure (<100 Fit Factor)[1] | 10 | Yes | Yes |
| Full-Face, Negative Pressure (<100 Fit Factor) Used in Atmosphere up to 10 Times the PEG | 10 | Yes | Yes |
| Full-Face, Negative Pressure (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG[2] | 50 | No | Yes |
| PAPR | 100 | Yes | Yes |
| SCBA/SAR Used in Positive Pressure (Pressure Demand Mode) | 10,000 | Yes | Yes |

Footnotes:

1. If quantitatively fit tested, the device must demonstrate a fit factor of at least 100.
2. If quantitatively fit tested, the device must demonstrate a fit factor of at least 500.

# ATTACHMENT 4

## MANDATORY RESPIRATOR FIT TEST PROTOCOL

### OSHA-Accepted Fit Test Protocols

**A. Fit Testing Procedures - General Requirements**

The company shall conduct fit testing using the following procedures. The requirements in this attachment apply to all OSHA-accepted fit test methods, both QLFT and QNFT. There are several OSHA-accepted fit test protocols for QLFT. This procedure includes only the irritant smoke protocol since it requires less equipment and is more practical for field use.

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

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
   a. Position of the mask on the nose;
   b. Room for eye protection;
   c. Room to talk; and
   d. Position of mask on face and cheeks.

7. The following criteria shall be used to help determine the adequacy of the respirator fit:
   a. Chin properly placed;
   b. Adequate strap tension, not overly tightened;
   c. Fit across nose bridge;
   d. Respirator of proper size to span distance from nose to chin;
   e. Tendency of respirator to slip; and
   f. Self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, he/she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing his/her duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

12. *Exercise Regimen*: Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

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

14. *Test Exercises*: The following test exercises are to be performed for all fit testing methods prescribed in this attachment, except for the controlled negative pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol.

    Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

    The test subject shall perform exercises, in the test environment, in the following manner:

    a. *Normal Breathing*: In a normal standing position, without talking, the subject shall breathe normally.

    b. *Deep Breathing*: In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.

    c. *Turning Head Side to Side*: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

d. *Moving Head Up and Down*: Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

e. *Talking*: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can count backward from 100, recite a memorized poem or song or read from a prepared text such as the Rainbow Passage.

> Rainbow Passage:
>
> When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

f. *Grimace*: The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)

g. *Bending Over*: The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

h. *Normal Breathing*: Same as Item A.14.a.

**B. Qualitative Fit Test (QLFT) Protocols**

1. General:

   a. The employer shall ensure that persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

   b. The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Irritant Smoke (Stannic Chloride) Protocol: This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

   a. General Requirements and Precautions:

      1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

      2. Only stannic chloride smoke tubes shall be used for this protocol.

      3. No form of test enclosure or hood for the test subject shall be used.

4. The smoke take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the buildup of irritant smoke in the general atmosphere.

b. Sensitivity Screening Check: The person to be tested must demonstrate his/her ability to detect a weak concentration of the irritant smoke.

1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

c. Irritant Smoke Fit Test Procedure:

1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

2. The test subject shall be instructed to keep his/her eyes closed.

3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

5. The exercises identified in Item A.14 of this attachment shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

## C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: quantitative fit testing using a nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General:

   a. The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.

   b. The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol: The ambient aerosol CNC quantitative fit testing (Portacount®) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

   a. Portacount® Fit Test Requirements:

      1. Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 Series 100, Series 99, or Series 95 particulate filter) per manufacturer's instruction.

      2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the

wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

3. Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; and self-observation in a mirror to evaluate fit and respirator position.

4. Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

5. Follow the manufacturer's instructions for operating the Portacount® and proceed with the test.

6. The test subject shall be instructed to perform the exercises in Item A.14 of this attachment.

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

b. Portacount® Test Instrument:

1. The Portacount® will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.

2. Since the pass or fail criterion of the Portacount® is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this attachment.

3. A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

3. Controlled Negative Pressure (CNP) Quantitative Fit Testing Protocol - The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer, Dynatech Nevada, also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his/her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity

of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. CNP Fit Test Requirements:

1. The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.

2. The CNP system defaults selected for test pressure shall be set at 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

   (Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

3. The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.

4. The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.

5. The test subject shall be trained to hold his/her breath for at least 20 seconds.

6. The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.

7. The QNFT protocol shall be followed according to Item C.1 of this attachment with an exception for the CNP test exercises.

b. CNP Test Exercises:

1. Normal Breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his/her breath for 10 seconds during the test measurement.

2. Deep Breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during test measurement.

3. Turning Head Side to Side: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the

turning head side to side exercise, the subject needs to hold head full left and hold his/her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his/her breath for 10 seconds during test measurement.

4. Moving Head Up and Down: Standing in place, the subject shall slowly move his/her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his/her head full up and hold his/her breath for 10 seconds during test measurement. Next, the subject shall hold his/her head full down and hold his/her breath for 10 seconds during test measurement.

5. Talking: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

6. Grimace: The test subject shall grimace by smiling or frowning for 15 seconds.

7. Bending Over: The test subject shall bend at the waist as if he/she were to touch his/her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

8. Normal Breathing: The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

c. CNP Test Instrument:

1. The test instrument shall have an effective audio warning device when the test subject fails to hold his/her breath during the test. The test shall be terminated whenever the test subject failed to hold his/her breath. The test subject may be refitted and retested.

2. A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

## ATTACHMENT 5
## RESPIRATOR FIT TEST FORM

NAME (Please Print): _____ SIGNATURE: _____

SSN: _____-_____-_____ HOME DEPT: _____ DATE: _____

CONDUCTED BY: _____ LOCATION: _____

| FIT TEST PROTOCOL | TYPE OF RESPIRATOR (Circle Appropriate One) |
|---|---|
| QUANTITATIVE:<br>Fit Factor _____ | APR/HF APR/FF SCBA<br>SAR/EGS PAPR OTHER |
| QUALITATIVE:<br>Irritant Smoke:<br>Other (specify): | Respirator Manufacturer: _____<br>Model: _____<br>Size: _____ |

| | | INITIAL: |
|---|---|---|
| 1. | I understand why respiratory protection is needed and where and when it should be used. | |
| 2. | I know how to use this respirator properly. | |
| 3. | I know how to clean and inspect this respirator. | |
| 4. | I understand the limitations and restrictions of this respirator. | |
| 5. | I wore this respirator in normal air and performed the user seal. | |
| 6. | I wore this respirator equipment in a test atmosphere. | |
| 7. | I understand that a good gas-tight face seal cannot be achieved with obstructions such as facial hair or glasses. | |
| 8. | I understand that corrective lenses compatible with the full facepiece are available by my manager. | |

## ATTACHMENT 6

## EMERGENCY RESPIRATORY PROTECTIVE EQUIPMENT MONTHLY INSPECTION CHECKLIST

INSPECTED BY (Print):_____ DATE:

BACKPACK#: _____ AIR CYLINDER#:

| | | | PASS | FAIL |
|---|---|---|---|---|
| A. Backpack and Harness Assembly | 1. Straps | Inspect for complete set | ☐ | ☐ |
| | | Inspect for damaged straps | ☐ | ☐ |
| | 2. Buckles | Inspect for mating ends | ☐ | ☐ |
| | | Check locking function | ☐ | ☐ |
| | 3. Backplage and Cylinder Lock | Inspect backplage for cracks, missing screws/rivets | ☐ | ☐ |
| | | Inspect cylinder hold down strap | ☐ | ☐ |
| | | Inspect strap tightener | ☐ | ☐ |
| B. Cylinder and Cylinder Valve Assembly | 1. Cylinder | Cylinder tight to backplate | ☐ | ☐ |
| | | Current Hydrostatic Test | ☐ | ☐ |
| | | Inspect cylinder for dents, gouges | ☐ | ☐ |
| | | Is cylinder at least 90% filled? | ☐ | ☐ |
| | 2. Head and Valve Assembly | Inspect cylinder valve lock for presence | ☐ | ☐ |
| | | Inspect cylinder gauge for condition | ☐ | ☐ |
| | | Proper function of cylinder valve lock | ☐ | ☐ |
| | | Test for cylinder leakage | ☐ | ☐ |
| C. Regulator and High Pressure Hose | 1. High Pressure Hose and Connector | Leakage in hose | ☐ | ☐ |
| | | Leakage in hose to cylinder connector | ☐ | ☐ |
| | 2. Regulator and Low Pressure Alarm | Read regulator gauge (at least 1,000 psi) | ☐ | ☐ |
| | | Low pressure alarm sounds at 500 psi | ☐ | ☐ |
| | | Test integrity of diaphragm | ☐ | ☐ |
| | | Test for positive pressure | ☐ | ☐ |
| | | Test bypass system | ☐ | ☐ |
| D. Facepiece and Corrugated Breathing Tube | 1. Facepiece | Inspect harness for deterioration | ☐ | ☐ |
| | | Inspect facepiece body for deterioration | ☐ | ☐ |
| | | Inspect lens | ☐ | ☐ |
| | | Inspect exhalation valve | ☐ | ☐ |
| | 2. Breathing Tube and Connector | Inspect breathing tube for deterioration | ☐ | ☐ |
| | | Inspect connector for threads and gasket | ☐ | ☐ |
| | 3. Leak Test and Cleaning | Perform negative pressure test on facepiece/ breathing tube | ☐ | ☐ |
| | | Clean and sanitize facepiece | ☐ | ☐ |

**Note:** Any item marked ☛Fail☚ will place the equipment out of service until repaired or replaced.

## ATTACHMENT 7

## GUIDE TO RESPIRATORY PROTECTIVE EQUIPMENT: CLEANING, INSPECTION, MAINTENANCE, AND STORAGE

A program for the maintenance of respirators shall include the following:

- Cleaning and sanitizing
- Inspection for defects
- Maintenance and repair
- Storage
- Assurance of breathing air quality.

The following maintenance, inspection, and storage program is recommended.

1. **Cleaning and Sanitizing**
   Respirators issued to an individual shall be cleaned and sanitized regularly. Each respirator shall be cleaned and sanitized before being worn by different individuals. Respirators intended for emergency use shall be cleaned and sanitized after being used. The following shall be completed in addition to the manufacturer's instruction for cleaning:

   a. Remove, when necessary, the following components of respiratory inlet covering assemblies before cleaning and sanitizing:

      1. Filters, cartridges, canisters
      2. Speaking diaphragms
      3. Valve assemblies
      4. Any components recommended by the respirator manufacturer.

   b. Wash respiratory inlet covering assemblies in warm (43 degrees C or 110 degrees F maximum temperature) cleaner sanitizer solution. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.

   c. Rinse the respirator inlet covering assemblies in clean, warm (43 degrees C or 110 degrees F maximum temperature) water.

   d. Drain all water, and air dry the respiratory inlet covering assemblies.

   e. Clean and sanitize all parts removed from the respiratory inlet covering assemblies as recommended by the manufacturers

   f. If necessary to remove foreign material, hand wipe respiratory inlet covering assemblies, all parts, and all gasket- and valve-sealing surfaces with damp, lint-free cloth.

   g. Inspect parts and replace any that are defective.

h. Reassemble parts on respirator inlet covering assemblies.

i. Visually inspect and, where possible, test parts and respirator assemblies for proper function.

j. Place assembled respirators in appropriate containers for storage.

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Extreme care shall be taken to ensure against tumbling, agitation, or exposure to temperatures above those recommended by the manufacturer (normally 43 degrees C or 100 degrees F maximum), as these conditions are likely to result in damage to the respirators.

Ultrasonic cleaners, clothes washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

Cleaner sanitizers that effectively clean the respirator and contain a bactericidal agent are commercially available. The bactericidal agent frequently used is a quaternary ammonium compound. Strong cleaning and sanitizing agents and many solvents can damage rubber or elastomeric respirator parts. These materials must be used with caution.

Alternatively, respirators may be washed in a detergent solution and then sanitized by immersion in a sanitizing solution. Some sanitizing solutions that have proven effective are: (a) a hypochlorite (bleach) solution (50 parts per million chlorine), 2-minute immersion; (b) an aqueous iodine solution (50 parts per million of iodine), 2-minute immersion; or (c) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness), 2-minute immersion.

Inflammation of the skin of the respirator user (dermatitis) may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are unstable and break down with time; they may cause deterioration of rubber or other elastomeric parts and may be corrosive to metallic parts. Immersion times should not be extended beyond the mentioned time periods, and the sanitizers shall be thoroughly rinsed from the respirator parts.

Respirators may become contaminated with toxic materials. If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; otherwise, separate decontamination steps may be required before cleaning.

## 2. Inspection

The user shall inspect the respirator immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly.

Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies, hoses, filters, cartridges, canisters, end-of-service indicators, electrical components, and shelf-life date(s); and for the proper function of regulators, alarms, and other warning systems. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

A record of inspection dates shall be kept for each respirator maintained for emergency or rescue use. Respirators that do not meet applicable inspection criteria shall be immediately removed from service (a temporary replacement assigned) and repaired or permanently replaced.

Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988, "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders," and will be examined for the following five types of damage:

- Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damage is repaired. Cylinders abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.

- Cuts are damage inflicted by a sharp object. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1- or 2-inch (25.4 mm or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.

- Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.

- Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.

- Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

**3. Maintenance and Repair**

Replacement of parts or repairs shall be done only be persons trained in proper respirator maintenance and assembly. Replacement parts shall be only those designated for the specific respirator repaired. Reducing or admission valves, regulators, and alarms shall be adjusted or repaired by the respirator manufacturer or a technician trained by the manufacturer. Instrumentation for valve, regulator, and alarm adjustments and tests should be calibrated to a standard traceable to the National Institute of Standards and Technology (NIST), at a minimum of every 3 years.

**4. Storage**

Respirators shall be stored in a manner that will protect them against physical and chemical agents such as vibration, shocks, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes, unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators that are placed in the work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

**5. Assurance of Breathing Air Quality**

Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous air shall meet at least the requirements of the specification for Type I-Grade D breathing air, and liquid air shall meet at least the requirements for Type II-Grade B breathing air as described in ANSI/CGA G-7.1-1989.

The CGA designation for Grade D and Grade E breathing air is as follows:

- Grade D breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 $mg/m^3$ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm carbon dioxide.

- Grade E breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 $mg/m^3$ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).

- Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and

when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.

Compressed gaseous air may contain low concentrations of oil introduced from equipment during processing or normal operation. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied air respirators or in open-circuit type self-contained breathing apparatus that have previously used compressed air. Oxygen concentrations greater than 23.5 percent shall be used only in equipment designed for oxygen service or distribution.

The dew point of air used to recharge self-contained breathing apparatus shall be –65 degrees F or lower (less than 25 ppm water vapor). The driest air obtainable (dew point of –100 degrees F or lower) should be used for recharging SCBA cylinders to be used in environments with ambient temperatures below –25 degrees F. The dew point of breathing air used with supplied air respirators should be lower than the lowest ambient temperature to which any regulator or control valve on the respirator or air-supplied system will be exposed.

Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of supplied air respirators with nonrespirable gases. **It is recommended that Foster or Hansen fittings be reserved for breathing air systems.** Breathing air outlets shall be labeled.

Breathing air may be supplied to supplied air respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable DOT specifications for shipping containers (49 CFR 173 and 178). Breathing gas containers shall be marked in accordance with ANSI/CGA C-4-1990. Specific test recommendations for purchased breathing air are given in the following table.

| Method of Preparation | Analysis Recommended |
|---|---|
| Compression: Supplier does not fill cylinders with any other gases. | Check 10% of cylinders from each lot for ppm CO and odor. |
| Compression: Supplier fills cylinders with gases other than air. | Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor. |
| Reconstitution. | Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor. |

A compressor shall be constructed so as to avoid entry of contaminated air. For all air compressors, including portable types, the air intake location shall be carefully selected, and monitored closely to ensure continued quality of air supply to the compressor. The system shall be equipped as necessary with a suitable in-line air-purifying sorbent bed and filter to further assure breathing air quality. Maintenance and replacement/refurbishment of compressor and associated air-purifying/filter media shall be performed periodically, by trained personnel following manufacturer's recommendations and instructions.

As part of acceptance testing, and prior to initial use, representative sampling of the compressor air output shall be performed to ensure that it complies with the requirements in Paragraph 1 of this section. To ensure a continued high-quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Samples should be collected on a periodic basis, as directed by the Program Coordinator. Specific test recommendations are given in the following table.

| Type/Sample | Oil Lubricated | Non-Oil Lubricated | Combustion Engine Powered |
|---|---|---|---|
| Water Vapor | ☒ | ☒ | ☒ |
| Carbon Monoxide | ☒ | | ☒ |
| Condensed Hydrocarbon | ☒ | | ☒ |
| Carbon Dioxide | | | ☒ |
| Odor | ☒ | ☒ | ☒ |

NOTES:

1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality.

2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment types, use, working environments, and operating experience.

3. Continuous monitoring of temperature and carbon monoxide are not required.

4. For non-oil lubricated compressors that operate at less than 35 psi, no sampling for water is required.

5. These requirements apply to systems designed for breathing air, other air-supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.

Further details on sources of compressed air and its safe use can be found in CGA G-7-1988.

# PROCEDURE

**Subject: MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS**

## 1.0 PURPOSE AND SUMMARY

This procedure prescribes the general requirements for the operation of motor vehicles on company business. All operators of company owned, leased, and rented vehicles, as well as personal vehicles used on company business, are covered by this procedure. U.S. Department of Transportation (DOT) regulated personnel must also comply with the guidelines contained in Procedure HS810. Key elements of this procedure include:

- All employees who drive or may drive on company business must be familiar with the requirements of this procedure and certify their acceptance of the Company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.

- All new hire candidates shall complete and be familiar with the company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.

- Employees must report all vehicular citations incurred while on company business to their supervisor as soon as possible, but not longer than 24 hours after the occurrence. Once reported, the established evaluation criteria in Section 5.4 will be used to determine corrective actions.

- Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria found in Section 5.3 to determine if their overall MVR citations exceed the Overall Driving Record limits (See Section 5.3.2).

- Employees utilizing vehicles while on company business are required to review this procedure and attend a company-designated driver training class at least once every two years.

- Requests for the re-instatement of denied or revoked driving privileges can be made to the appropriate business line Vice-President and the Director of Health & Safety.

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## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

## 4.0 DEFINITIONS

**Chargeable Vehicle Accident** - Any at fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles and property is involved and damage exceeds $2,500.00.

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**Company** - Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and its subsidiaries and affiliates.

**Motor Vehicle** - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. This includes personal vehicles operated on company business. For the purpose of this procedure, off-road vehicles, such as ATV's (Four Wheelers) earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. The use of motorcycles on company business is prohibited

**Project Assigned Employees** – Any employee that is assigned to a field operations project position. This designation includes Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, Project Business Accountants, etc. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, perform program reviews, etc.

## 5.0 TEXT

### 5.1 Company Rules for Motor Vehicle Operation

All employees who will or may be required to operate a company owned, leased, or rented motor vehicle or a personal vehicle used on company business shall acknowledge acceptance of the Company Rules for Motor Vehicle Operation & Employee Driving Record Certification (Attachment 2) prior to such operation. The signed form shall be retained by the Baton Rouge, LA Health & Safety Records Department. Each year, the company shall reserve the right to require covered employees to sign a copy of the most current Company Rules for Motor Vehicle Operation.

**FAILURE OF EMPLOYEES TO COMPY WITH COMPANY RULES FOR MOTOR VEHICLE OPERATION OR THIS POLICY SHALL BE SUBJECT TO DISCIPLINARY ACTION UP TO AND INCLUDING (BUT NOT LIMITED TO) REVOCATION OF DRIVING PRIVILEGES FOR COMPANY BUSINESS AND TERMINATION OF EMPLOYMENT.**

Those employees who are assigned to use an Employer vehicle which they take home with them must meet the following conditions:

a) The Employee's supervisor signs an Authorization for Assignment Form (See Attachment 7)

b) The Employee signs and agrees to be bound to a Vehicle Usage Agreement (See Attachment 8)

c) The Employee provides proof of insurance on the Employee's personal vehicle which lists the Employee as an insured driver on the insurance and such insurance contains minimum coverage required by law and acknowledges that the Employee's personal insurance will provide primary coverage of the Employee's use of a Company owned vehicle when such use is not in the course and scope of employment. The

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authorizing supervisor shall attach a copy of the proof or personal insurance to Attachment 8 for future reference.

The Vehicle Usage Agreement is an agreement by the Employee that his own personal vehicle insurance will be primary as to any claims arising from the Employee's **NON COMPANY** use of Company Vehicles.

Employees operating Company Vehicles without compliance with these requirements, as well as any supervisor who allowed or granted such use, will be deemed to be in violation of Company policy and will be subject to discipline up to and including termination from employment.

### 5.1.1 Project Assigned Employee Vehicle Use Requirements

The following requirements are set forth as it pertains to Project Assigned Employees.

- Project-assigned employees are not permitted to operate company vehicle (owned, leased or rented) on non-company business after 10:00 p.m. without written authorization from the project manager or the appointed Site Manager/Supervisor with jurisdiction over the vehicle. In those cases where there is shift work, a non-traditional workday (i.e. 3PM to 11PM workday, etc.) or other non-typical circumstances, it is understood that the after 10:00 PM restriction would not be appropriate. However, even in these non-typical circumstances, the Project Manager or the appointed site manager/supervisor shall be required to execute the required written authorization for use of a company vehicle, including the time frame in which employees shall be permitted to use the vehicle after their non-traditional workday.

- Project assigned personnel that are residing in temporary housing / hotels are granted permission to drive to and from the temporary residence and work. Additionally, the Project Manager, or the appointed Site Manager/Supervisor his/her designee (Site Manager, Supervisor, etc.) is required to evaluate and optimize the potential of carpooling of project assigned personnel in an effort to reduce the number of company vehicles being driven to and from the project site.

- Project assigned employees shall not use company vehicles for sight seeing or any other personal/recreational activities.

- Vehicles may be used in support of "daily life activities" such as going to restaurants for dinner, laundromats, local retail stores, grocery stores, etc.

- A maximum distance for "daily life activity" driving shall be no further than 20-miles from the temporary housing in which an employee resides. In those cases where the maximum allowed distance does not permit daily

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life activities to be conducted, a written authorization, from the Project Manager or the appointed Site Manager/Supervisor, is required to travel further distances.

- For normal routine travel to and from work, employees shall utilize their own personal transportation.

- If an employee is assigned to a project site that is located within driving distance from the employee's permanent residence, but is too far away to allow for a daily commute, that employee shall utilize their own personal transportation to drive to and from their permanent residence and the project site. (i.e. for initial assignment arrival to the project, trips home on rotation, etc.) Upon arrival to the site, employees shall be allowed to use a company vehicle as required to perform project activities. In these cases, the employee will also be required to drive their personal vehicle to and from the project site from their temporary housing / hotel residence, for personal "daily life activities", etc.

- Employees may drive a Shaw-owned, leased or rented vehicle home during off hours only when authorized in writing by a business line manager, who must hold a position at least one level above the site / project manager to whom the authorized employee reports. In other words, the approval must be signed by the employee's, supervisor's, supervisor or a higher level manager.

- In making vehicle use decisions the authorizing manager shall consider the risk of vehicle accidents, Shaw's liability risks, client and project specific needs, distances to be traveled, employee driving history, and any other relevant factors. Attachments 7 and 8, (Authorization for Assignment and Vehicle Use Agreement forms), shall be used to facilitate this process.

### 5.2 Pre-employment Evaluation

Human Resources shall distribute a copy of this procedure to all new hire candidates for the completion of Attachment 2. Information provided should be evaluated via the point system in Section 5.3. Human Resources and the hiring manager will be advised regarding any hiring or driving privilege restrictions that may apply. Hiring of persons with regular driving duties (e.g., field technicians and leadmen, sales persons, or others with assigned company motor vehicles) may only proceed after the information contained in Attachment 2 is evaluated.

Once Attachment 2 is completed, it is to be faxed to the Baton Rouge, LA Corporate Health and Safety Records Department at (225) 987-3714. The driving status of the prospective employee will be reported to the appropriate Human Resources Department. Health & Safety will notify the appropriate Human Resources manager when the attachments are not returned.

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Discrepancies between the certified driving record report and Attachment 3 shall be reviewed with the prospective employee. Deliberate falsification of driving record information will disqualify prospective employees from being hired.

## 5.3 Driving Record Point System

The following point system will be used to evaluate the driving record of all existing employees and new hire candidates that can reasonably be expected to operate a motor vehicle during their employment. This data is to be collected through Motor Vehicle Records (MVR) search and by the employee completing Attachment 2 of this policy. Attachment 2 is to be completed by the new hire candidate and reviewed by the regional H&S Assistant to ensure compliance.

| Driving Record Point System | |
|---|---|
| **Description** | **Assigned Point Value** |
| Overweight, loss of load, vehicular equipment infraction, etc. | 1 |
| Moving violation: speeding, failure to stop, failure to signal, etc. | 2 |
| At-fault accident, seatbelt violation | 3 |
| Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, Open Container (Non-Work Related), etc. | 6 |
| Driving under the influence, Hit and Run (leaving the scene) | 8 |
| Open Alcohol Container (Work Related) | 8 |

### 5.3.1 Pre-Employment Driving Record Point System Evaluation

If a new hire candidate has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be given the privilege to drive motor vehicles on company business without restrictions.

If a new hire has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, they will be placed on probation for a period of twelve (12) months. They will be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (i.e., speeding tickets, at-fault accidents, citations, etc.) accumulated during this probationary period will result in termination of the privilege to drive a motor vehicle on company business.

If the new hire candidate has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first twelve (12) months of employment, the employee can petition the appropriate business line Vice President and the Director of Safety and Health for reconsideration of driving privileges.

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If a new hire candidate is expected to drive a vehicle, to fulfill the responsibilities of his/her role, and there has been an accumulation of twelve (12) points or more in the last twelve (12) months or sixteen (16) points or more in the last twenty-four (24) months, the candidate shall not be hired. See Table below:

| Candidate's Driving Privilege Status Description | Past 12 Months | Past 24 Months |
|---|---|---|
| Can drive without restriction. | 0 to 3 points | 0 to 5 points |
| Can drive with understanding of probationary status. | 4 to 6 points | 6 to 8 points |
| Not eligible for company driving privileges for first 12 months of employment. | 7 to 11 points | 9 to 15 points |
| Candidate not eligible for hire. | 12 points or more | 16 points or more |

### 5.3.2 Existing Employee Driving Record Point System

An acceptable traffic record is one requirement for continued driving privileges. Accordingly, all affected employee's MVR traffic record is subject to periodic and annual review to ensure compliance with state and federal regulations, as well as company policy.

WORK RELATED TRAFFIC VIOLATIONS

It is the responsibility of all affected employees to provide verbal notice to their supervisor of any work related traffic violations that have occurred as soon as practicable but not longer than 24 hours after the occurrence. This verbal notice shall be followed by the employee completing an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2), and "Notification of Work Related Citation" form (Attachment 3). Both Attachment 2 and 3 shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

NON-WORK RELATED TRAFFIC VIOLATIONS

Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria, as described below, to determine if their overall traffic citations exceed acceptable company limits. It is not necessary for employees to report non-work related citations to their supervisor as they occur. However, if an employee's overall MVR record (work related or not) exceeds the company's established points system criteria, the employee must verbally inform their supervisor as soon as practicable but not longer than the following business day after the occurrence. This verbal notice shall be followed by the employee completing an updated Attachment 2 (Company Rules for Motor Vehicle Operation & Employee Driving Record Certification), and it shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

OVERALL DRIVING RECORD EVALUATION

If it is determined that an employee has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24)

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months, they will be allowed to continue with the privilege to drive motor vehicles on company business without restrictions.

If an employee has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, the employee will be placed on probation for a period of twelve (12) months. The employee can continue to drive motor vehicles on company business during this probationary period.

If the employee has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Continued employment may only be extended with the strict understanding of denial of the privilege to drive company owned, leased or rented motor vehicles on company business. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges. See Table below:

| Employee's Driving Privilege Status Description | Past 12 Months | Past 24 Months |
|---|---|---|
| Can drive without restriction. | 0 to 3 points | 0 to 5 points |
| Can drive with understanding of probationary status. | 4 to 6 points | 6 to 8 points |
| Company driving privileges are revoked. | 7 to 11 points | 9 to 15 points |

## 5.4 Employee Evaluation Criteria

All employees who may operate a motor vehicle on company business will become familiar with the requirements of this procedure, complete the currently-designated company driver training class, and complete Attachment 2 prior to such operation. The employee driving evaluation criteria is based upon all infractions including those incurred while on company business and during off-work hours. It is imperative that employees notify their supervisors immediately as possible and no later than 24 hours following a work-related citation/accident. Once notified, the supervisor will ensure the completion of Attachment 2 , forward it to the Baton Rouge, LA H&S Records Office, and initiate one of the following corrective actions as required. Additionally, as it relates to non-work related and work related traffic violations, it is the employee's responsibility to ensure that their overall driving record does not allow for the exceeding of the driving records points system. Should the employee's driving record points exceed the system limits, that they must notify their supervisor immediately, complete an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2 & 3) and forward it to the Baton Rouge, LA Health & Safety Records Department.

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### 5.4.1 Work-Related Minor Citation

When an employee is given a work related minor citation (i.e., speeding ticket, moving violation, failure to signal turn, loss of load, etc.), the employee's supervisor will meet with the employee to discuss the corrective action that must be taken so that further violations do not occur. At a minimum, the supervisor shall require the employee to attend a recognized course in defensive driving on his/her own time and the cost of this training will be borne by the employee. This course shall be pre-approved by the Division Health & Safety Manager. The supervisor will provide written direction to the employee regarding the assigned corrective action(s). The supervisor shall forward a copy of an updated Company Rules for Motor Vehicle Operation & Employee Driving Record Certification form (Attachment 2 & 3) and a form of verification showing the employee's successful completion of an approved defensive driving course to the appropriate regional Human Resources Department for inclusion in the employee's personnel file. These documents shall also be forwarded to the **Baton Rouge, LA Health & Safety Records Department.**

### 5.4.2 Work Related Major Citation

When an employee is given a work related major citation (i.e., reckless driving, tailgating, suspended license, speed contest, etc.), the supervisor will hold a meeting with the employee, at which time the supervisor will complete the company Disciplinary Action Form (Procedure HR207) thereby informing the employee that any additional infractions will lead to more severe disciplinary action. In addition, the employee will be required to attend a recognized defensive driving course on his/her own time, as described in section 5.4.1, and will be suspended from work for one day without pay. A copy of the Disciplinary Action Form shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

### 5.4.3 Failure to Notify

Should an employee fail to notify his/her supervisor of any work or non-work related citation or accident within the required reporting time, his/her company driving privilege may be revoked. The supervisor will also take disciplinary action that is appropriate for the unreported event. If the unreported event is work related and is either an at-fault accident, driving under the influence case or a hit and run violation, the termination process will be initiated. All disciplinary actions shall be documented to the employee by the supervisor. This copy, and any written response by the employee, shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

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### 5.4.4 At-Fault Accident

Whenever an employee is operating a company owned/leased/rented vehicle or their personal vehicle on company business and is involved in an at-fault vehicle accident, an Accident Review Board shall be convened and recommend the corrective action to be taken. At a minimum, the action shall include the completion of a recognized driver safety course on their time and at their expense, as described in section 5.4.1. All disciplinary actions resulting from at-fault vehicle accidents will be reviewed for consistency by the appropriate Safety Council.

Depending upon the circumstances and severity of the accident, termination of the employee can be considered. As above, this must be approved by the appropriate Human Resources Department. All communication to the employee regarding the accident and resulting action shall be in writing with a copy to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

### 5.4.5 Driving Under the Influence, Hit & Run (Leaving The Scene) and Open Container

If an employee is charged with Driving Under the Influence, Hit and Run or an Open Alcohol Container violation, he/she will have their driving privileges temporarily suspended pending final resolution of the charge. If the charge is resolved in the employee's favor, with a final adjudication holding no penalty, driving privileges may be re-instated. However, if any penalty is attached, such as probation, license restrictions, etc., the employee may be considered unqualified to drive for the company. Whenever an employee is convicted or pleads no contest to a company-related driving under the influence, hit and run or open container charge, he/she will be immediately terminated.

In a case that is not work related, and an employee is convicted or pleads no contest to a hit and run or driving under the influence charge, the employee shall notify his supervisor. Accordingly, the employee's company driving privileges will then be revoked for twelve (12) months. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges.

## 5.5 Training

All employees who will, or may reasonably be expected to, drive a company owned/leased/rented vehicle or their personal vehicle on company business shall review this procedure and complete the currently-designated company driver training class prior to such operation. This class is designed to be taught either via the company's Web-based training program or by local Health and Safety personnel and must include the following elements: federal/state/local driving rules, company driving rules, emergency/accident procedures, and defensive driving techniques. Specific information

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on the vehicle to be operated will be provided locally. Personnel conducting this class shall provide the Knoxville Health and Safety Training Department with a copy of the course attendance sheet for inclusion in individual training records. All affected employees shall complete a driver safety training class at least once every two years.

### 5.6 Reinstatement of Driving Privilege

Any employee who has had his/her privilege to drive a motor vehicle on company business revoked or denied, and who desires to reinstate this privilege, must apply to the business line Vice President and the Director of Health and Safety for reinstatement. The Director of H&S, or his designee, shall specify rehabilitation program (if applicable), an external safe driving course, and any other requirements in which he/she deems appropriate. Once the employee completes the program, documentation of successful completion must be formally presented to the appropriate Vice President and the Director of H&S. If the documentation is accepted, the driving privilege may be reinstated. Copies of all documents shall then be forwarded, by the responsible H&S Manager, to Human Resources and to the Baton Rouge, LA Health & Safety Records Department.

Reinstatement of the driving privilege may occur one (1) time, at the discretion of the Director of Health & Safety and the responsible Business Line Vice President. If employee driving performance leads to a subsequent revocation of this privilege, such revocation shall be permanent.

### 5.7 Non-Shaw Employee Vehicle Use Requirements

Only approved non-Shaw employees (client, subcontractor or temporary/temp agency employees) who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw owned, leased, or rented vehicle. Upon completing the questionaire and prior to the driver operating a Shaw vehicle, the subject questionnaire must be signed , dated and placed on file at the job site. The primary vehicle operator or the Shaw Project Management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800. The driver qualification point system can be found in section 5.3 of this policy.

In addition to the above requirement, it is also a requirement of the responsible Shaw Project Manager to forward a fully executed, company specific version of the correspondence that is found in Attachment 6, to the employer of the non-Shaw driver. This correspondence should not be modified except for the fields that specify the name and address of the subcontractor or client to which the letter is being written. This written correspondence will serve to notify that any employee that is assigned by their company to a Shaw project, and is required to operate/drive a Shaw owned, leased, or rented vehicle, will be subject to either meeting or exceeding the operator requirements for Shaw employees.

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As the employer of individuals who are assigned to a Shaw project, the authorized non-Shaw employer representative shall sign and return Attachment 6 to the respective Shaw Project Manager. By signing Attachment 6, the non-Shaw employer is acknowledging that they are either adopting the requirements set forth in this policy (HS800, Motor Vehicle Operation) or have developed a similar policy that meets or exceeds these requirements. Failure of a non-Shaw employer to comply with the requirements set forth in HS800 shall result in the prohibition of their employees driving any Shaw owned, leased or rented vehicles.

## 5.8 DRIVER SAFETY NOTIFICATION STICKER

A safety notification bumper sticker shall be applied to all Shaw owned / leased vehicles in an effort to ensure continued compliance with driving safety regulations. The notification service will be managed by a third party fleet safety management company and will serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Findlay, OH equipment division will serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service. Upon receiving a report from the third party administrator, the equipment division shall determine what business line the vehicle / driver is located within and then contact the respective business line Divisional H&S Manager. The Divisional H&S Manager will then contact the affected employee and the employee's supervisor for a counseling/discussion meeting, concerning the complaint. Upon conclusion of the meeting, the information will be reviewed by the supervisor and the Divisional H&S Manager for determination of corrective or disciplinary action.

The company shall endeavor to ensure that all company owned/leased fleet vehicles shall have a safety notification bumper sticker applied to the rear of the vehicle. It is the responsibility of the driver, who is deemed the primary / responsible operator of the vehicle, to ensure that the sticker remains on the vehicle and remains legible and in no way defaced. If the vehicle is project or program assigned and there is no designated primary operator, then the Project Manager will be considered the primary / responsible operator. The primary / responsible operator shall contact the Equipment Division in Findlay, OH, at 1-800-225-6464 ext. 6051 or direct dial 419-425-6051, immediately upon recognizing that the sticker is defaced or removed such that a new one can be re-applied. Failure, on the part of the primary operator, to ensure that a legible sticker remains on the vehicle shall result in disciplinary action, up to and including vehicle usage being revoked, in addition to possible termination of employment.

## 6.0 EXCEPTION PROVISIONS

Variances and exceptions, not explained herein, may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

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## 7.0 CROSS REFERENCES

HR207 Employee Disciplinary Action
HS013 Health and Safety Procedure Variances
HS020 Accident Prevention Program: Reporting, Investigation, and Review
HS810 Motor Vehicle Operation: Federal Motor Carrier Safety Regulations for Driver Qualifications

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Company Rules for Motor Vehicle Operation
3. Driving Record Certification
4. Notification of Work-Related Citation
5. Non-Shaw Employee Driver Questionnaire
6. Memo Template for Employers of Non-Shaw Drivers
7. Vehicle Use Authorization Form

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# ATTACHMENT 1
## MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS RESPONSIBILITY MATRIX

| Action | Procedure Section | *Responsible Party* | | | | | |
|---|---|---|---|---|---|---|---|
| | | Local Health & Safety Assistant | Business Line Health and Safety Manager | Supervisor | Accident Review Board | Corporate Human Resources | Director of H&S |
| Issue, Revise, and Maintain This Procedure | 3.1 | | | | | | X |
| Ensure Employees Complete Attachment 2 | 5.1 | | | X | | X | |
| Distribute HS800 to New Hire Candidates for Completion of Attachment 2 | 5.2 | | | | | X | |
| Request Evaluation of New Hire Driving Record | 5.2 | X | | X | | X | |
| Obtain Driving Record and Determine Driving Status | 5.2 | X | | | | | |
| Initiate Corrective Actions | 5.4 | | | X | | X | |
| Ensure Completion and Distribution of Attachment 3 | 5.4 | X | | | | | |
| Accident Review | 5.4.4 | | | | X | | |
| Ensure Drivers Meet Training Requirements | 5.5 | | X | X | | | |
| Specify Program for Reinstatement of Driving Privilege | 5.6 | | | | | | X |
| Reinstatement of Driving Privilege | 5.6 | | | | | | X |
| Non-Shaw Employee Vehicle Use Requirements | 5.7 | | | X | | | |
| Contact Employee to discuss report from Safety Notification Sticker Service | 5.8 | | X | X | | | |

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## ATTACHMENT 2
## COMPANY RULES FOR MOTOR VEHICLE OPERATION

1. Prior to motor vehicle operation, all motor vehicle operators are required to provide the company with current documentation of licensing for the motor vehicle(s) to be operated. Supervisors shall review and approve said documentation.

2. The motor vehicle operator is responsible for the vehicle, and for conducting a pre-trip, walk around inspection prior to use (including load evaluation, if applicable). No vehicle with any mechanical defect, which endangers the safety of the driver, passengers, or the public, shall be used. The motor vehicle operator is also responsible for the Driver Safety Notification sticker ( Sec. 5.8)

3. All company owned/leased trucks, should have small convex mirrors attached to the side mirrors.

4. The operator shall drive defensively at all times and is responsible for complying with all state and local traffic laws, as well as customer regulations concerning motor vehicle operation.

5. The operator and all passengers shall use seat belts at all times when the vehicle is in motion.

6. No employee shall operate a motor vehicle when abnormally tired, temporarily disabled, or under the influence of alcohol or drugs.

7. No employee shall allow a company owned, leased, or rented motor vehicle to be operated by an unauthorized employee or non-employee. (See also: unauthorized personal use of company vehicles) (Sec. 5.7)

8. The operator shall not allow for any open alcoholic beverage containers within a company vehicle or within a personal vehicle while it is being utilized for company business.

9. No employee shall drive beyond any barricades or into any area with designations such as HAZARDOUS, DO NOT ENTER, etc.

10. Use caution when driving through congested areas, or near where personnel and equipment are working.

11. Whenever possible, a spotter shall be used for backing all vehicles. This may be a fellow company employee, or a non-company employee who is willing to help.

12. Unless required, such as on a client's property, keys shall not be left in an unattended vehicle.

13. Employees shall not leave the driver's seat of a vehicle while the motor is running. Exemption: Vehicles equipped with a power take-off device with parking brake set and chocks in place.

14. No motorcycles are to be operated on company business.

15. Radar detectors are prohibited in all company owned, leased, or rented vehicles or in personal vehicles while being used for company business.

16. Analytical samples will be transported in accordance with 49 CFR regulations. Regulated hazardous substances shall not be transported in personal vehicles.

17. In case of an accident, the following steps shall be taken:
    A. Stop.
    B. Call for medical assistance in case of injuries.

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C. Notify police.
D. Complete Vehicle Accident Report and submit to your supervisor as soon as possible.

18. Whenever a vehicle is stopped upon the traveled portion of a highway or the shoulder of a highway, for any cause other than necessary traffic stops, the driver shall, as soon as possible, place or activate the warning devices with which the vehicle is equipped.

19. Employee must notify the supervisor as soon as possible, but not longer than 24 hours after occurrence, for work related citations, accidents, and license expiration, suspension, or revocation.

20. No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 16 hours. No employee may drive for more than 12 hours in any single on-duty period. Once either of these criteria has been met, a period of 8 consecutive hours off duty is required before driving duties may be resumed. These are maximum, not minimum, requirements and employees may be unfit to drive after shorter on-duty periods. Commercial DOT drivers are subject to the more restrictive hours of service regulations described in Procedure HS810.

21. Project-assigned employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor. (See section 5.1.1)

22. Employees shall not operate company vehicles for any type of personal use, no exceptions. Personal use includes any usage that is not directly related to company business. See section 5.1.1 for definitions concerning "daily life activities" for Project Assigned Employees.

23. Employees shall not use a company vehicle to visit an establishment that has a primary function of providing nighttime entertainment including the dispensing of alcoholic beverages.

24. Temporary or non-Shaw employees shall be allowed to utilize Shaw company vehicles only after the driver has completed Attachment 5 and has satisfied the point system requirements set forth in Section 5.3 of this policy. In addition, the employer of that driver shall have satisfied the requirement set forth in section 5.7 of this policy and signed a copy of the memo set forth in Attachment 6. This includes clients or subcontractors.

25. Employees shall not transport family members, friends or any other unauthorized guest passenger unless it is arising out of course and scope of company business.

26. Employees may not drive company owned, leased, or rented vehicles home when off of duty <u>except when authorized in writing</u> by a designated business line manager and in accordance with Sec. 5.1.1.

27. Employees needing to use a mobile phone or engage in other potentially distracting activity while operating a Motor Vehicle are advised to pull off the road when safe to do so for the duration of the activity.

I have read and understand company procedure HS800 and the company rules for Motor Vehicle Operation and agree to abide by all requirements

| _____ | _____ | _____ |
|---|---|---|
| Employee's Name (Printed) | Employee Signature | Date |

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# ATTACHMENT 3
## DRIVING RECORD CERTIFICATION

**Fair Credit Reporting Act Disclosure Statement**

In accordance with the provisions of Section 604 (b)(2)(A) of the Fair Credit Reporting Act, Pubic Law 91-508, as amended by the Consumer Credit Reporting Act of 1996 (title II, Subtitle D, Chapter I, of Pubic Law 104-208), you are being informed that reports verifying your driving record may be obtained on you for employment purposes. These reports are required by Sections 382.413, 391.23 and 391.25 of Federal Motor Carrier Safety Regulations. You have the right to receive a copy of the reports and have the prescribed allotment of time by law to have any errors corrected and the reports obtained after corrections have been posted.

| | Assigned Point Value |
|---|---|
| Overweight, loss of load, vehicular equipment infraction, etc. | 1 |
| Moving violation: speeding, failure to stop, failure to signal turn, etc. | 2 |
| At-fault accident | 3 |
| Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, open container, etc. | 6 |
| Driving under the influence or Hit and Run (Leaving the Scene) | 8 |

In the space provided below, please list all violations and accidents currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two [2] years). Determine the number of points assigned from the table above, and write in column labeled Points.@ Finally, write the sum total of all points where indicated.

| Violations/Accidents | Driver License #/State | Date (mo/yr) | Points |
|---|---|---|---|

**Total Points** _____

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous twenty-four (24) months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s). I understand that falsification of data will disqualify me from being hired or may result in revocation of my company driving privileges.

Driver's License No. _____ Driver's Lic. State of Issuance _____

Expiration Date _____ Date of Birth _____

_____ _____

Print Name Social Security Number

_____ _____

Signature Date

**PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714**

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## ATTACHMENT 4
## NOTIFICATION OF WORK-RELATED CITATION

This form is to be completed by employees incurring a work-related vehicular citation. Once complete, it is to be signed by the employee's supervisor and forwarded to the appropriate Human Resources Department for inclusion in the employee's personnel file.

Employee Name _____ Employee No. _____ Date _____

Nature of Citation _____

_____

Location of Citation (City, State) _____

Date/Time Citation Received _____

Is Citation Being Contested? ☐ No ☐ Yes Details _____

_____

_____

Employee Signature _____ Date _____

Corrective Action Being Taken _____

_____

_____

Supervisor Signature _____ Date _____

**PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714**

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## ATTACHMENT 5
## Non-Shaw Employee Driver Questionnaire

_____ _____
*Date* *Time*

_____ _____
*Vehicle is assigned to what Shaw Employee?* *Signature of Shaw Employee*

_____
*Non-Shaw Driver's Name*

Do you have a valid driver's license? Yes No

State in which license was issued, DL Number and Exp Date_____

Have you had any citations or accidents in the past 24 months? Yes No

If yes, please list type of citations and the associated dates below:

_____

_____

_____

_____

(Refer to HS800, Section 5.3, to determine driver eligibility based on the points system provided)

By signing below, I, the temporary driver, am acknowledging that the above information is true and accurately represents my driving record. I understand and agree that any misrepresentation or omission of material fact on this questionnaire will constitute sufficient grounds for your removal from the project site and will restrict the future use of Shaw vehicles.

I have read and fully understand the above:

_____
*Signature of Non-Shaw Driver*

_____
*Date*

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**ATTACHMENT 6**

Address
Address
Phone
Fax:

# Memorandum

**Date:**

**To:**

**CC:**

**From:** Project Manager

**RE:** Requirements for Motor Vehicle Operation

---

Attached is Shaw Environmental & Infrastructure, Inc. (Shaw) policy HS800 - Motor Vehicle Operation: General Requirements. As you can see, this policy applies to all operators of Shaw owned, leased, or rented vehicles, as well as personal vehicles used on Shaw business.

Accordingly, you are hereby notified that any employee that is assigned by your company to a Shaw Environmental & Infrastructure, Inc project and is required to operate/drive Shaw owned, leased, or rented vehicles, will be subject to either meeting or exceeding the operator requirements for Shaw employees. Please be aware that as the employer of individuals who are assigned to a Shaw project, you must ensure that your company either adopts the requirements set forth in policy HS800 (Motor Vehicle Operation) or develop a similar policy that meets or exceeds those requirements

Only approved non-Shaw employees, who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw vehicle. Furthermore, prior to the driver operating a Shaw vehicle, the subject questionnaire must be completed and placed on file at the job site. The primary vehicle operator or responsible Shaw management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800.

Failure to comply with the requirements of this correspondence or the requirements set forth in HS800 shall result in disciplinary action up to and including driving privilege revocation or removal of an affected non-Shaw employee from a project site. If the duties of your employees are expected to include driving a Shaw owned, leased or rented vehicle, please complete Attachment 5, for all of your affected personnel, and provide these to Shaw's site management. Alternatively, please be aware and make your employees aware that they are not authorized to drive a Shaw owned, leased, or rented vehicle without such compliance.

By signing this document, I, an authorized employee and agent of the subject company/employer, am acknowledging acceptance of the above information and agree to my employer's compliance with the referenced requirements stated herein.

_____
*Signature / Title*

_____
*Date*

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## ATTACHMENT 7
## AUTHORIZATION FOR ASSIGNMENT FORM

I, the hereby undersigned Supervisor / Manager, give my consent and approval for the Employee listed below to be assigned a Company Owned and/or Rented vehicle ("Company Vehicle") as specified herein and in accordance with the Company Motor Vehicle Use Policy and the Company Rules for Motor Vehicle Operation. I have given a copy of the Rules and the Policy to the Employee listed below and the Employee has signed and agreed to be bound by the Vehicle Usage Agreement.

Employee Name_____
VIN Number of Vehicle_____
Company Vehicle ID Number_____
Period of Allowance_____
Phone:_____
Company by which employed:_____

I, the undersigned Supervisor, personally attest that the following things have been done and are in proper order: *(Please check off when complete and attach appropriate documents)*

- ☐ Employee Driving Record Complete within the last six months
- ☐ Employee Driving Record rating allows operation of motor vehicle in accordance with policy (*List Rating* _____ *Date Completed*_____)
- ☐ Employee has presented a valid driver's license (*attach a copy)*
- ☐ Employee has signed the Vehicle Use Agreement and a copy has been obtained by the Company (*attach a copy)*
- ☐ Employee has been given a copy of Motor Vehicle Use Policy and Company Rules for Motor Vehicle Operation
- ☐ Employee has provided sufficient Proof of Insurance as required by the Policy (*attach a copy)*

SUPERVISOR SIGNATURE: _____
Printed Name:_____
Date:_____
Phone Number:_____

**FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.**

**DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT**

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## ATTACHMENT 8
## VEHICLE USE AGREEMENT

THIS VEHICLE USE AGREEMENT made and entered into this _____day of _____, _____, between the undersigned Employee listed below ("Employee") and the undersigned Company below ("Company")

WITNESSETH:

WHEREAS, Employee has been granted permission to be assigned a Company owned/leased vehicle ("Company Vehicle") as is set forth and approved on the AUTHORIZATION FOR ASSIGNMENT FORM

In consideration of being assigned use of a Company Vehicle, Employee agrees to the following:

1. Employee will not use the Company Vehicle for personal use. .
2. Employee will follow all rules and requirements set forth in the Company's Motor Vehicle Use Policy, a copy of which Employee has received;
3. Employee certifies that Employee has automobile insurance on a personal vehicle of Employee, Employee has provided to Company a copy of such insurance, and a copy is attached to this agreement;
4. Employee agrees that for any claims for damage, injury or death related to Employee's operation of the Company Vehicle while operating the vehicle on non-company business (personal use), that Employee's own personal automobile liability insurance will be primary and will pay the claim **FIRST AND BEFORE** any insurance of Company. In the event that Employee fails to secure and maintain personal automobile insurance coverage and there is a claim for damage or injury related to Employee's operation of the vehicle for personal use, the Employee will then be responsible and accepts liability for any claims paid by Company up to the minimum limits of insurance required in the state of the Employee's permanent residence.
5. Employee understands that violation of this Agreement or any policy or provision or rule contained in the Motor Vehicle Use Policy or any other Policy of the Company will subject the Employee to discipline including the potential loss of driving privileges for the Company or suspension or termination.

I am a person who is able to read in English and I have read this document and agree to all of its terms and conditions. I understand that the privilege to be assigned a Company Vehicle to take home can be withdrawn by the Company at any time for any reason (and without cause) with notice to me. I agree to comply with return of the vehicle when requested by the Company.

Employee_____
Date:_____
Address:_____
Phone:_____

COMPANY Supervisor / Manager:
Name (Print & Sign):_____ Date:_____

**FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.**

**DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT**

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# PROCEDURE

**Subject: COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE**

## 1.0 PURPOSE AND SUMMARY

This procedure covers the general requirements for operation and maintenance of commercial motor vehicles. Requirements are based upon Federal regulations covering interstate (and intrastate for drug and alcohol testing) activity and/or activity in non-agreement states. Locations are authorized to use applicable State regulations for intrastate activity, but must fully comply with Federal regulations whenever an "intrastate" unit engages in "interstate" activity. Key provisions include:

- General Requirements;
- Financial Responsibility;
- Notification and Reporting of Accidents;
- Qualifications of Drivers;
- Driving of Motor Vehicles;
- Inspection, Repair and Maintenance;
- Hours of Service of Drivers; and
- Management Review and Follow-up.

Any location or major project wishing to establish a pool of commercial drivers, or even one commercial driver, **must** contact the DOT Administrator in Findlay and the Corporate Health & Safety office in Pittsburgh for enrollment in the random drug testing pool.

## 2.0 TABLE OF CONTENTS

1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
4.0 Definitions
5.0 Text
- 5.1 General Requirements
- 5.2 Minimum Levels of Financial Responsibility for Motor Carriers
- 5.3 Notification and Reporting of Accidents
- 5.4 Qualifications of Drivers
- 5.5 Driving of Motor Vehicles
- 5.6 Inspection, Repair, and Maintenance
- 5.7 Hours of Service of Drivers
- 5.8 Transportation of Hazardous Materials Driving and Parking Rules
- 5.9 Carriage by Public Highway

6.0 Exception Provisions
7.0 Cross Reference
8.0 Attachments

## 3.0 RESPONSIBILITY MATRIX

### 3.1 Procedure Responsibility

The Vice President of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

### 3.2 Action/Approval Responsibilities

See Responsibility Matrix, Attachment 1.

## 4.0 DEFINITIONS

General definitions can be found in 49 CFR 390.5. Other definitions can be found at the beginning of the regulatory reference for each section of this procedure.

**Commercial Motor Vehicles Requiring CDL Drivers**

In accordance with Federal Motor Carrier Safety Regulations (FMCSR) 383.91, there are three vehicle groups which require a fully qualified, documented DOT driver holding a Commercial Driver's License. These classes are as follows:

**Group A** "Any combination of vehicles with a GCWR of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds. (Holders of a Group A license may, with any appropriate endorsements, operate all vehicles within Groups B and C.)"

**Group B** "Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR. (Holders of a Group B license may, with any appropriate endorsements, operate all vehicles within Group C.)"

**Group C** "Any single vehicle, or combination of vehicles, that does not meet the definition of Group A or Group B as contained herein, but that either is designed to transport 16 or more passengers including the driver, or is placarded for hazardous materials."

All three of the above groups require a qualified driver holding a CDL. This includes a complete DQ file, filing Driver's Daily Logs (or time cards), etc.

**Commercial Motor Vehicles NOT Requiring CDL Drivers**
In accordance with FMCSR 390.5(a):

> "Commercial motor vehicle means any self-propelled or towed vehicle used on public highways in interstate commerce to transport passengers or property when...the vehicle has a gross weight rating or gross combination weight rating of 10,001 or more pounds."

The CMV (commercial motor vehicle) described here is not covered in FMCSR 383.91 and thus would not require a driver holding a CDL. However, since the vehicle is considered a CMV by Federal regulations, any employee operating such a vehicle must have a complete DQ file in Findlay, is responsible for completing Driver's Daily Logs (or time cards), etc.; the regulations for the driver are exactly the same as for a driver holding a Commercial Driver's License, with the exception that these drivers are not required to hold a CDL; a State license is sufficient.

Also, the vehicle described in this section would automatically, as a CMV, fall into the group of vehicles requiring maintenance documentation at Findlay (Annual Inspections, Preventative Maintenance, Driver Inspection Reports, etc).

**Company** – All wholly-owned subsidiaries of the Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

## 5.0 TEXT

This section is organized to follow the DOT Safety/Compliance Review Checklist.

### 5.1 General Requirements

**5.1.1** All locations operating commercial motor vehicles shall maintain a current copy of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials Regulations (HMR), both of which are found in Title 49 of the Code of Federal Regulations.

**5.1.2** Training requirements for all drivers include the following minimum classes:

- Safe Driver Training (SDT)
- Hazardous Waste Hauling (HWH)
- Vacuum Truck Safety Training (VTST) (Note: Vacuum truck operators only)

Refresher training is required every two (2) years.

**5.1.3** All locations shall include safe commercial motor vehicle operation in their safety incentive/awareness programs.

**5.1.4** Each location shall monitor overall compliance as required in HS021, Accident Prevention Program: Management Safety Audits and Inspections; and HS018, Safety Councils.

**5.1.5** A person is qualified to operate a commercial motor vehicle if he or she:

- Is at least 21 years old;
- Can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and make entries on reports and records;
- Can by reason of experience, training, or both, safely operate the type of motor vehicle he or she drives;
- Can by reason of experience, training, or both, determine whether the cargo to be transported has been properly located, distributed and secured in or on the motor vehicle;
- Is familiar with methods and procedures for securing cargo in or on the motor vehicle; and
- Has a complete and current Driver Qualification File (See Section 5.2) in the possession of the Findlay DOT Administrator.

## 5.2 Minimum Levels of Financial Responsibility for Motor Carriers

*(See 49 CFR 387 for further details)*

**5.2.1** The Corporate Risk Management Department shall maintain insurance/financial responsibility as required in the current version of referenced regulation.

**5.2.2** An executed DOT MCS90 shall be maintained, with a copy forwarded to the DOT Administrator in Findlay.

## 5.3 Notification and Reporting of Accidents

*(See 49 CFR 390 for further details)*

**5.3.1** All accidents and near misses shall be reported in accordance with HS020 Accident Prevention Program: Reporting, Investigation and Review, and HS091 Serious Injury and Fatality Reporting Requirements. All required accident documentation shall accompany the Monthly Loss Reports.

**5.3.2** DOT procedures require that motor carriers maintain, for a period of one year after an accident occurs, an "Accident Register" containing specific information. This applies to <u>all commercial vehicle accidents</u>. Corporate Health & Safety will maintain the Register. The Register must include: date and time of accident, city/state, driver's name, number of injuries and/or fatalities, and whether hazardous materials other than fuel were released. Motor carriers are also required to maintain copies of all accident reports required by State or other governmental entities or insurers. **This is effective for all accidents occurring after March 3, 1993. Motor carriers must continue to retain copies of all accident reports previously submitted to FHWA for a period of three (3) years after the date of the accident.** (49 CFR 390, Subpart A)

**5.3.3** Corporate Health & Safety must be notified by telephone or fax of all commercial vehicle accidents within 24 hours, or not later than the next business day. Use the current Vehicle Accident Report found in Shaw E & I Procedure HS020.

**5.3.4** The Accident Register shall include the most reliable information on "reportable accidents" available to the motor carrier. A "reportable accident" means an occurrence involving a commercial motor vehicle operating on a public road which results in:

1. A fatality;
2. Bodily injury to a person who, as a result of the injury, immediately receives medical treatment away from the scene of the accident; or
3. One or more vehicles incurring disabling damage as a result of the accident, requiring the vehicle(s) to be transported away from the scene by a tow truck or other vehicle.

The term "accident" does not include:

1. An occurrence involving only boarding and alighting from a stationary motor vehicle;
2. An occurrence involving only the loading or unloading of cargo; or
3. An occurrence in the course of the operation of a passenger car or a multipurpose passenger vehicle (as defined in section 571.3 of 49 CFR) by a motor carrier and is not transporting passengers for hire or hazardous materials of a type and quantity that require the motor vehicle to be marked or placarded in accordance with section 177.823 of 49 CFR.

"Disabling damage" means damage which precludes departure of a motor vehicle from the scene of the accident in its usual manner in daylight after simple repairs.

Inclusions:

1. Damage to motor vehicles that could have been driven, but would have been further damaged if so driven.

Exclusions:

1. Damage which can be remedied temporarily at the scene of the accident without special tools or parts;
2. Tire disablement without other damage even if no spare tire is available;
3. Damage to turn signals, horn or windshield wipers which makes them inoperative.

"Fatality" means any injury which results in the death of a person at the time of the motor vehicle accident or within 30 days of the accident.

**5.3.5** All Vehicle Accident Reports shall include the most reliable information available to the motor carrier on the following subjects:

1. Date of accident;
2. Time of accident;
3. Location (city, state) of the accident;
4. Name of driver;
5. Number of persons injured;
6. Number of persons killed; and
7. Whether hazardous materials were released (other than fuel).

**5.3.6** Follow-up action with drivers involved with vehicle accidents shall be per HS800 Motor Vehicle Operation: General Requirements and the Shaw E & I progressive discipline system.

## 5.4 Qualifications of Drivers

*(See 49 CFR 391 for further details)*

**5.4.1** All hiring of drivers shall be done in accordance with the requirements of HS800 Motor Vehicle Operation: General Requirements and 49 CFR 391.

**5.4.2** All prospective drivers shall be interviewed to verify the accuracy of information on the application.

**5.4.3** All prospective drivers shall be required to show proof of current automobile insurance prior to hiring.

**5.4.4** All locations shall track and verify that the following driver documents are current: driver's license, Driver's Certification of Violations, Annual Review of Driving Record and medical. The Employee's Records Expiration Dates form may be used for this purpose.

**5.4.5** Prior to being allowed to operate a commercial motor vehicle, all drivers will be required to establish with the company (original in Findlay, copy at home terminal) a Driver Qualification File with the following minimum contents.

- **Commercial Drivers License (CDL)**

  **Combination Vehicle (Group A)** - Any combination of vehicles with a Gross Combination Weight Rating (GCWR) of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds.

**Heavy Straight Vehicle (Group B)** - Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.

**Small Vehicle (Group C)** - Any single vehicle, or combination of vehicles, that meets neither the definition of Group A nor that of Group B as contained in this section, but that either is designed to transport 16 or more passengers including the driver, or is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR Part 172, Subpart F).

(See 49 CFR 383.91 Figure 1 for further details on vehicles and CDL Groups.)

- **State License** - A driver operating a combination vehicle with a gross combined weight rating exceeding 10,001 pounds, but never operating a vehicle in one of the CDL categories (A,B,C), may perform these duties with an appropriate state license instead of a CDL.

  - Receipt for Federal Motor Carrier Safety Regulations (FMCSR)
  - Application for Employment
  - DOT Driver Supplemental Application for Employment
  - Driver's Road Test Examination
  - Written Examination
    This exam must be graded and incorrect responses reviewed with the driver. Supervisor and driver shall initial test when done.
  - Certification of Road Test and Written Examination
    A copy of this form must be provided to the driver.
  - Annual Driver's Certification of Violations
  - Inquiry to Previous Employers
    This form pertains to experience operating commercial motor vehicles.
  - Alcohol & Controlled Substance Test Information Inquiry to Previous Employers
    This is a Federal requirement which went into effective January 1, 1995. Whereas the Inquiry to Previous Employers regarding experience does not required a response, this form requires a response from the previous employer with 14 days of the driver being qualified. If a response is not received within the specified time, the driver is automatically disqualified.
  - Inquiry to State Agencies for Driver's Record
  - Annual Review of Driving Record.
  - Driver Data Sheet
  - Medical Examiner's Certificate

The certificate must be signed by the driver and Shaw E & I's Medical Review Officer. A copy must also be provided to the driver.

- DOT Long Form
- Medical Clearance and Drug and Alcohol Test Report

  **NOTE:** All drug and alcohol test results for commercial drivers must be retained in the Pittsburgh files only. Medical Clearance must be endorsed for DOT and signed on back by supervisor and driver. DOT requires examination every two years. Shaw E & I requires examination every year due to hazardous waste operations duties. Also note that issuance of medical clearance signifies a negative drug test result for baseline and update exams. See Shaw E & I Procedures HS100 Medical Policies and HS101 Drug and Alcohol Testing for further information.
- Vehicle Types
  This list details which vehicles a driver is qualified and/or authorized to operate based on his CDL class and endorsements. Applicable to all states.
- Certification of Drug and Alcohol Awareness Training

## 5.5 Driving of Motor Vehicles

*(See 49 CFR 392 for further detail)*

**5.5.1** Use, possession, or sale of drugs, alcohol, or other illicit substances is generally prohibited. Specific procedures are found in HR024 Illegal Drugs, Alcohol, and Other Substances and HS101 Drug and Alcohol Testing.

**5.5.2** Authorized passengers are limited to employees of Shaw E & I and those subcontractor, client or regulatory personnel who are integral to a task being performed.

**5.5.3** Management shall monitor compliance with speed laws by reviewing daily miles of operation versus actual driving time. Runs in excess of 500 miles shall have documentation attached that speed laws and hours of service rules were not violated (e.g. operations were in an area where speed laws exceed 55 mph).

## 5.6 Inspection, Repair, and Maintenance

*(See 49 CFR 396 for further detail)*

**5.6.1** All commercial motor vehicles shall be included in a scheduled preventive maintenance program. Service intervals shall be in terms of miles or hours of operation. Service intervals and service requirements shall be per the manufacturer's recommendations with manufacturer recommendations documented in the Vehicle Maintenance File in Findlay.

**5.6.2** Whenever manufacturer service recommendations either fail to cover company's utilization of the equipment or are unavailable, preventative maintenance shall be done in accordance with Shaw E & I Procedure FE006, Minimum Preventive Maintenance Standards for Corporate Equipment.

**5.6.3** All drivers shall conduct and document a pre-trip inspection (including tow bars and saddle mounts as applicable) before operating a commercial motor vehicle. No vehicle shall be operated unless the following parts and accessories are in good working order: service brakes (including trailer brake connections), parking brake, steering mechanism, lighting devices and reflectors, tires, horn, windshield wiper(s), rear-vision mirror(s) and coupling devices. The Driver's Inspection Report Form shall be used. A copy is to be submitted to the Maintenance Supervisor and the original is to remain with the vehicle.

When repairs are complete the mechanic is to make the appropriate entry in the Vehicle Maintenance File and sign the original Driver's Inspection Report in the vehicle. The on-coming driver shall verify that repairs have been made, sign the Driver's Inspection Report and turn in the final copy. Final (original) copy must be forwarded to the DOT Administrator in Findlay for comparison with Driver's Daily Logs and retention.

**5.6.4** All Driver's Inspection Report forms shall be forwarded to the DOT Administrator in Findlay not later than the twentieth day of the following month, and retained there for three months.

**5.6.5** All vehicles shall be subject to an annual safety inspection in accordance with 49 CFR 396.17. A copy of this inspection shall be forwarded to the DOT Administrator. Note that the vehicle must either carry a copy of the inspection or be marked with a sticker/decal displaying the information required in 49 CFR 396.17(c)(2).

**5.6.6** A limited safety inspection is required no less often than 90 days, and is to be noted in the home terminal Vehicle Maintenance File.

**5.6.7** Inspectors shall meet the qualification requirements in 49 CFR 396.19. (Use forms provided in DOT Manual.)

**5.6.8** Brake inspectors shall meet the qualification requirement in 49 CFR 396.25, which generally includes completion of an approved training program or one year of documented experience. (Use forms provided in DOT Manual.) Any driver making brake adjustments must also have certification of qualifications on file in Findlay.

**5.6.9** Where Shaw E & I employees perform inspections and repairs, documentation of qualifications shall be on file with the DOT Administrator.

**5.6.10** Where an outside vendor is used for inspection and repair, Shaw E & I management shall verify that the vendor understands and will comply with inspector qualification requirements.

**5.6.11** The Maintenance/Inspection Check list (see DOT Manual) shall be used to check completeness of Vehicle Maintenance Files.

**5.6.12** The current version of the North American Uniform Out-of-Service criteria must be followed in determining the service status of all commercial motor vehicles.

**5.6.13** All cargo tanks shall have a copy of the manufacturer's data report and required recertifications in the maintenance file. Qualifications for recertification vendors shall be on file with the DOT Administrator. Recertification requirements can be found in 49 CFR 180.

**5.6.14** All exemption vehicles or trailers are required to carry a copy of the exemption on the vehicle.

## 5.7 Hours of Service of Drivers

*(See 49 CFR 395 for further details)*

**5.7.1** Drivers shall not operate a commercial motor vehicle under the following conditions:

- More than 10 hours following 8 consecutive hours off-duty;
- For any period after having been on duty for 15 hours; or
- For any period after having been on duty for 70 hours during the period of eight consecutive days with the eighth day being the current date.

**5.7.2** All drivers shall record their duty status on the Driver's Daily Log (see DOT Manual), including recap. Logs shall be completely filled out and submitted to home terminal management daily, or no less often than every 13 days for extended trips. Note that a drivers daily log cannot be used as a time card only.

**5.7.3** Local management shall carefully review all Driver's Daily Logs. They shall require the driver to correct any errors, and take follow-up action (training or progressive discipline) where regulations or company procedures have been violated.

**5.7.4** Dispatchers shall track drivers hours of service via the driver's recap for local service, and via recap and daily phone calls during extended trips.

**5.7.5** 100 air mile radius drivers may use the time card included in the DOT Manual, as long as they comply with the instructions provided. Whenever these instructions are not met, a Driver's Daily Log must be completed for that day or

days. Note that switching between time cards and daily logs makes it easy to introduce errors into the recap. It is recommended that driver logs be used so that switching between the two forms is minimized.

**5.7.6** The DOT Log Book Compliance Checklist shall be used by management to review Driver's Daily Logs.

**5.7.7** All original Driver's Daily Logs are to be forwarded to the DOT Administrator in Findlay by the twentieth day of the following month, and retained there for six months. Copies must also be retained at the local office for six months.

## 5.8 Transportation of Hazardous Materials Driving and Parking Rules

*(See 49 CFR 397 for further details).*

**5.8.1** A motor vehicle containing hazardous materials must not be operated near an open fire unless its driver has first taken precautions to ascertain that the vehicle can safely pass the fire without stopping.

**5.8.2** A motor vehicle containing hazardous materials must not be parked within 300 feet of an open fire.

**5.8.3** No person may smoke or carry a lighted cigarette, cigar, or pipe on or within 25 feet of:

- A motor vehicle which contains explosives, oxidizing materials, or flammable materials; or
- An empty tank motor vehicle which has been used to transport flammable liquids or gases and which, when so used, was required to be marked or placarded in accordance with the rules in subsection 177.823 or 49 CFR.

**5.8.4** When a motor vehicle which contains hazardous materials is being fueled:

- Its engine must not be operating, and
- A person must be in control of the fueling process at the point where the fuel tank is filled.

**5.8.5** A motor vehicle transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in accordance with subsection 177.823 of 49 CFR must also display the information required in subsection 390.21 of 49 CFR, including USDOT 197183 (the Shaw E & I DOT number).

**5.8.6** Special consideration shall be given to avoidance of heavily populated areas when hauling hazardous material/waste loads.

## 5.9 Carriage by Public Highway

*(See 49 CFR 177 for further details)*

**5.9.1** All loads of hazardous materials or hazardous wastes shall be accompanied by shipping papers or hazardous waste manifest, respectively. These documents shall be prepared in accordance with 49 CFR 177.817 and 49 CFR 172 Subpart C. All documents shall be retained for at least three years. Shipping documents using any generic descriptions (e.g.. "n.o.s.") must also contain the technical name of the hazardous substance in parentheses following the basic description.

**5.9.2** Shipping documents shall be within the drivers reach and readily visible. When the driver is out of the cab, they shall be in the drivers door pocket or on the drivers seat.

**5.9.3** All hazardous materials/wastes loads shall be marked, labeled, and placarded in accordance with 49 CFR 192 Subparts D, E, and F, respectively.

**5.9.4** All hazardous materials/wastes loads shall be reported and segregated in accordance with 49 CFR 177.848.

**5.9.5** Spill incidents meeting any of the criteria listed below shall be reported to the DOT Administrator on DOT Form F 5800.1 (Attachment 2):

- Any quantity of hazardous waste,
- A reportable quantity (RQ) of hazardous material,

(Criteria listed below require immediate phone notification)

- A fatal injury or hospitalization occurs;
- Property damage exceeds $50,000;
- Radioactive materials are spilled;
- The general public is evacuated for more than one hour; or
- Etiologic agent(s) are discharged.

## 6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variances.

## 7.0 CROSS REFERENCES

| | |
|---|---|
| HS018 | Safety Councils |
| HS020 | Accident Prevention Program: Reporting, Investigation and Review |
| HS021 | Accident Prevention Program: Management Safety Audits and Inspections |
| HS091 | Serious Injury and Fatality Reporting Requirements |
| HS100 | Medical Policies |
| HS101 | Drug and Alcohol Testing |
| HS800 | Motor Vehicle Operation: General Requirements |

## 8.0 ATTACHMENTS

1. Responsibility Matrix
2. Hazardous Materials Incident Report (Form DOT F 5800.1)

**NOTE:** All other DOT forms can be found in the DOT Manual. Contact your DOT Administrator in Findlay.

# ATTACHMENT 1
# COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE

## Responsibility Matrix

| Action | Procedure Section | *Responsible Party* | | | |
|---|---|---|---|---|---|
| | | DOT Administrator | Risk Mgmt. Dept. | Corporate HS | Driver |
| Verify driver meets general requirements, including training | 5.1 | X | | X | |
| Maintain statutory financial responsibility | 5.2 | | X | | |
| Accident Reporting: Internal | 5.3 | X | | | X |
| Accident Reporting: External | 5.3 | | | X | |
| Document driver qualification:<br>▪ Establish DQ file<br>▪ Maintain DQ file | <br>5.4<br>5.4 | <br>X<br>X | | | |
| Monitor driver performance | 5.5 | X | | | |
| Maintain, inspect and service vehicles, and document (retain working copy) | 5.6 | X | | | |
| Hold maintenance documents | 5.6 | X | | | |
| Verify drivers comply with and document hours of service requirements | 5.7 | X | | | |
| Hold Driver's Daily Logs for six (6) months | 5.7 | X | | | |

# ATTACHMENT 2
# HAZARDOUS MATERIALS INCIDENT FORM

## DEPARTMENT OF TRANSPORTATION
## HAZARDOUS MATERIALS INCIDENT REPORT

Form Approved DMB No. 2137 0039

**INSTRUCTIONS:** Submit this report in duplicate to the Information Systems Manager, Office of Hazardous Materials Transportation, DHM-63, Research and Special Programs Administration, U.S. Department of Transportation, Washington, D.C. 20590. If space provided for any item is inadequate, complete that item under Section IX, keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Information Systems Manager, Office of Hazardous Materials Transportation. Additional copies in this prescribed format may be reproduced and used, if on the same size and king of paper.

### I. MODE, DATE, AND LOCATION OF INCIDENT

1. MODE OF TRANSPORTATION ☐ Air ☐ Highway ☐ Rail ☐ Water ☐ Other

2. DATE AND TIME OF INCIDENT (Use Military time [e.g., 8:30 am=0830, Noon=1200, 6 pm=1800, Midnight=2400])
Date: Time:

3. LOCATION OF INCIDENT (Include airport name in ROUTE/STREET if incident occurs at an airport.)
CITY: STATE:
COUNTY: ROUTE/STREET:

### II. DESCRIPTION OF CARRIER, COMPANY, OR INDIVIDUAL REPORTING

| 4. FULL NAME | 5. ADDRESS (Principal place of business) |
|---|---|
| | |

6. LIST YOUR OMC MOTOR CARRIER CENSUS NUMBER, REPORTING RAILROAD ALPHABETIC CODE, MERCHANT VESSEL NAME AND ID NUMBER OR OTHER REPORTING CODE OR NUMBER.

### III. SHIPMENT INFORMATION (From Shipping Paper or Packaging)

| 7. SHIPPER NAME AND ADDRESS (Principal place of business) | 8. CONSIGNEE NAME AND ADDRESS (Principal place of business) |
|---|---|
| 9. ORIGIN ADDRESS (If different from Shipper address) | 10. DESTINATION ADDRESS (If different from Consignee address) |

11. SHIPPING PAPER/WAYBILL IDENTIFICATION NO.

### IV. HAZARDOUS MATERIAL(S) SPILLED (NOTE: REFERENCE 49 CFR SECTION 172.101.)

| 12. PROPER SHIPPING NAME | 13. CHEMICAL/TRADE NAME | 14. HAZARD CLASS | 15. IDENTIFICATION NO. (i.e., UN 2020) |
|---|---|---|---|
| | | | |

16. IS MATERIAL A HAZARDOUS SUBSTANCE? ☐ YES ☐ NO

17. WAS THE RO MET? ☐ YES ☐ NO

| 18. ESTIMATED QUANTITY HAZARDOUS MATERIAL RELEASED (Include easurement) | 19. FATALITIES | 20. HOSPITALIZED | 21. NON-HOSPITALIZED |
|---|---|---|---|
| 22. NUMBER OF PEOPLE EVACUATED | | | |

23. ESTIMATED DOLLAR AMOUNT OF LOSS AND/OR PROPERTY DAMAGE, INCLUDING COST OF DECONTAMINATION OR CLEANUP (Round off in dollars):

| A. PRODUCT LOSS | B. CARRIER DAMAGE | C. PUBLIC/PRIVATE PROPERTY DAMAGE | D. DECONTAMINATION/ CLEANUP | E. OTHER |
|---|---|---|---|---|
| | | | | |

24. CONSEQUENCES ASSOCIATED WITH INCIDENT:
☐ SPILLAGE ☐ FIRE ☐ EXPLOSION ☐ VAPOR (GAS) DISPERSION ☐ ENVIRONMENTAL DAMAGE ☐ MATERIAL ENTERED WATERWAY SEWER ☐ NONE ☐ OTHER

## VI. TRANSPORT ENVIRONMENT

25. INDICATE TYPE(S) OF VEHICLE(S) INVOLVED:
❑ TANK CAR ❑ RAIL CAR ❑ TOFC/COFC ❑ CARGO TANK ❑ VAN TRUCK/TRAILER ❑ FLAT BED TRUCK TRAILER
❑ AIRCRAFT ❑ BARGE ❑ SHIP ❑
OTHER_____

26. TRANSPORTATION PHASE DURING WHICH INCIDENT OCCURRED OR WAS DISCOVERED:
❑ EN ROUTE BETWEEN ORIGIN/DESTINATION ❑ LOADING ❑ UNLOADING ❑ TEMPORARY STORAGE TERMINAL

27. LAND USE AT INCIDENT SITE:
❑ INDUSTRIAL ❑ COMMERCIAL ❑ RESIDENTIAL ❑ AGRICULTURAL ❑ UNDEVELOPED

28. COMMUNITY TYPE AT SITE: ❑ URBAN ❑ SUBURBAN ❑ RURAL

29. WAS THE SPILL THE RESULT OF A VEHICLE ACCIDENT/DERAILMENT? ❑ YES ❑ NO
IF YES AND APPLICABLE, ANSWER PARTS A THRU C.

| A ESTIMATED SPEED: | B. HIGHWAY TYPE:<br>❑ DIVIDED/LIMITED ACCESS<br>❑ UNDIVIDED | C. TOTAL NUMBER OF LANES:<br>[ ] ONE [ ] THREE<br>[ ] TWO [ ] FOUR OR MORE | SPACE FOR DOT USE ONLY |
|---|---|---|---|

## VII. PACKAGING INFORMATION: If the package is overpacked (consists of several packages [e.g., glass jars within a fiberboard box]), begin with for information on the innermost package.

| ITEM | A | B | C |
|---|---|---|---|
| 30. TYPE OF PACKAGING. INCLUDE INNER RECEPTACLES l drum, tank car) | | | |
| 31. CAPACITY OR WEIGHT PER UNIT PACKAGE (e.g., 55 gallons, 65 lbs.) | | | |
| 32. NUMBER OF PACKAGES OF SAME TYPE WHICH FAILED CAL MANNER | | | |
| 33. NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT | | | |
| 34. PACKAGE SPECIFICATION IDENTIFICATION (e.g., DOT 17E, DOT 105A 100, UN1A1 or none) | | | |
| 35. ANY OTHER PACKAGING MARKINGS (e.g., STC, 18/16-55-88, Y1.4/150/87) | | | |
| 36. NAME AND ADDRESS, SYMBOL OR REGISTRATION OF PACKAGING MANUFACTURER | | | |
| 37. SERIAL NUMBER OF CYLINDERS, PORTABLE TANKS, ANKS, TANK CARS | | | |
| 38. TYPE OF LABELING OR PLACARDING APPLIED | | | |
| 39. IF RECONDITIONED OR FIED — A. REGISTRATION OR SYMBOL | | | |
| B. DATE OF LAST TEST OR ON | | | |
| 40. EXEMPTION/APPROVAL/COMPETENT AUTHORITY IF APPLICABLE (e.g., DOT E1012) | | | |

## VIII. DESCRIPTION OF PACKAGING FAILURE: Check all applicable boxes for the package(s) identified above.

41. ACTION CONTRIBUTING TO PACKAGING FAILURE:

| | A | B | C | |
|---|---|---|---|---|
| a. | ❑ | ❑ | ❑ | TRANSPORT VEHICLE COLLISION |
| b. | ❑ | ❑ | ❑ | TRANSPORT VEHICLE OVERTURN |
| c. | ❑ | ❑ | ❑ | OVERLOADING/OVERFILLING |
| d. | ❑ | ❑ | ❑ | LOOSE FITTINGS, VALVES |
| e. | ❑ | ❑ | ❑ | DEFECTIVE FITTINGS, VALVES |
| f. | ❑ | ❑ | ❑ | DROPPED |
| g. | ❑ | ❑ | ❑ | STRUCK/RAMMED |
| h. | ❑ | ❑ | ❑ | IMPROPER LOADING |
| i. | ❑ | ❑ | ❑ | IMPROPER BLOCKING |
| j. | ❑ | ❑ | ❑ | CORROSION |
| k. | ❑ | ❑ | ❑ | METAL FATIGUE |
| l. | ❑ | ❑ | ❑ | FRICTION/RUBBING |
| m. | ❑ | ❑ | ❑ | FIRE/HEAT |
| n. | ❑ | ❑ | ❑ | FREEZING |
| o. | ❑ | ❑ | ❑ | VENTING |
| p. | ❑ | ❑ | ❑ | VANDALISM |
| q. | ❑ | ❑ | ❑ | INCOMPATIBLE MATERIALS |
| r. | ❑ | ❑ | ❑ | OTHER |

42. OBJECT CAUSING FAILURE:

| | A | B | C | |
|---|---|---|---|---|
| a. | ❑ | ❑ | ❑ | OTHER FREIGHT |
| b. | ❑ | ❑ | ❑ | FORKLIFT |
| c. | ❑ | ❑ | ❑ | NAIL/PROTRUSION |
| d. | ❑ | ❑ | ❑ | OTHER TRANSPORT VEHICLE |
| e. | ❑ | ❑ | ❑ | WATER/OTHER LIQUID |
| f. | ❑ | ❑ | ❑ | GROUND/FLOOR/ROADWAY |
| g. | ❑ | ❑ | ❑ | ROADSIDE OBSTACLE |
| h. | ❑ | ❑ | ❑ | NONE |
| i. | ❑ | ❑ | ❑ | OTHER |

43. HOW PACKAGE(S) FAILED:

| | A | B | C | |
|---|---|---|---|---|
| a. | ❑ | ❑ | ❑ | PUNCTURED |
| b. | ❑ | ❑ | ❑ | CRACKED |
| c. | ❑ | ❑ | ❑ | BURST/INTERNAL PRESSURE |
| d. | ❑ | ❑ | ❑ | RIPPED |
| e. | ❑ | ❑ | ❑ | CRUSHED |
| f. | ❑ | ❑ | ❑ | RUBBED/ABRADED |
| g. | ❑ | ❑ | ❑ | RUPTURED |
| h. | ❑ | ❑ | ❑ | OTHER_____ |

44. PACKAGE AREA THAT FAILED:

| | A | B | C | |
|---|---|---|---|---|
| a. | ❑ | ❑ | ❑ | END, FORWARD |
| b. | ❑ | ❑ | ❑ | END, READ |
| c. | ❑ | ❑ | ❑ | SIDE, RIGHT |
| d. | ❑ | ❑ | ❑ | SIDE, LEFT |
| e. | ❑ | ❑ | ❑ | TOP |
| f. | ❑ | ❑ | ❑ | BOTTOM |
| g. | ❑ | ❑ | ❑ | CENTER |
| h. | ❑ | ❑ | ❑ | OTHER_____ |

45. WHAT FAILED ON PACKAGE(S):

| | A | B | C | |
|---|---|---|---|---|
| a. | ❑ | ❑ | ❑ | BASIC PACKAGE MATERIAL |
| b. | ❑ | ❑ | ❑ | FITTING/VALVE |
| c. | ❑ | ❑ | ❑ | CLOSURE |
| d. | ❑ | ❑ | ❑ | CHIME |
| e. | ❑ | ❑ | ❑ | WELD/SEAM |
| f. | ❑ | ❑ | ❑ | HOSE/PIPING |
| g. | ❑ | ❑ | ❑ | INNER LINER |
| h. | ❑ | ❑ | ❑ | OTHER |

**IX. DESCRIPTION OF EVENTS: Describe the sequence of events that led to incident, action taken at time discovered, and action taken to prevent idents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should ted when necessary for clarification. ATTACH A COPY OF THE HAZARDOUS WASTE MANIFEST FOR INCIDENTS INVOLVING HAZARDOUS WASTE. on additional sheets if necessary.**

| | | |
|---|---|---|
| 46. NAME OF PERSON RESPONSIBLE FOR PREPARING REPORT (Please Print) | 47. SIGNATURE | |
| 48. TITLE OF PERSON RESPONSIBLE FOR PREPARING REPORT | 49. TELEPHONE NUMBER (Area Code)<br>( ) - | 50. DATE REPORT SIGNED |

***Attachment 3***
***Activity Hazard Analyses***

Activity Hazard Analyses

- AHA for Mobilization/Demobilization and Site Set-up
- AHA for Installation of Erosion & Sediment Control
- AHA for Utility Relocation
- AHA for Material Excavation and Handling
- AHA for Field Sampling and Offsite Analysis
- AHA for Site Restoration
- AHA for Transportation and Disposal

| ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/ DEMOBILIZATION AND SITE SET-UP | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Mobilization/ Demobilization and Site Set-up | Slips, Trips, Falls | • Clear walkways, work areas of equipment, tools, vegetation and debris<br>• Exit equipment slowly and maintain three point contact<br>• Mark, identify, or barricade other obstructions | | |
| | Spills | • Clean up spills before initiating maintenance<br>• Review maintenance procedures for safety practices | | |
| | Struck By/ Against Heavy Equipment | • Wear reflective warning vests when exposed to vehicular traffic<br>• Isolate equipment swing areas<br>• Make eye contact with operators before approaching equipment<br>• Understand and review hand signals<br>• Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket.<br>• Step away from equipment when bucket adjustments are made | Warning vests, hard hat, safety glasses and steel toe work boots | |
| | Pinch points | • Review equipment adjustment procedures, identify pinch points<br>• Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles | Leather gloves | |
| | Equipment failure | • Perform daily maintenance inspections on operating equipment | | |

| ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/ DEMOBILIZATION AND SITE SET-UP | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | Electrical Shock | • De-energize or shut off utility lines at their source before work begins<br>• Use double insulated or properly grounded electric power-operated tools<br>• Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters<br>• Use qualified electricians to hook up/disconnect electrical circuits<br>• Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation<br>• Cover or elevate electric wire or flexible cord passing through work areas to protect from damage<br>• Keep all plugs and receptacles out of water<br>• Use approved water-proof, weather-proof type if exposure to moisture is likely<br>• Inspect all electrical power circuits prior to commencing work<br>• Follow Shaw procedure HS315, Control of Hazardous Energy and the Site Specific Lockout/Tagout/Try Plan | Lockout/Tagout Devices | Voltage Meter or “Tic” Tracer |
| | Handling Heavy Objects | • Observe proper lifting techniques<br>• Obey sensible lifting limits (60 lb. Maximum per person manual lifting)<br>• Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads<br>• Avoid carrying heavy objects above shoulder level<br>• Avoid manual lifting/carrying tasks | | |

| ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/ DEMOBILIZATION AND SITE SET-UP | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | Sharp Objects | • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>• Avoid razor knives. Use hooked cutters or shears whenever possible<br>• Cut away from the body<br>• Maintain all hand and power tools in a safe condition | Leather gloves | |
| | Ladders | • Inspect ladders before use for mud buildup on treads<br>• Clean mud from boots before climbing on ladders<br>• Follow the three point of contact rule<br>• Review Shaw Health and Safety Procedure HS302-Ladders | | |
| | High Noise Levels | • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) | Hearing protection | |
| | Burns associated with loading/unloading equipment on trucks | • Identify heavy objects for loading that may have hot surfaces<br>• Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from buns | | |
| | Walking on machine tracks | • Avoid walking on machine tracks whenever possible; clean tracks for safe walking/working surfaces<br>• Observe track surfaces when walking, move cautiously on uneven, slippery surfaces<br>• Avoid sudden awkward motions (pulling/jerking fuel hoses) | | |
| | High Ambient Temperature | • Provide fluids to prevent worker dehydration<br>• Monitor for heat stress in accordance with Shaw Health and Safety Procedure HS400 | | Meteorological Equipment |

| ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/ DEMOBILIZATION AND SITE SET-UP | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| **EQUIPMENT REQUIRED** | | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** | |
| • Forklifts/hand carts<br>• Ladders<br>• Hand tools | | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan.<br>• Review operations/safety manuals for all equipment utilized | |

| ACTIVITY HAZARD ANALYSIS FOR INSTALLATION OF EROSION AND SEDIMENT CONTROL | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Silt Fence, Hay Bale Installation | Slips, Trips, Falls | C Clear walkways, work areas of equipment, tools and debris<br>C Mark, identify, or barricade other obstructions | | |
| | Handling Heavy Objects | C Observe proper lifting techniques<br>C Obey sensible lifting limits (60 lb. maximum per person manual lifting)<br>C Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads | | |
| | Allergic Reaction | C Identify and review poisonous plants with workers<br>C Provide workers proper skin protection to prevent skin allergic reaction from exposure to hay, contaminated soil, plants, or other skin irritants | Tyvek coveralls, duct tape bottom of coveralls to boots; latex gloves within cotton gloves, if needed | |
| | Struck-by Hand Tools, Flying Debris | C Hold stakes in place with tongs, vice-pliers or other remote grasping tools<br>C Wear safety goggles when using sledge hammer, hatchet, maul or axe | Leather gloves, face shield and goggles | |
| | Sharp Objects | C Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>C Maintain all hand and power tools in a safe condition<br>C Keep guards in place during use | Leather gloves | |
| | High Noise Levels | C Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)<br>C Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA | Ear plugs | Sound Level Meter |
| | High/Low Ambient Temperature | C Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401<br>C Provide fluids to prevent worker dehydration<br>C Follow work/rest schedule in the SSHSP Table 4.2 | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |

| ACTIVITY HAZARD ANALYSIS FOR INSTALLATION OF EROSION AND SEDIMENT CONTROL | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| **EQUIPMENT REQUIRED** | | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** | |
| • Hay bales<br>• Silt Fence<br>• Miscellaneous hand tools, shovels<br>• Emergency Equipment | | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan.<br>• Review operations/safety manuals for all equipment utilized | |

| ACTIVITY HAZARD ANALYSIS FOR UTILITY RELOCATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Excavation of Soil | Underground/ Overhead Utilities | C Identify all utilities around the site before work commences<br>C Cease work immediately if unknown utility markers are uncovered<br>C Use manual excavation within 3 feet of known utilities<br>C Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance<br>C Use qualified personnel to shut down or energize overhead/underground utilities | | |
| | Struck By/ Against Heavy Equipment | C Wear reflective warning vests when exposed to vehicular traffic<br>C Isolate equipment swing areas<br>C Make eye contact with operators before approaching equipment<br>C Understand and review hand signals | Warning vests, hard hat, safety glasses, steel toe work boots | |
| | Sharp Objects | C Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>C Maintain all hand and power tools in a safe condition<br>C Keep guards in place during use | Leather gloves | |
| | High Noise Levels | C Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)<br>C Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA | Ear plugs | Sound Level Meter |
| | Slips, Trips, Falls | C Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris<br>C Mark, identify, or barricade other obstructions | | |
| | Excavation Wall Collapse | C Construct diversion ditches or dikes to prevent surface water from entering excavation<br>C Provide good drainage of area adjacent to excavation<br>C Collect ground water/rain water from excavation and | Hard hat, safety glasses | |

| ACTIVITY HAZARD ANALYSIS FOR UTILITY RELOCATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Excavation of Soil (Continued) | | dispose of properly<br>C Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face<br>C Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth<br>C Place ladders no more than 25 feet apart laterally<br>C Treat excavations over 4 feet deep as confined spaces<br>C Complete confined space permit entry procedure<br>C Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency<br>C Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required<br>C Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting<br>C Inspect excavations (when personnel entry is required) daily, any time conditions change<br>C Provide at least two means of exit for personnel working in excavations | | |
| | Handling Heavy Objects | C Observe proper lifting techniques<br>C Obey sensible lifting limits (60 lb. maximum per person manual lifting)<br>C Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads | | |
| | Inhalation and Contact with Hazardous Substances | C Provide workers proper skin, eye and respiratory protection based on the exposure hazards present<br>C Review hazardous properties of site contaminants with workers before operations begin<br>C Monitor breathing zone air to determine levels of contaminants<br>C Dampen soil using light water spray to prevent fugitive | Modified Level 'D' PPE required if employees are in contact with contaminated soil;<br><br>Upgrade per Section | PID, Data Ram |

| ACTIVITY HAZARD ANALYSIS FOR UTILITY RELOCATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Excavation of Soil (Continued) | | dust emissions<br>C Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions<br>C Conduct air monitoring / sampling to determine exposure levels | 6.1 of the SSHSP | |
| | High/Low Ambient Temperature | C Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401<br>C Provide fluids to prevent worker dehydration<br>C Follow work/rest schedule in the SSHSP Table 4.2 | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |
| Removal/Relocate Line | Struck by/ Against Heavy Equipment, Protruding Objects | C Use reflective warning vests when exposed to vehicular traffic<br>C Isolate equipment swing areas<br>C Make eye contact with operators before approaching equipment<br>C Wear hard hats, safety glasses with side shields, and steel-toe safety boots<br>C Understand and review hand signals | Hard hat, safety glasses, Steel-toe boots | |
| | Slips, Trips, Falls | C Clear walkways, work areas of equipment, vegetation, excavated material, tools and debris<br>C Mark, identify, or barricade other obstructions | | |
| | Handling Heavy Objects | C Observe proper lifting techniques<br>C Obey sensible lifting limits (60 lb. maximum per person manual lifting)<br>C Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads | | |
| | Caught In/ Between Moving Parts | C Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions<br>C Assure guards are in place to protect from these parts of equipment during operation<br>C Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects<br>C Maintain all equipment in a safe condition | | |

| ACTIVITY HAZARD ANALYSIS FOR UTILITY RELOCATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | | C Keep all guards in place during use<br>C De-energize and locked-out machinery before maintenance or service | | |
| Backfilling | Slips, Trips, Falls | C Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris<br>C Mark, identify, or barricade other obstructions | | |
| | Struck By/ Against Heavy Equipment | C Wear reflective warning vests when exposed to vehicular traffic<br>C Isolate equipment swing areas<br>C Make eye contact with operators before approaching equipment<br>C Understand and review hand signals | Warning vests, hard hat safety glasses, steel toe work boots | |
| | Sharp Objects | C Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>C Maintain all hand and power tools in a safe condition<br>C Keep guards in place during use<br>C | Leather gloves | |
| **EQUIPMENT REQUIRED** | | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** | |
| • Heavy Equipment<br>• Monitoring Equipment<br>• Miscellaneous hand tools, shovels<br>• Emergency Equipment<br>• Piping | | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan.<br>• Review operations/safety manuals for all equipment utilized | |

| ACTIVITY HAZARD ANALYSIS FOR MATERIAL EXCAVATION AND HANDLING | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Soil Excavation | Underground/ Overhead Utilities | • Identify all utilities around the site before work commences<br>• Complete the underground utility permit in accordance with Shaw Health and Safety Procedure HS308<br>• Cease work immediately if unknown utility markers are uncovered<br>• Use manual excavation within 3 feet of known utilities<br>• Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance | | |
| | Sharp Objects | • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>• Maintain all hand and power tools in a safe condition<br>• Keep guards in place during use<br>• Observe work area and location of other personnel before lifting/moving objects with sharp edges | Leather gloves | |
| | Struck By/ Against Heavy Equipment | • Wear reflective warning vests when exposed to vehicular traffic<br>• Isolate equipment swing areas<br>• Make eye contact with operators before approaching<br>• Understand and review hand signals<br>• Step away from equipment when bucket adjustments are made.<br>• Park equipment in areas where operator can see clearly to dismount equipment | | |
| | High Noise Levels | • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)<br>• Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA | Hearing protection | |

| ACTIVITY HAZARD ANALYSIS FOR MATERIAL EXCAVATION AND HANDLING | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Soil Excavation (continued) | Slips, Trips, Falls | • Clear, walkways of equipment, vegetation, excavated material, tools and debris<br>• Mark, identify, or barricade other obstructions<br>• Exit equipment slowly and maintain three point contact<br>• Clean boot soles before climbing on equipment | | |
| | Handling Heavy Objects | • Observe proper lifting techniques<br>• Review proper lifting posture/techniques regularly at safety meetings<br>• Obey sensible lifting limits (60 lb. Max per person)<br>• Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads<br>• Avoid carrying heavy objects above shoulder level<br>• Warm up muscles before engaging in manual lifting | Warning vests, hard hat, safety glasses and steel toe work boots | |
| | High/Low Ambient Temperature | • Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401<br>• Provide fluids to prevent worker dehydration<br>• Take adequate rest periods in a cool/warm shaded area<br>• During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages<br>• Remove PPE if possible during rest periods<br>• Include plenty of salt in your food intake, however, do not take salt tablets | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |
| Soil Excavation (continued) | Inhalation and Contact with Hazardous Substances or exhaust gases | • Review hazardous properties of site contaminants with workers before operations begin<br>• Monitor breathing zone air and work area to determine levels of contaminants<br>• Dampen material using light water spray to prevent fugitive dust emissions | Modified Level 'D'; Upgrade to Level 'C' per Section 6.1 of SSHSP | Data RAM<br>PID<br>Personal Sample Pumps |
| Manual Excavation | Struck/Struck By | • Use the right tool for the task at hand<br>• Maintain personal balance when performing manual | | |

| ACTIVITY HAZARD ANALYSIS FOR MATERIAL EXCAVATION AND HANDLING | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | | excavation<br>• Concentrate on the work task being performed | | |
| | Overexertion | • Use the right tool for the task at hand<br>• Avoid actions/activities that produce overexertion | | |
| | Horseplay | • Prohibit horseplay on all project sites<br>• Review rules about horseplay with subcontract Superintendents and workers<br>• Remind workers not to respond/participate in horseplay started by others | | |
| | Slips, Trips, Falls | • Clear, walkways of equipment, vegetation, excavated material, tools and debris<br>• Mark, identify, or barricade other obstructions<br>• Exit equipment slowly and maintain three point contact<br>• Clean boot soles before climbing on equipment | | |
| **EQUIPMENT REQUIRED** | | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** | |
| • Excavator<br>• Dump trucks<br>• Data RAM, PID, personal pumps | | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)<br>• Underground Utility Permit (HS308)<br>• Excavation permit (HS307)<br>• Inspect all dump trucks in accordance with Section 18 of the USACE EM 385-1-1 Manual | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan<br>• Review the hazards associated with site contaminants – primarily lead | |

| ACTIVITY HAZARD ANALYSIS FOR FIELD SAMPLING AND OFFSITE ANALYSIS | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Sampling | Handling Heavy Objects (coolers) | • Observe proper lifting techniques<br>• Obey sensible lifting limits (60 lb. maximum per person manual lifting)<br>• Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads | | |
| | Slips, Trips, Falls | • Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris<br>• Mark, identify, or barricade other obstructions | | |
| | Spills | • Wear splash protection as necessary to prevent dermal contact<br>• Ensure spill cleanup equipment/material on hand/ready for use (i.e.: Baking soda to neutralize and sample preservative spills)<br>• Cleanup spills immediately | Full face shield /guard and goggles | |
| | Inhalation and Contact with Hazardous Substances | • Review hazardous properties of site contaminants with workers before operations begin<br>• Monitor breathing zone air and work area to determine levels of contaminants<br>• Dampen material using light water spray to prevent fugitive dust emissions | Initial: Modified Level 'D' if in contact with soil;<br>Upgrade per section 6.1 of SSHSP | PID; |

| ACTIVITY HAZARD ANALYSIS FOR FIELD SAMPLING AND OFFSITE ANALYSIS | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | High/Low Ambient Temperature | • Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401<br>• Provide fluids to prevent worker dehydration<br>• Take adequate rest periods in a cool/warm shaded area<br>• During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages<br>• Remove PPE if possible during rest periods<br>• Include plenty of salt in your food intake, however, do not take salt tablets | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |

| **EQUIPMENT REQUIRED** | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** |
|---|---|---|
| • Sample supplies | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan |

| ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Site Restoration | Struck by/ Against Heavy Equipment, Protruding Objects | • Wear reflective warning vests when exposed to vehicular traffic<br>• Avoid equipment swing areas<br>• Make eye contact with operators before approaching equipment<br>• Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times<br>• Understand and review hand signals | Warning vests, Hard hat, Safety glasses, Steel toe work boots | |
| | Slips, Trips, Falls | • Clear, walkways of equipment, tools, debris, other materials<br>• Mark, identify, or barricade other obstructions | | |
| | High Noise Levels | • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)<br>• Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA | Hearing protection | |
| | Handling Heavy Objects | • Observe proper lifting techniques<br>• Obey sensible lifting limits (60 lb. per person for manual lifting)<br>• Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads | | |
| Site Restoration (continued) | High/Low Ambient Temperature | • Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401<br>• Provide fluids to prevent worker dehydration | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |

| ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | | • Take adequate rest periods in a cool/warm shaded area<br>• During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages<br>• Remove PPE if possible during rest periods<br>• Include plenty of salt in your food intake, however, do not take salt tablets | | |

| EQUIPMENT TO BE USED | INSPECTION REQUIREMENTS | TRAINING REQUIREMENTS |
|---|---|---|
| • Bob Cat or Forklift for moving bulky loads<br>• Grass Seed/Sod | • Equipment inspections<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) | • Review SSHP<br>• Review site-specific AHA with all task personnel |

| ACTIVITY HAZARD ANALYSIS FOR TRANSPORTATION AND DISPOSAL | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| Transportation and Disposal | Struck By/ Against Heavy Equipment | • Wear reflective warning vests when exposed to vehicular traffic<br>• Obey posted speed limits<br>• Isolate equipment swing areas<br>• Make eye contact with operators before approaching equipment<br>• Understand and review hand signals<br>• Exit equipment slowly and maintain three point contact<br>• Report minor incidents to site supervision<br>• Park equipment in areas where operator can see clearly to dismount equipment<br>• Step away from equipment when bucket adjustments are made<br>• Do not attempt verbal communication in high noise backgrounds<br>• Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into loader bucket. | Warning vests, hard hat, safety glasses and steel toe work boots | |
| | Inhalation and Contact with Hazardous Substances | • Review potential hazardous properties of site contaminants with workers before operations begin<br>• Monitor breathing zone air and work area to determine levels of contaminants<br>• Dampen soil using light water spray to prevent fugitive dust emissions<br>• Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions | Initial Level ‘D’;<br>Upgrade: Level ‘C’ | Data RAM |
| Soil Load-out and Disposal (continued) | Slips, Trips, Falls | • Clear walk ways, work areas of equipment, tools and debris<br>• Mark, identify, or barricade other obstructions<br>• Clean mud from boots before climbing on equipment | | |

| ACTIVITY HAZARD ANALYSIS FOR TRANSPORTATION AND DISPOSAL | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | Sharp Objects | • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects<br>• Maintain all hand and power tools in a safe condition<br>• Keep guards in place during use | Leather gloves | |
| | High Noise Levels | • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)<br>• Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA | Hearing protection | |
| | Walking on machine tracks | • Avoid walking on machine tracks whenever possible; clean tracks for safe walking/working surfaces<br>• Observe track surfaces when walking, move cautiously on uneven, slippery surfaces<br>• Avoid sudden awkward motions (pulling/jerking fuel hoses) | | |
| | Handling Heavy Objects | • Observe proper lifting techniques<br>• Obey sensible lifting limits (60 lb. max per person)<br>• Use mechanical lifting equipment to move large loads<br>• Avid carrying heavy objects above shoulder level<br>• Avoid actions/activities that contribute to overexertion<br>• Warm up muscles before engaging in manual lifting activities<br>• Review lifting posture/techniques regularly at safety meetings | | |
| Soil Load-out and Disposal (continued) | Defective Vehicles | • Inspect all trucks before loading<br>• Do not load soil or equipment into defective equipment | | |
| | Roadways | • Ensure that the roadways on the route to the landfill or final destination are designed to handle the weight of the vehicles and allow HAZMAT materials | | |

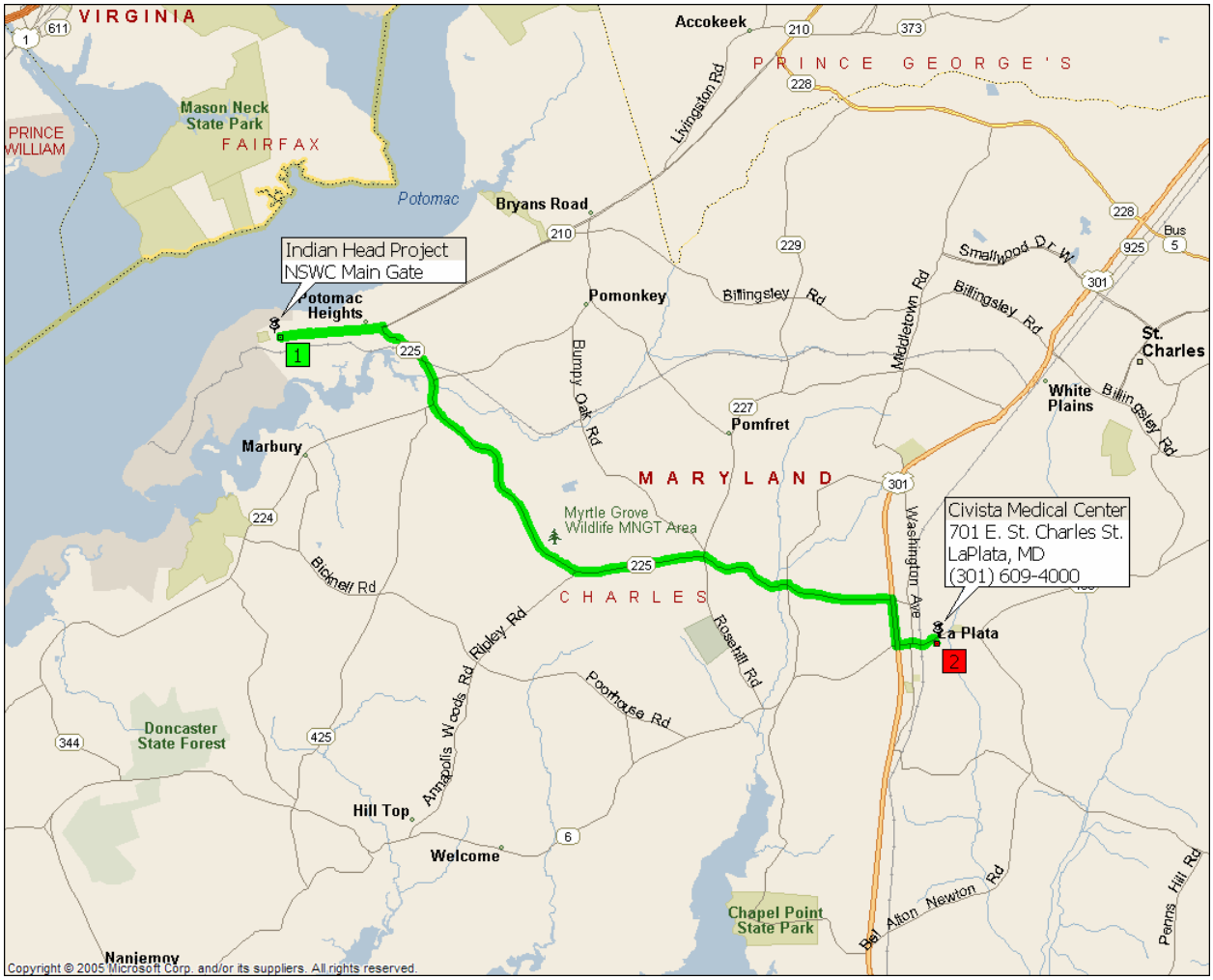
| ACTIVITY HAZARD ANALYSIS FOR TRANSPORTATION AND DISPOSAL | | | | |
|---|---|---|---|---|
| **Task Breakdown** | **Potential Hazards** | **Critical Safety Practices** | **Personal Protective Clothing and Equipment** | **Monitoring Devices** |
| | Horseplay | • Prohibit horseplay on all project sites<br>• Review rules about horseplay with subcontractor Superintendents and workers<br>• Remind workers not to respond/participate in horseplay stared by others | | |
| | High/Low Ambient Temperature | • Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401<br>• Provide fluids to prevent worker dehydration<br>• Take adequate rest periods in a cool/warm shaded area<br>• During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages<br>• Remove PPE if possible during rest periods<br>• Include plenty of salt in your food intake, however, do not take salt tablets | Insulated Clothing (subject to ambient temperature) | Meteorological Equipment |

| **EQUIPMENT REQUIRED** | **INSPECTION REQUIREMENTS** | **TRAINING REQUIREMENTS** |
|---|---|---|
| • Excavator<br>• Trucks<br>• Data RAM and PID | • Daily equipment inspections as per manufacturers requirements<br>• Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)<br>• Inspect all dump trucks in accordance with Section 18 of the USACE EM 385-1-1 Manual | • Review AHA with all task personnel<br>• Review Site Specific Health and Safety Plan.<br>• Review operations/safety manuals for all equipment utilized<br>• Review site specific chemical hazards |

***Attachment 4***
***Route to Hospital and Health Resource Clinic***

# Route to Hospital:

## Civista Medical Center
## 701 E. St. Charles Street
## LaPlata, MD
## (301) 609-4000




Summary: 13.6 miles (21 minutes)

| Time | Mile | Instruction | For | Toward |
|---|---|---|---|---|
| **9:00 AM** | **0.0** | **Depart Indian Head on SR-210 [Indian Head Hwy] (East)** | **1.6 mi** | |
| 9:02 AM | 1.6 | Turn RIGHT (South) onto SR-225 [Hawthorne Rd] | 1.2 mi | |
| 9:04 AM | 2.8 | Bear RIGHT (South) onto SR-224 [SR-225] | 0.4 mi | |
| 9:05 AM | 3.2 | Bear LEFT (South-East) onto SR-225 [Hawthorne Rd] | 8.6 mi | |
| 9:17 AM | 11.8 | Keep STRAIGHT onto SR-225 [W Hawthorne Rd] | 0.4 mi | |
| 9:18 AM | 12.2 | Turn RIGHT (South) onto US-301 [Blue Star Memorial Hwy] | 0.7 mi | |
| 9:19 AM | 12.9 | Turn LEFT (East) onto SR-6 | 21 yds | |

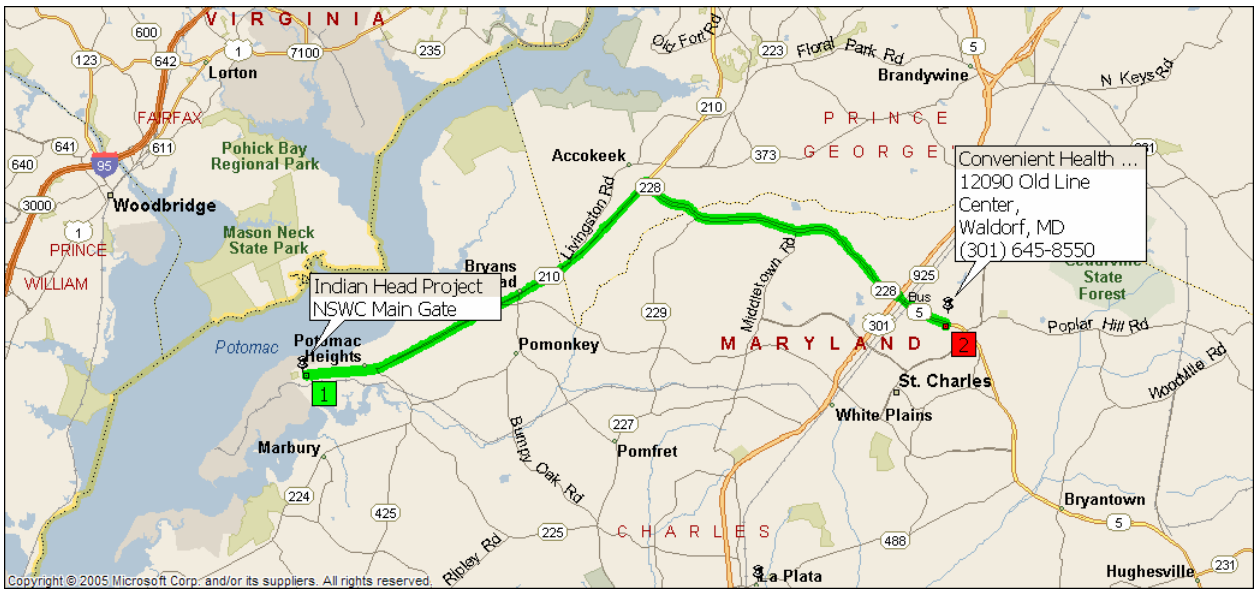
| | | | |
|---|---|---|---|
| 9:20 AM | 12.9 | Keep STRAIGHT onto SR-6 [Charles St] | 0.6 mi |
| 9:21 AM | 13.5 | Turn RIGHT (South) onto Garrett Ave | 131 yds |
| **9:21 AM** | **13.6** | **Arrive La Plata** | |

## *SUMMARY*

Driving distance: 13.6 miles
Trip duration: 21 minutes
Driving time: 21 minutes

# Route to Health Resources Clinic

**Convenient Health Care**
**12090 Old Line Center**
**Waldorf, MD 20602**
**301-645-8550**




Summary: 17.5 miles (24 minutes)

| Time | Mile | Instruction | For | Toward |
|---|---|---|---|---|
| **9:00 AM** | **0.0** | **Depart Indian Head on SR-210 [Indian Head Hwy] (East)** | **9.3 mi** | |
| 9:11 AM | 9.3 | Keep RIGHT onto Local road(s) | 153 yds | |
| 9:12 AM | 9.4 | Keep STRAIGHT onto SR-228 [Berry Rd] | 6.7 mi | |
| 9:21 AM | 16.1 | Bear RIGHT (South-East) onto SR-5 Bus | 1.3 mi | |
| 9:23 AM | 17.4 | Turn RIGHT (South) onto Old Line Center | 98 yds | |
| **9:24 AM** | **17.5** | **Arrive 12090 Old Line Center, Waldorf, MD 20602** | | |

## *SUMMARY*

Driving distance: 17.5 miles
Trip duration: 24 minutes
Driving time: 24 minutes

***Attachment 5***
***Health and Safety Plan***
***Amendment Documentation Form***

# Site Specific Health & Safety Plan
# Amendment Documentation

**Project Name:** **Project No.**

**Amendment No.** **Date:**

**The Amendment Addresses the Following Sections:**

**Task(s) Amendment Affects:**.

**Reason For Amendment:**

**Amendment:**

**Completed by:** **Approved by:**

***Attachment 6***
***Hurricane Preparedness Plan***

**ATTACHMENT 6**

# HURRICANE PREPAREDNESS PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
5700 Thurston Avenue, Suite 116
Virginia Beach, Virginia 23455

May 2006
Project No. 120359

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## List of Attachments

| Attachment | Title |
|---|---|
| Attachment A | Hurricane Preparedness Responsibility Checklists |
| Attachment B | Emergency Phone Numbers |
| Attachment C | Hurricane Tracking Map |

## List of Acronyms

| | |
|---|---|
| COR | Condition of Readiness |
| FEMA | Federal Emergency Management Administration |
| HPP | Hurricane Preparedness Plan |
| mph | miles per hour |
| NOAA | National Oceanic and Atmospheric Administration |
| PPE | Personal Protective Equipment |
| ROICC | Resident Officer In Charge Of Construction |
| SS | Site Superintendent |
| SSO | Site Safety Officer |

# 1.0 Introduction

**PURPOSE**

This Hurricane Preparedness Plan (HPP) outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings at Indian Head, Maryland. All personnel should understand that predicting the occurrence and path of a hurricane is difficult, however the risk can be minimized and controlled by following the procedures in this plan.

**SCOPE**

This procedure is applicable to all site personnel, including subcontractors; temporary construction facilities; and remediation equipment present at the Fuel Farm project sites.

**DISCUSSION**

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the Indian Head, Maryland area, attention must be paid to all hurricanes, since there is no way to determine with 100 percent accuracy whether a hurricane will actually hit the area until a few hours before landfall.

The following table demonstrates that the accuracy of forecasting where a hurricane landfall will occur is very low more than 24 hours in advance of a storm.

| Hours Before Landfall | Maximum Probability Values |
|---|---|
| 72 Hours | 10 Percent |
| 48 Hours | 13-18 Percent |
| 36 Hours | 20-25 Percent |
| 24 Hours | 35-45 Percent |
| 12 Hours | 60-70 Percent |

## 2.0 Definitions

The following definitions apply to various terms used in this document.

**Conditions of Readiness (COR)**:

**Condition V** - Destructive winds are possible at the Indian Head site within 96 hours. Observe normal daily job-site cleanup and good housekeeping practices.

**Condition IV** - Destructive winds are possible at the Indian Head site within 72 hours. Observe normal daily job-site cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material, and rubbish for removal and disposal at the end of each work day. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects which could become missile hazards. Contact Resident Officer In Charge of Construction (ROICC) for Condition requirements, updates, and completion of required actions.

**Condition III** - Destructive winds are possible at the Indian Head site within 48 hours. Maintain Condition IV requirements. Begin securing the job-site and taking those actions necessary for Condition I that cannot be completed within 18 hours. Cease all routine activities that might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to Condition II and continue action as necessary to attain Condition III readiness.

**Condition II -** Destructive winds are possible at the Indian Head site within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove form work any scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the job-site. Contact ROICC for weather and COR updates and completion of required actions.

**Condition I** - Destructive winds are possible at the Indian Head site within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the job-site and leave the government premises.

**Destructive Winds** - Generally winds reaching or exceeding the force of a tropical storm (> 39 miles per hour [mph] or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury that would warrant the a Condition IV alert.

**Gale** - Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).

**Hurricane Watch** - An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.

**Hurricane Warning** - A warning that sustained winds of 74 mph (64 knots) or higher, associated with a hurricane are expected in a specified coastal area in 24 hours or less.

**Hurricane -** A tropical cyclone in which the maximum sustained surface wind is 74 mph (64 knots) or greater.

**Missile Hazard -** Any object that may become airborne during high winds.

**Severe Weather** - Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds

**Small Area Storms** – Thunderstorms or tornadoes.

**Small Area Storms Condition I** - Destructive winds, heavy rain, lightning and hail are imminent within 1-hour.

**Small Area Storms Condition II** - Destructive winds, heavy rain, lightning and hail are expected within 6-hours.

**Storm** - Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).

**Storm Surge -** An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.

**Storm Tide -** The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."

**Tornado -** Violent rotating columns of air with winds 115 to 288 mph (100 to 250 knots).

**Tropical Depression -** A tropical low pressure system in which the maximum sustained surface wind is 38 mph (33 knots) or less.

**Tropical Storm -** A tropical low pressure system in which the maximum surface wind ranges from 39 to 73 mph (34 to 63 knots) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.

**Tropical Storm Watch -** Tropical storm conditions pose a threat to a coastal area generally within 36 hours.

**Tropical Storm Warning -** A warning for tropical storm conditions with sustained winds within the range of 39 to 73 mph (34 to 63 knots) that are expected in a specified coastal area within 24 hours or less.

# 3.0 Responsibilities

**Project Manager – Steve Carriere**

The Project Manager is responsible for ensuring that all adequate measures have been taken to prepare for hurricanes and to protect site personnel and property in the event of a hurricane. The Project Manager will ensure that ample resources are available to implement this plan and that all personnel are aware of this plan and their responsibilities.

**Site Superintendent – Brian Harris**

The Site Superintendent will communicate all hurricane information to site personnel and keep the site personnel continually informed of the measures to be taken. The Site Superintendent is responsible for the coordination and direction of site equipment shut down and will oversee the preparation of site facilities for any imminent storm. The Site Superintendent will oversee the coordination of both pre- and post-storm operations and will ensure that the proper material, equipment, and supplies are utilized to implement this procedure.

**Site Safety Officer – TBD**

The Site Safety Officer (SSO) will monitor weather information, including the National Weather Service probability values for landfall. The SSO will maintain the necessary emergency supplies, and will periodically tour the site to ensure that proper steps are being taken to protect site personnel and property. The SSO will develop the emergency contact list will be maintained in a site dedicated vehicle.

**Note**: When personnel identified in Section 3.0 leave the site, they are responsible for notifying the Site Superintendent or a designated back up person. The back up person will be instructed in their responsibilities in the event of a hurricane.

# 4.0 Emergency Operating Procedures

**Condition V Early Preparedness**

The Site Superintendent will notify the Project Manager when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at Indian Head within 96 hours. This will initiate COR Condition V. This phase will continue until:

- The storm or condition is downgraded,
- The storm track poses no threat to the site, or
- Condition IV begins.

During Condition V, the progress of the storm will be monitored and tracked. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Attachment A for the Hurricane Preparedness Responsibility Checklist for Condition V.

**Condition IV - (Destructive winds are possible within 72 Hours)**

This COR starts when severe weather is within 72 hours of posing a threat to the project location. The SSO will ensure that the following steps are taken:

- Monitor the storm and inform the Project Manager of its progress.
- Check Personal Protective Equipment (PPE) supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed.

During Condition IV, the progress of the storm will be continuously monitored and tracked. The Site Superintendent will instruct site personnel to begin general cleanup of all loose materials that may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other items that may become missile hazards. All lumber will be stacked in neat piles less than 4 feet high. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV.

The Site Superintendent will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations that might interfere with securing operations, such as starting a major excavation, will cease.

The Site Superintendent will ensure that the following steps are taken:

- Fill fuel tanks in all equipment on site.
- Secure stockpiled material on site.
- Review requirements for Condition II with all site personnel.
- Maintain condition IV requirements.

See Attachment A for the Hurricane Preparedness Responsibility Checklist for Condition IV.

**Condition III - Tropical Storm Warning (Destructive winds are possible Within 48 Hours)**

This COR starts when severe weather places the project site under a tropical storm warning. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching Indian Head has generated destructive winds in other locations. The Project Manager, Site Superintendent and SSO will determine when to cease all operations based upon current weather conditions and/or as directed by the ROICC. If the storm or Condition is downgraded, the Project Manager and Site Superintendent will meet with the Program Manager and ROICC to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

- Machinery, tools, equipment, and materials will be secured or removed form the site.
- Take actions to secure job-site necessary for Condition II that cannot be completed within 18 hours.

See Attachment A for the Hurricane Preparedness Responsibility Checklist for Condition III.

**Condition II - Destructive Winds are anticipated within 24 hours or a Small Area Storm is anticipated within 6 hours.**

Condition II begins when destructive winds are anticipated within 24 hours, a small area storm within 6 hours, and/or as directed by the ROICC. The Project Manager and Site Superintendent will determine when to demobilize from the site based upon weather conditions. During this phase the Site Superintendent will direct the following actions:

- Secure machinery, tools, equipment and materials or remove them from the job-site.
- Conduct a roll call of personnel on site and inform the SSO.
- Notify personnel on leave of schedule changes.
- Personnel needing to leave the project to attend to personal matters will notify their Site Superintendent immediately.
- Heavy equipment will be secured according to the manufacturer's recommendations.
- All small field equipment will be secured.
- All visitors from the site are evacuated.
- Make a final site walk through to determine that the site is secure and clear all missile hazards from the job-site.
- Inform the Project Manager that all personnel are being released from the site.

If the storm or Condition is downgraded, the Project Manager and Site Superintendent will meet to decide if a downgrade of the phase is necessary.

See Attachment A for the Hurricane Preparedness Responsibility Checklist for Condition II.

**Condition I - Destructive winds are anticipated within 12 hours or a Small Area Storm is imminent within 1 hour.**

- Complete all remaining actions required for lower conditions of readiness.
- Secure job-site access and evacuate to safe refuge.

See Attachment A for the Hurricane Preparedness Responsibility Checklist for Condition I.

**Resume Site Operations**

The Project Manager will contact the Program Manager to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The Site Superintendent and SSO will conduct a damage survey with the Project Manager. Photographs of the storm damage at the site will be taken by the Site Superintendent or SSO. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Attachment A for the Hurricane Preparedness Responsibility Checklist to Resume Site Operations.

# 5.0 Debriefing

Following the return to work of site personnel, the Site Superintendent will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

- Finalize a recovery plan.
- Review the Hurricane Plan for effectiveness.
- Suggest and agree on improvements to the plan.
- Incorporate plan changes.

When completed, the Project Manager and Site Superintendent will meet with site personnel to discuss any corrective actions or changes in this plan.

# 6.0 References

The list of emergency telephone numbers is included as Attachment B. In addition, an example of a Hurricane Tracking Chart is presented in Attachment C.

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response.

- Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA).
- U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA)

# Attachment A
# Hurricane Preparedness Responsibility Checklists

# Condition V

**Date/Time Entered Condition V:_____**

Severe Weather/Tropical Storm: _____

**Action Items**

☐ Project Manager Notified

☐ Track of Storm Poses No Threat

☐ Storm or Condition is Downgraded

☐ Upgrade to Condition IV

Storm Location

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Condition V Action Items Complete:_____ Date:_____

## Condition IV (Landfall within 72 hours)

**Date/Time Entered Condition IV:_____**

**Action Items:**

☐ Notify Project Manager

☐ Notify Project Superintendent

☐ Notify Site Personnel

☐ Assemble shift personnel to begin preparation

☐ Track storm on hurricane tracking map (Attachment C) (if applicable)

☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to a secured site location.

☐ All equipment fuel tanks will be filled.

☐ All subcontractors with equipment or supplies on-site will be notified to begin removal procedures

**Condition IV Action Items Complete:_____ Date:_____**

## Condition III (Landfall within 48 hours)

**Date/Time Entered Condition III:_____**

**Action Items:**

☐ Provide the status of the storm to site personnel on an hourly basis

☐ Take actions to secure job-site necessary for Condition I that cannot be accomplished in 18 hours

☐ Recheck all items on checklist IV to ensure they are complete (i.e. gas tanks are still filled)

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action)

**Condition III Action Items Complete:_____ Date:_____**

**Itemized Equipment Checklist, Condition III.**

| Equipment | Secure in Place | Remove from Project Site |
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# Condition II

**Date/Time Entered Condition II:_____**

**Action Items:**

☐ Evacuate all visitors from the site

☐ Conduct a role call of site personnel and inform the Project Manager

☐ Check the status all incoming shipments of supplies and equipment

☐ Remove all unnecessary vehicles from the site

☐ Secure heavy equipment in accordance with manufacturer's specification

☐ Secure all valuable records and equipment

☐ Release personnel from the site

☐ Recheck all items on checklist IV and III to ensure they are complete (i.e.: gas tanks are still filled)

**Condition II Action Items Complete:_____ Date:_____**

# Condition I

**Date/Time Entered Condition I:_____**

**Action Items:**

☐ Complete all action items for lower conditions of readiness

☐ Secure job-site access and evacuate to safe refuge

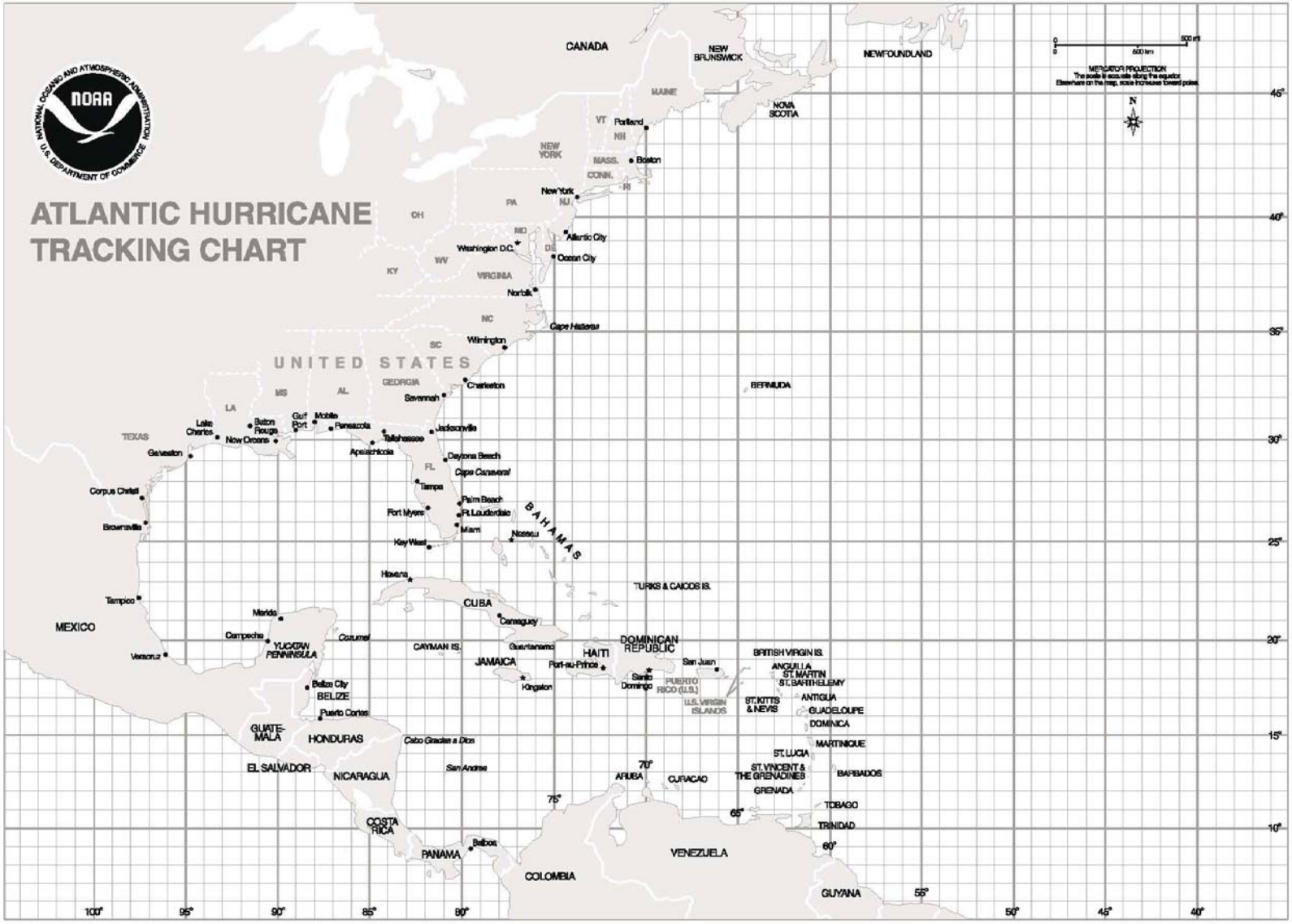
**Condition I Action Items Complete:_____ Date:_____**

# Attachment B
# Emergency Phone Numbers

| EMERGENCY TELEPHONE NUMBERS | |
|---|---|
| Local Agencies - | |
| Base Fire Protection Division | (301) 744-4333 |
| Ambulance | (301) 744-4333 |
| Fire | (301) 744-4333 |
| Security | (301) 744-4333 |
| Hospital<br>Civista Medical Center<br>701 East St. Charles Street<br>LaPlata, MD 20646 | (301) 609-4000 |
| Health Resources Clinic<br>Convenient Health Care<br>12090 Old Line Center Road<br>Waldorf, MD 20602 | (301) 645-8550 |
| Regional Poison Control Center | (800) 282-5846 |
| Federal Agencies | |
| Center for Disease Control | (404) 639-3311 |
| Department of the Navy, Atlantic Division (LANTDIV) | |
| DROICC - LT Michael O'Donnell | (301) 744-2177 |
| Contracting Officer – Christine Foskey-Brown | (757) 322-4165 |
| Contracting Officer Technical Representative - Cathy Gardner | (301) 744-2181 |
| Shaw Personnel | |
| Project Manager – Steve Carriere | (609) 234-6361 (cellular) |
| Site Superintendent – Brian Harris | (240) 375-1786 (cellular) |
| Site Safety Officer – Jim Wright | (925) 383-7646 (cellular) |
| LANTDIV Safety Manager- Kym Edelman | (757) 435-5384 (cellular) |
| Program CIH – Dave Mummert | (419) 425-6129 (office) |
| Regional Health and Safety Manager – Joe Hoyt | (804) 337-6982 (cellular) |
| Shaw E & I (24 hour) | 866-299-3445 |

# Attachment C
# Hurricane Tracking Map

# ATLANTIC HURRICANE TRACKING CHART



# Resume Site Operations

**Date/Time Resume Site Operations:_____**

**Action Items:**

- ☐ Conduct a damage survey
- ☐ Notify all site personnel when to return to work
- ☐ Develop a prioritized recovery plan
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink
- ☐ Remove storm debris from site
- ☐ Notify Program Manager of the resumption of site activities

**Resume Site Operations Action Items Complete:_____ Date:_____**

***Attachment 7***
***Accident Prevention Plan***

**ATTACHMENT 7**

# ACCIDENT PREVENTION PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
5700 Thurston Avenue, Suite 116
Virginia Beach, Virginia 23455

May 2006
Project No. 120359

**ACCIDENT PREVENTION PLAN**
**SIGNATURE SHEET**

_____

Approved by:
David Mummert, CIH
Program Certified Industrial Hygienist (CIH)
(419) 425-6129 (office)

_____

Approved by:
Steve Carriere, PMP
Project Manager
(609) 234-6361 (cellular)

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## *List of Acronyms*

| | |
|---|---|
| AHA | Activity Hazard Analysis |
| ANSI | American National Standards Institute |
| APP | Accident Prevention Plan |
| ASTM | American Society for Testing and Materials |
| CD | Compact Disc |
| CFR | Code of Federal Regulations |
| CIH | Certified Industrial Hygienist |
| EH&S | Environmental Health and Safety |
| EMR | Experience Modification Rate |
| HPP | Hurricane Preparedness Plan |
| HS | Health and Safety |
| HSC | Health and Safety Coordinator |
| HSM | Health and Safety Manager |
| NIOSH | National Institute for Safety and Health |
| OSHA | Occupational Safety and Health Administration |
| PM | Project Manager |
| PPE | Personal Protective Equipment |
| Shaw | Shaw Environmental, Inc. |
| SSHSP | Site Specific Health and Safety Plan |
| SS/SSO | Site Superintendent/Site Safety Officer |
| USACE | United States Army Corps of Engineers |
| USCG | United States Coast Guard |

# 1.0 Background Information

The primary site tasks include the following:

The removal activities to be performed at Site 57 include:

- Site set-up,
- Utility Relocation,
- Field Sampling and Analysis,
- Installation of Erosion and Sediment Controls,
- Material Excavation and Handling,
- Transportation and Disposal, and
- Site Restoration.

Activity Hazard Analyses (AHA) have been prepared for the above activities and are included in Attachment 3 of the Site Specific Health and Safety Plan (SSHSP).

**Shaw Remediation Services, LLC (Shaw) Accident Experience**

| Year | Experience Modification Rate (EMR) (Interstate) | OSHA Recordable Incident Rate |
|---|---|---|
| 2005 | 0.49 | 1.03 |
| 2004 | 0.50 | 1.07 |
| 2003 | 0.57 | 1.09 |

# 2.0 Statement of Safety and Health Policy

**Corporate Policy**

Subject: SAFETY

**Purpose and Summary**

It is the policy of Shaw to provide a safe and healthful workplace for all employees, subcontractors, and consultants in compliance with governmental requirements. Additionally, the requirements of our clients shall take precedence provided that their requirements exceed those of Shaw and governmental regulations.

We believe in two fundamental principles of safety: all accidents, injuries and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, every associate will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner.

Safety, industrial hygiene and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of their associates. Safety shall take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established safety rules and procedures. No individual(s) may pose a direct threat to the health and safety of other individuals in the workplace.

Managers must conduct their businesses in compliance with governmental safety regulations and company procedures. All Shaw health and safety procedures shall be implemented for all Shaw employees on all projects where Shaw is the subcontractor, or a joint venture partner. If Shaw is the prime contractor, Shaw procedures shall be applied to all Shaw and subcontractor personnel.

The implementation of effective safety and health practices is a key measure of managerial performance. Management, with the assistance of the internal health and safety professional staff, will conduct audits to assess the effectiveness of the safety program(s) in place, and to identify areas for improvement. All deficiencies shall be corrected promptly.

All injuries, occupational illnesses, vehicle accidents, and incidents with potential for injury or loss will be investigated. Appropriate corrective measures will be taken to prevent recurrence, and to continually improve the safety of our workplace.

# 3.0 Responsibilities and Lines of Authority

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the SSHSP. The Project Manager (PM), Site Superintendent/Site Safety Officer (SS/SSO), Health and Safety Coordinator (HSC), Program Certified Industrial Hygienist (CIH) and Program Health and Safety Manager (HSM) are responsible for formulating and enforcing health and safety requirements, and implementing the SSHSP.

# 4.0 Subcontractors and Suppliers

Each subcontractor working on the project site will be required to adhere to the SSHSP and the requirements presented below.

## 4.1 Subcontractor/Supplier Coordination and Control

All subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. Subcontractors will comply with the requirements for site safety as outlined in Shaw's Health and Safety (HS) Procedure HS101 (Attachment 2 of the SSHSP). The SS/SSO will be responsible for the conduct and control of Shaw subcontractors.

## 4.2 Subcontractor/Supplier Safety Responsibilities

All subcontractor employees are subject to the same training and medical surveillance requirements as Shaw personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit Activity Hazard Analyses (AHAs) for their work activities to the SS/SSO. The subcontractor reports directly to the Project Manager. All incidents involving subcontractor employees shall be reported to the SS/SSO and a copy of the subcontractor's injury/illness report shall be submitted to the SS/SSO within 24 hours.

Subcontractors are required to read and sign the SSHSP and comply with all requirements of this Accident Prevention Plan (APP). Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120/1926.65. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow facility hot work rules if hot

work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of and litter will not permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

# 5.0 Training

Outlines of the site safety orientation and training for site personnel, subcontractors and visitors are provided in Section 10.0 of the SSHSP.

## 5.1 Mandatory Training and Certifications

Mandatory training and certifications are discussed in Section 10.0 of the SSHSP.

## 5.2 Emergency Response Training

All Shaw personnel who have completed the Shaw 40-hour HAZWOPER training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

## 5.3 Superintendent and Employee Safety Meetings

The Shaw SS/SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the Shaw daily safety meetings. Daily safety meetings will comply with HS051 (Attachment 2 of the SSHSP).

# 6.0 Health and Safety Inspections

## 6.1 Inspections

The Shaw Project Manager and SS/SSO are required to conduct bi-monthly inspections of the sites using the Project Safety Inspection Report. The SS/SSO is responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, and equipment conditions and submitting them to HSM. The SS/SSO will discuss any necessary corrective actions with the SS/SSO and review new procedures. Copies of these reports are maintained on file at the project locations.

The Shaw HSM or HSC representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Virginia Beach, Virginia office and are tracked in a database for each Shaw Project Manager and SS/SSO, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

## 6.2 External Inspections/Certifications

Shaw does not anticipate, but may consider the use of outside sources, to provide safety inspections on an as needed basis.

As required, safety equipment will comply with appropriate regulations of OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), United States Coast Guard (USCG), or other recognized certification organizations.

# 7.0 Safety and Health Expectations, Incentive Programs, and Compliance

Shaw considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of zero incidents for all projects. All projects will be conducted in a manner that minimizes the probability of near misses, equipment/property damage or injury. Shaw will establish programs to recognize people and projects that demonstrate excellence in safety performance. Shaw will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. Shaw site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. Shaw will provide and enforce safety rules to protect employees, subcontractors, clients and the public.

## 7.1 Shaw Safety Incentive Programs

A copy of the Shaw Safety Incentive Award Program will be available at each project. The Shaw Project Manager will develop a site-specific program for approval by the HSM and the LANTDIV program Manager within 10 days of project mobilization.

## 7.2 Shaw Employee Safety Responsibility Requirements

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the Safety Improvement Process, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS/SSO. All Shaw personnel will follow the policies set forth in the Shaw Health and Safety Procedures HS001-999 (Available on site on compact disc [CD]). Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM. All project personnel have the authority to stop work if in their judgment serious injury could result from continued activity. The SS/SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. Shaw Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules (Attachment 2 of the SSHSP).

### *7.3 Managers and Superintendents Safety Accountability*

It is the duty of the first line Superintendent to motivate employees to adhere to Shaw's safety policy in each work situation. A first line Superintendent for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All Superintendents shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision, or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Superintendents will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions that involved site employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment (PPE) as specified by this APP, SSHSP, other Shaw procedures or as directed by the HSC, CIH or HSM.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the Shaw Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

# 8.0 Accident Reporting

## 8.1 Exposure Data (Man-Hours Worked)

Shaw's Environmental Health and Safety (EH&S) Manager tracks and maintains incident records as to Federal reporting requirements. Incident rates are reported monthly to Shaw's EH&S Manager. Incident Rates and Workers Compensation losses are tracked for each business line. LANTDIV program incident rates are reported monthly by the Program HSM.

## 8.2 Accident Investigations, Reports and Logs

The SS/SSO conducts accident/incident investigations. A report is completed by the SS/SSO and it must be submitted to Shaw's Baton Rouge, Louisiana Safety Department within 24 hours. All incident reporting forms are provided in HS020.

## 8.3 Immediate Notification of Major Incidents

Shaw will immediately notify the client of any major incident, including injury, fire, equipment/ property damage, and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

## 8.4 Accident Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew Superintendent will be summoned.

The work crew Superintendent will immediately make radio contact with the SS/SSO to alert him of a medical emergency situation. The work crew Superintendent will advise the following information:

- Location of the victim at the work site,
- Nature of the emergency,
- Whether the victim is conscious, and
- Specific conditions contributing to the injury, if known.

# 9.0 Medical Support

On-site Medical Support/Off-site Medical Arrangements will be outlined in Section 9.0 (Emergency Response) of the SSHSP.

# 10.0 Personal Protective Equipment

Protection levels provided in the SSHSP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these Personal Protective Equipment (PPE) levels. Any significant change in the PPE level will be approved by the SS/SSO in consultation with the HSM and/or CIH. PPE selection criteria are outlined in HS600 and HS601 (Attachment 2 of the SSHSP).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS601 (Attachment 2 of the SSHSP).

# 11.0 Plans Required by the Safety Manual

## 11.1 Hazard Communication Program

The Site-Specific Hazard Communication Program is included Section 4.2 of the SSHSP. Shaw Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (Attachment 2 of the SSHSP).

## 11.2 Emergency Response Plans

The Emergency Response and Contingency Plan is included in Section 9.0 of the SSHSP.

## 11.3 Layout Plans

Work zones are defined in Section 5.0 of the SSHSP.

## 11.4 Respiratory Protection Plan

The primary objective of respiratory protection is to prevent employee exposure to atmospheric contamination. When engineering measures to control contamination are not feasible, or while they are being implemented, personal respiratory protective devices will be used.

The criteria for determining respirator needs have been evaluated based on the site contaminants. Air monitoring will be conducted to confirm that respiratory protection levels are adequate. All respirator users will be OSHA trained in proper respirator use and maintenance. The SS/SSO will observe workers during respirator use for signs of stress. The SS/SSO, HSC, CIH, HSM, and SSO will also evaluate the implementation of the SSHSP, periodically, to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

## 11.5 Contingency Plan for Severe Weather

Contingency plans for severe weather are included in Section 9.0 of the SSHSP. A Hurricane Preparedness Plan (HPP) is located in Attachment 6 of the SSHSP.

## 11.6 Alcohol and Drug Abuse Prevention Plan

Shaw substance abuse procedures are outlined in Shaw HS101 - Drug, and Alcohol Testing.

# 12.0 Contractor Information to Meet the Requirements of the Major Sections of EM 385-1-1

In addition to this APP, Shaw has prepared a SSHSP to meet the major requirements of United States Army Corps of Engineers (USACE) Manual 385-1-1. Additional procedures for major requirements are provided in the Shaw Health and Safety Procedures Manual HS001-999 (Available on site on CD).

***Attachment 8***
***Safety Plan Acknowledgement***

**WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN**



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I have been informed of, and will abide by, the procedures set forth in the SSHSP developed for Indian Head. I have also been provided with an opportunity to read this SSHSP and the hazard communication program. I also have been properly trained, medically monitored, and fit tested for the work that I am to perform.

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**WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN**



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***Attachment 9***
***OSHA 300 Log***

# OSHA's Form 300 (Rev. 01/2004)

# Log of Work-Related Injuries and Illnesses

**Attention:** This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 2004

**U.S. Department of Labor**
Occupational Safety and Health Administration

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name Shaw Environmental & Infrastructure, Inc.

City _____ State _____

| Identify the person | | Describe the case | | | | | Classify the case | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **CHECK ONLY ONE** box for each case based on the most serious outcome for that case: | | | | Enter the number of days the injured or ill worker was: | | Check the "injury" column or choose one type of illness: | | | | | |
| (A) Case No. | (B) Employee's Name | (C) Job Title (e.g., Welder) | (D) Date of injury or onset of illness (mo./day) | Business Line - Project/Site | (E) Where the event occurred (e.g. Loading dock north end) | (F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch) | Death | Days away from work | Remained at work | | Away From Work (days) | On job transfer or restriction (days) | (M) Injury | Skin Disorder | Respiratory Condition | Poisoning | Hearing Loss | All other illnesses |
| | | | | | | | | | Job transfer or restriction | Other record-able cases | | | | | | | | |
| | | | | | | | (G) | (H) | (I) | (J) | (K) | (L) | (1) | (2) | (3) | (4) | (5) | (6) |
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Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

| Injury | Skin Disorder | Respiratory Condition | Poisoning | Hearing Loss | All other illnesses |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |

# OSHA's Form 300A (Rev. 01/2004)

# Summary of Work-Related Injuries and Illnesses

Year 2004

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

*All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete*

*Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."*

*Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.*

## Number of Cases

| Total number of deaths | Total number of cases with days away from work | Total number of cases with job transfer or restriction | Total number of other recordable cases |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| (G) | (H) | (I) | (J) |

## Number of Days

| Total number of days away from work | Total number of days of job transfer or restriction |
|---|---|
| 0 | 0 |
| (K) | (L) |

## Injury and Illness Types

| Total number of… (M) | | | |
|---|---|---|---|
| (1) Injury | 0 | (4) Poisoning | 0 |
| (2) Skin Disorder | 0 | (5) Hearing Loss | 0 |
| (3) Respiratory Condition | 0 | (6) All Other Illnesses | 0 |

**Post this Summary page from February 1 to April 30 of the year following the year covered by the form**

## Establishment information

Your establishment name

Street

City State Zip

Industry description (e.g., Manufacture of motor truck trailers)

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)

## Employment information

Annual average number of employees

Total hours worked by all employees last year

## Sign here

**Knowingly falsifying this document may result in a fine.**

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive Title

Phone Date

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

# OSHA's Form 301

# Injuries and Illnesses Incident Report

**Attention:** This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor

Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by

Title

Phone Date

## Information about the employee

1) Full Name

2) Street

City State Zip

3) Date of birth

4) Date hired

5) ☐ Male
☐ Female

## Information about the physician or other health care professional

6) Name of physician or other health care professional

7) If treatment was given away from the worksite, where was it given?

Facility

Street

City State Zip

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

## Information about the case

10) Case number from the Log *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness

12) Time employee began work AM/PM

13) Time of event AM/PM ☐ Check if time cannot be determined

14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was spayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

17) **What object or substance directly harmed the employee?** Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.

18) **If the employee died, when did death occur?** Date of death

Public reporting burden for this collection of information is estimated to average 22 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a current valid OMB control number. If you have any comments about this estimate or any other aspects of this data collection, including suggestions for reducing this burden, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

***Attachment 10***
***Blood Borne Pathogens Exposure Control Plan***

**ATTACHMENT 10**

# BLOOD BORNE PATHOGEN EXPOSURE CONTROL PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

**Field Support Services, Inc.**
6303 Ivy Lane, Suite 800
Greenbelt, Maryland 20770

and

**Shaw Environmental, Inc.**
5700 Thurston Avenue, Suite 116
Virginia Beach, Virginia 23455

May 2006
Project No. 120359

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## *List of Acronyms*

| | |
|---|---|
| AIDS | Acquired Immunodeficiency Syndrome |
| CIH | Certified Industrial Hygienist |
| CPR | Cardiopulmonary Resuscitation |
| HBV | Hepatitis B Virus |
| HIV | Human Immunodeficiency Virus |
| NIOSH | National Institute for Occupational Health and Safety |
| OSHA | Occupational Safety and Health Administration |
| PPE | Personal Protective Equipment |
| SSHSP | Site Specific Health and Safety Plan |
| SSO | Site Safety Officer |
| USACE | United States Army Corps of Engineers |

# 1.0 Blood-Borne Pathogen Exposure Control Plan

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who come into contact with infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period of time. The HBV can remain infectious for up to 10-days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent hepatitis B virus infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS as a result of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

## 1.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens
- Safety and Health Requirements Manual, EM 385-1-1 (United States Army Corps of Engineers [USACE], 2003), Section A.03.06

- Shaw HS 512, Handling of Blood or Other Potentially Infectious Material.

### *1.2 Exposure Determination*

Occupational Safety and Health Administration (OSHA) requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of personal protective equipment. For exposure determination purposes, employees are considered to be exposed, even if they wear personal protective equipment (PPE).

Activities at this project do not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or cardiopulmonary resuscitation (CPR) to injured workers and when personnel clean-up areas and equipment that may have come in contact with blood as a result of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Field Superintendent—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety Officer (SSO)—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, rashes)
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes
- Punctures through the skin with a contaminated sharp object (i.e., scissors)

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

### *1.3 Schedule of Implementation*

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel, who are available to voluntarily provide first aid care and CPR hold a valid training completion certificate from a reputable training provider (American Red Cross or American Heart Association).
- The SSO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.
- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030, Blood-borne Pathogens; Safety and Health Requirements Manual, EM 385-1-1 (USACE, 2003), Section A.03.06; and Shaw HS512, Handling of Blood or Other Potentially Infectious Material. This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:
    - A copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents
    - A general explanation of the epidemiology and symptoms of blood-borne diseases
    - An explanation of the modes of transmission of blood-borne pathogens
    - An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials
    - An explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment
    - Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of personal protective equipment
    - An explanation of the basis for selection of personal protective equipment
    - Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated

- Information on the appropriate actions to take and persons to contact in an emergency
- An explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Also information on the medical counseling that is provided for exposed individuals
- An explanation of required signs and labels

The SSO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include:
  - (Two) Red-bags for temporary storage of contaminated PPE and cleaning materials
  - (One) Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste
  - (One) Whisk-broom and dust pan for cleaning up contaminated broken glass
  - (One) Gallon container of Clorox household bleach
  - (One) Large utility sponge
  - (Two) Rolls paper towels
  - (One) Container of liquid disinfectant hand soap
  - (Two) “Biohazard” warning labels
  - (Ten) Individually packaged disinfectant towelettes
  - (Two) CPR barriers

  The SSO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

  Verifying that the appropriate PPE for use in an emergency is readily available at the project site. Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include:

  - (Two) Face-shields with ratcheting head-suspension

- (Two-pair) Safety glasses with clear lens
- (Box of 100) Disposable Nitrile examination gloves
- (Two pair) Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood
- (Two-pair) Vinyl or latex disposable boot covers

The SSO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

### *1.4 Work Practice Controls*

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned/disinfected immediately after being contacted by potentially infectious materials. A 10% bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a contact time of 15-minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.
- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned/disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All personal protective equipment shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.

### *1.4.1 Universal Precautions*

Using universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent

contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eye wear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other body fluids.
- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- CPR barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

### *1.4.2 Personal Protective Equipment*

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves, shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or body fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employee has the potential for the hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, non-intact

skin, and when handling items or surfaces soiled with blood or other potentially infectious materials.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and body fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or body fluids to which universal precautions apply.

### *1.4.3 Waste Handling*

All wastes generated as a result of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

## *1.5 Biohazard Waste Disposal*

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on-site in labeled container(s) until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

## *1.6 Medical Requirements*

Employees receive medical evaluations in accordance with Shaw Procedure HS100 *Medical Policies and Procedures*. The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluation. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure,

unless they read and sign the Hepatitis B and Tetanus Vaccination Declination Form (see attached).

### 1.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them at no cost a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

### 1.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of tetanus vaccination (current status for tetanus vaccination is within 5 years.) All potentially exposed employees shall be offered a tetanus vaccination at no cost.

### 1.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw HS020, Accident Prevention Program: Reporting, Investigation, and Review. The Corporate Medical Director shall be advised in addition to standard notification procedures.

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure
- HBV and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or at a later date if the

employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.

- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the Corporate Medical Director.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

### *1.6.4 Physician Information*

The following information shall be provided to the evaluating physician:

- A copy of 29 CFR 1910.1030 and its appendices
- A description of the affected employee's duties as they relate to the employee's occupational exposure.

### *1.6.5 Physician Opinion*

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive HBV vaccination. Any other findings and diagnoses shall remain confidential.

## *1.7 Hazard Communication*

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

### 1.7.1 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

### 1.7.2 Warning Signs

There are no designated areas for medical treatment on-site, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

### 1.7.3 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in HS512, *Handling Blood and Other Potentially Infectious Materials*, this SSHSP and its attachments, and the general provisions of this procedure.

## 1.8 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

### 1.8.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions.

The training records will be maintained by the Shaw Training Department for at least five (5) years from the training date.

### 1.8.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation.

The employee medical records will be forwarded to and maintained by Health Resources, 600 West Cumming Park, Suite 3400, Woburn, Massachusetts 01801-6350 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of the National Institute for Occupational Safety and Health (NIOSH) in writing three months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

### *1.8.3 Incident Recording*

An incident that occurs as a result of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the Project Certified Industrial Hygienist (CIH) for proper reporting and follow-up.

## *1.9 Plan Review and Update*

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

# 2.0 Hepatitis B and Tetanus Vaccination Declination

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide and encourages you to accept, vaccination for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

## 2.1.1 Tetanus

- A bacterial disease causing muscle spasms, seizures, and "lockjaw."
- This single injection vaccination has few side effects.
- There is minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance.

## 2.1.2 Hepatitis B

- A viral infection of the liver.
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths.
- This three injection vaccination has few side effects.
- Vaccination is 90% effective for at least seven years when given prior to exposure.
- Vaccination is 70-88% effective when given within one week of exposure.
- Hepatitis B can survive in the environment for 24-48 hours after drying.
- Risk of infection from one cut or puncture wound from a contaminated object:
    - Hepatitis B Virus 6-30%
    - Human Immunodeficiency Virus (AIDS) 0.5%.

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to be vaccinated by hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

***Attachment 11***
***Incident Reporting Management Procedure***

Shaw E & I, Inc.

# Incident Reporting and Management Procedure - Federal

| Action | Who? *When*? | Under what circumstances? | How? | Notes: |
|---|---|---|---|---|
| 1. Notify Supervisor for all incidents (no matter how minor) | Injured person, first person recognizing incident, driver/passenger, or employee causing damage<br>*Immediately* | All incidents no matter how minor | In person or by telephone | |
| 2. For *life-threatening injuries/illnesses* - contact local emergency personnel<br><br>For *non life-threatening injuries/illnesses* - transport injured person to doctor at an occupational medical facility<br><br>For *vehicle accidents* – make scene safe, notify police, aid injured parties<br><br>For *equipment/property damage* - make scene safe, prevent further damage or injuries | Site Supervisor<br>*Immediately (concurrently with next step if injury or illness)*<br><br>Site Supervisor<br>*Immediately (concurrently with next step if injury or illness)*<br><br>Driver/passenger<br>*Immediately*<br><br>Employee causing damage<br>*Immediately* | In case of serious injury or illness requiring off-site medical care | Via ambulance<br><br>Via vehicle | Site Supervisor or Site Safety Officer must immediately go to emergency care facility.<br><br>Site Supervisor or Site Safety Officer must transport and stay with injured person until released from care |
| 3. Notify Health Resources (for injuries/illnesses to Shaw employees only) | Site Supervisor<br>*Immediately, prior to transporting the injured employee, unless injuries are life threatening* | ♦ Serious injury requiring off-site medical care<br>♦ If employee states that he/she has been exposed to any chemical or biological substance | 800-350-4511<br><br>Note: Outside Continental US call<br><br>781-935-8581 | ♦ Not required for temporary agency and contract labor<br>♦ Provide name of injured employee, name and phone # of treating medical facility, description of the incident<br>♦ Health Resources will help with medical facility coordination and follow-up care |
| 4. Notify Regional/Program H&S Manager | Site Supervisor<br>*Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)* | All incidents | See Federal Incident Notification and Communication Contact List (attached) | ♦ Contact should be made prior to sending the individual for medical care<br>♦ Regional/Program H&S Manager will notify Bob Brooks as appropriate |

# Incident Reporting and Management Procedure – Federal (continued)

| Action | Who?<br>*When*? | Under what circumstances? | How? | Notes: |
|---|---|---|---|---|
| 5. Notify Shaw Notification Hotline/Help Desk | Site Supervisor<br>*As soon as possible. Prior to sending an individual for medical treatment* | ♦ Illness and/or injury (doctors cases and above)<br>♦ Property damage (damage > $2,500.00)<br>♦ Vehicle accidents (All)<br>♦ Criminal activity (i.e. bomb threat, theft)<br>♦ Natural disaster (all)<br>♦ Explosion and/or fires (damage > $2,500.00 or result in injury)<br>♦ Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact)<br>♦ Regulatory agency visit<br>♦ Fatalities | Shaw Notification Hotline/Help Desk Phone Number 866-299-3445<br>Note: Outside the Continental US call<br>225-215-5056 | |
| 6. Complete forms: I*njuries and illnesses*<br>♦ Authorization for Release of Protected Medical Information<br>♦ Authorization for Treatment of Occupational Injury/Illness<br>♦ Return-To-Work Examination Form<br>*and* fax to Health Resources<br>*and* fax to Loss Prevention Manager (Casey Parker) | Injured employee and medical facility personnel (Site Supervisor is responsible for verifying forms are completed)<br>*Prior to leaving medical facility* | ♦ Serious injury requiring off-site medical care<br>♦ If employee states that he/she has been exposed to any chemical or biological substance | Fax to Health Resources at 800-853-2641<br>Fax to Loss Prevention Manager (Casey Parker at 225-987-3080) | Site Supervisor or Site Safety Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) |
| 7. Call Project Manager and notify of incident | Site Supervisor<br>*As soon as reasonably possible* | | | Project Manager will report incident to upper levels of Operations/Business Line Management |

# Incident Reporting and Management Procedure – Federal (continued)

| Action | Who?<br>*When*? | Under what circumstances? | How? | Notes: |
|---|---|---|---|---|
| 8. Call back Regional/Program H&S Manager to report on status of ***injured/ill employee*** | Site Supervisor<br>*Prior to employee leaving medical facility* | All injuries and illnesses requiring off-site medical care | See Federal Incident Notification and Communication Contact List (attached) | |
| 9. Complete forms:<br>*OSHA Recordable Cases*<br>Supervisor's Employee Injury/Illness Report Form<br>Injured Employee Statement<br>Witness Statement Form(s)<br>*First Aid Cases*<br>Supervisor's Employee Injury/Illness Report<br>Injured Employee Statement<br>Witness Statement Form(s)<br>Fax completed forms to Shaw Corporate Claims and Regional/Program H&S Manager and Health Resources. | ♦ Site Supervisor<br>♦ Witnesses<br>*As soon as possible – no later than 24 hours* | All injuries, illnesses, and first aide cases | Shaw Corporate Claims Department Fax (225-932-2636)<br>Health Resources Fax 800-853-2641<br>See Federal Incident Notification and Communication Contact List (attached) | Site Supervisor should have these forms with him/her at all times (Contained in HS 020) |
| 10. Complete forms:<br>*Chargeable Vehicle Accidents*<br>Vehicle Accident Report<br>Witness Statement Form(s)<br>Driving Record Certification (Procedure HS800)<br>*Non-Chargeable Vehicle Accidents*<br>Vehicle Accident Report<br>Witness Statement Form(s)<br>*Equipment, Property Damage and General Liability Incidents*<br>Equipment, Property Damage and General Liability Loss Report<br>Witness Statement Form(s)<br>Fax completed forms to Shaw Corporate Claims and Regional/Program H&S Manager. | ♦ Site Lead / Supervisor<br>♦ Witnesses<br>*As soon as possible – no later than 24 hours* | All vehicle accidents and /or all property damage | Shaw Corporate Claims Department (225-932-2636)<br>See Federal Incident Notification and Communication Contact List (attached) | Supervisor should have these forms with him/her at all times (Contained in HS 020) |

# Incident Reporting and Management Procedure – Federal (continued)

| Action | Who?<br>*When*? | Under what circumstances? | How? | Notes: |
|---|---|---|---|---|
| 11. Complete forms:<br>*OSHA Recordable Cases*<br>Incident Investigation Report<br>*First Aid Cases*<br>Incident Investigation Report<br>*Chargeable Vehicle Accidents*<br>Incident Investigation Report<br>*Non-Chargeable Vehicle Accidents*<br>Incident Investigation Report<br>*Equipment, Property Damage and General Liability Incidents*<br>Incident Investigation Report<br>*Near Miss*<br>Incident Investigation Report<br>Fax completed forms to Regional/Program H&S Manager | Site Supervisor<br>*As soon as possible – no later than 72 hours of incident* | | Shaw Corporate Claims Department (225-932-2636)<br><br>See Federal Incident Notification and Communication Contact List (attached) | Supervisor should have these forms with him/her at all times (Contained in HS 020) |
| 12. Perform "Accident Review Board" (ARB) and fax to Regional/Program H&S Manager. | Site Supervisor/Project Manager<br>*Within 10 days of incident* | OSHA Recordable Cases<br><br>Chargeable Vehicle Accidents | | ARB must include: Regional Manager, Project Manager,<br>Employee's Direct Supervisor,<br>Regional/Program H&S Manager, and<br>Employee(s) involved in the incident. Lost time injuries will require Bill Winkler and Bob Brooks. |

## FEDERAL INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: _____ Project / Office / Facility Location: _____

| **Name** | **Phone Number(s)** | **Fax Number** | **E-mail** |
|---|---|---|---|
| Shaw Notification Hotline / Helpdesk | 866-299-3445<br>225-215-5056 (Outside Continental US) | N/A | N/A |
| Health Resources | 800-350-4511 | 800-853-2641 | |
| Shaw Corporate Claims Department | | 225-932-2636 | |
| Program/Project H&S Manager- Kym Edelman | 757-435-5384 | 757-363-7222 | Kym.edelman@shawgrp.com |
| Northeast Region H&S Manager - Joe Hoyt<br>Alternate: Kym Edelman | 804-337-6982<br>757-435-5384 | 225-987-3273<br>757-363-7222 | joseph.hoyt@shawgrp.com<br>kym.edelman@shawgrp.com |
| Federal H&S Director - Bob Brooks | 973-770-5325 (office) / 908-217-5124 (cell) | 973-770-5135 | robert.brooks@shawgrp.com |
| Project Manager: | | | |
| Program Manager: Jim Dunn | 757-318-5124 (office)<br>757-373-9117 (cell) | 757-363-7222 | James.dunn@shawgrp.com |
| Regional Operations Manager: Mike Fitzgerald | 609-588-6380 (office)<br>732-927-0630 (cell) | 609-588-6300 | Mike.fitzgerald@shawgrp.com |
| Business Line Manager: Roland Moreau | 757-318-5123 (office)<br>757-288-1915 (cell) | 757-363-7222 | Roland.moreau@shawgrp.com |
| Corporate H&S Coordinator (Scott Reily) | 225-987-7228 (office) / 225-229-4390 (cell) | 225-987-3413 | scott.reily@shawgrp.com |
| Loss Prevention Manager (Casey Parker) | 225-932-2763 (office) / 225-405-1246 (cell) | 225-987-3080 | casey.parker@shawgrp.com |
| Shaw E&I Health & Safety Director (Troy Allen) | 225-932-2579 (office) / 225-229-1759 (cell) | 225-987-3454 | troy.allen@shawgrp.com |

Note: Notifications to operations chain will be verbal and as soon as reasonably possible, but no later than 24-hours following the incident.

# *Appendix D*
# *Quality Control Plan (QCP)*

**APPENDIX D**

# QUALITY CONTROL PLAN
# INTERIM REMOVAL ACTION FOR AT
# SITE 57 – BUILDING 292 TCE CONTAMINATION
# NAVAL SUPPORT FACILITY INDIAN HEAD
# INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

Naval Facilities Engineering Command Washington
1314 Harwood Street, S.E.
Washington Navy Yard, DC 20374-5018

Prepared by:

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May 2006
Project No. 120359

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## List of Attachments


| Attachment | Title |
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| 1 | Shaw Environmental Inc. Program Quality Control Plan |

## STATEMENT OF QUALITY CONTROL PROGRAM

Field Support Services, Inc. (FSSI) and Shaw Environmental Inc. (Shaw) will be performing the quality control (QC) function for Task Order 025, Contract No. N62470-03-D-4402. This task order is for the interim removal action of Site 57 – Building 292 TCE Contamination at the Naval Support Facility, Indian Head in Indian Head, Maryland. This Site Specific Addendum is prepared and submitted to incorporate the methods and procedures from the Shaw Program Quality Control Plan (PQCP) approved by the Atlantic Division, Naval Facilities Engineering Command, which is provided in Attachment 1. FSSI/Shaw will perform the inspections and tests required to ensure that materials, workmanship, and construction conform to the Work Plan and contract requirements.

### Note to Employees – Concept of Quality Control

QC should not be considered a person or an organization of personnel, but a concept to perform in such a manner that the end product of our efforts provides a quality product and customer satisfaction. The QC individual or group cannot inspect quality into the final product, but only inspect and document the results of our efforts. The only people that can build quality into the product are the individuals performing the task of producing the end product.

It should be noted by all employees that the documentation requirements of FSSI/Shaw procedures and the Work Plan are considered equally as important as the end product itself. When it is stated that the documentation will be approved prior to the start of work, this is exactly what is intended. To eliminate problems in this area requires careful planning and execution by everyone.

We would do well to remember that our livelihood depends on how well we satisfy our customer. To accomplish this requires teamwork and attention to detail by all employees and contractors.

# 1.0 Quality Control Organization

The Site QC Manager will have the authority to implement and manage the Quality Control Plan (QCP), the three phases of QC and the authority to stop work, which is not in compliance with the contract.

Mr. Adam Forshey will function as the Site QC Manager for this task order. Mr. Forshey has one year of construction management and QC experience and maintains the current United States Army Corps of Engineers (USACE) Construction Quality Management for Contractors, QC certification. Mr. Forshey will be further trained on QC activities by the Shaw Program QC Manager, Mr. Ernie Duke and Ms. Patricia Gamble.

Mr. Forshey will work with Mr. Steve Carriere, Shaw Project Manager and Mr. William Simpson, Site Superintendent regarding daily operations at the site. As the Site QC Manager he will report independently of the site operations to the Shaw Program QC Manager, Mr. Ernie Duke regarding QC issues at the site.

The independent relationship between the QC Organization, and Production Personnel of the Task Order, is presented in the Organizational Chart, Figure I-1.

## 2.0 Names and Qualifications

Figure II-1 provides the resume of the Site QC Manager. The resumes of any alternate QC Managers will be submitted to the Contracting Officer (CO) or designated representative upon request.

# 3.0 Duties, Responsibility and Authority of QC Personnel

The duties and responsibilities are further defined in the Shaw PQCP that is provided in Attachment 1.

# 4.0 Outside Organizations

Lists of outside organizations such as subcontractors hired by FSSI/Shaw for work under this task order are provided in Exhibit IV-1. This list provides each company's name and address and a description of the services each company will provide. This list will be maintained current by the Site QC Manager and will be available for review.

# 5.0 Appointment Letter

The Site QC Manager appointment letter is provided as Figure V-1. This letter identifies the responsibility and authority of the Site QC Manager on the project.

# 6.0 Submittal Procedures and Initial Submittal Register

The submittal process is defined in the Shaw PQCP provided in Attachment 1. The Initial Submittal Register is provided as Exhibit VI-1 for Site 57.

Personnel authorized to review and certify submittals other than the Site QC Manager are identified on Exhibit VI-2. Any additional personnel assigned to perform submittal review and certification must be approved by the CO prior to performance.

# 7.0 Testing Laboratory Information

Testing laboratory information requirements are addressed in Section 1, Part 4.7, Construction Testing, of the Shaw PQCP (Attachment 1). A copy of the accreditations will be submitted as part of the submittal procedure.

# 8.0 Testing Plan & Log

A Testing Plan and Log has been prepared for Site 57 and is provided as Exhibit VIII-1.

# 9.0 Procedures to Complete Rework Items

Rework items will be documented on the Daily QC Report and on the Rework Items Log. These procedures will be used to report and track rework items to ensure they are completed and approved prior to subsequent work that may be affected by these deficient items. The Rework Items Log is provided as Exhibit IX-1.

# 10.0 Documentation Procedures

Daily activities at the site will be documented on the Daily QC Report and Daily Production Report. The Shaw PQPC (Attachment 1) provides the details of the documentation procedures.

# 11.0 List of Definable Features

The definable features for Site 57 are listed on the Quality Control Inspection Plan, Exhibit XI-1.

# 12.0 Procedures for Performing the Three Phases of Control

The procedures for performing the three phases of control are fully provided in the Shaw PQCP (Attachment 1). The Quality Control Inspection Plan, Exhibit XI-1, lists the definable features of work with provisions for recording the corresponding checklist/report for each phase of the three-phase control process. As each control phase is satisfactorily preformed, the Site QC Manager will record the corresponding checklist/report number and date.

This list has been prepared to correspond to the subtasks of the task order. It will be maintained as provided in Section 1, Part 4.4 of the PQCP (Attachment 1).

# 13.0 Personnel Matrix

The personnel matrix, Exhibit XIII-1, shows all sections of the Work Plan with identification of who will review and certify submittals, who will perform and document the three phases of control, and who will perform and document testing. This matrix should be completed as much as possible prior to and during site mobilization.

# 14.0 Procedures for Completion Inspection

The procedures for the completion inspection are described in the Shaw PQCP (Attachment 1).

***Figures***

**FIGURE I-1**
**QC ORGANIZATIONAL RELATIONSHIP WITH PRODUCTION PERSONNEL**

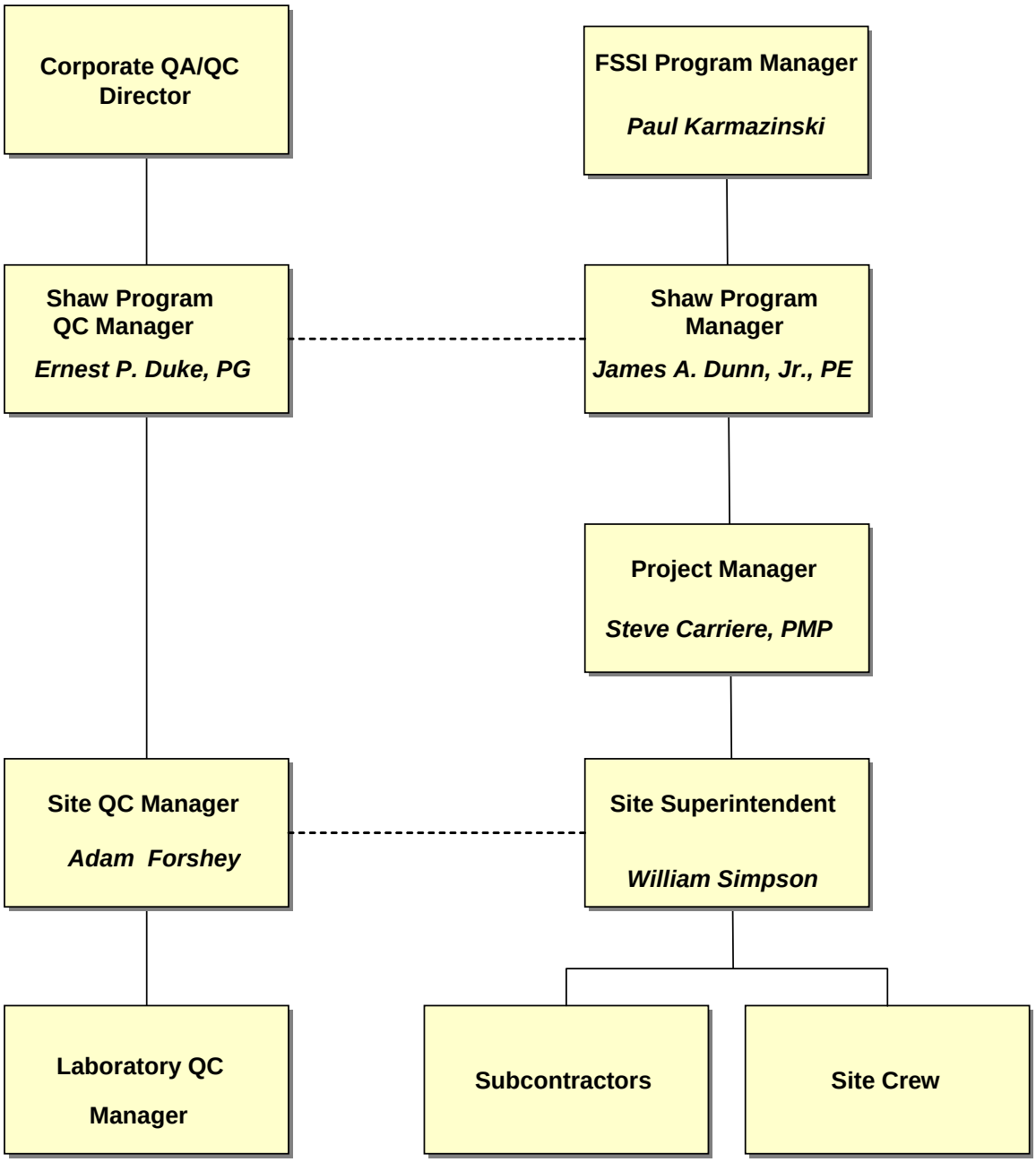

**FIGURE II-1**
**SITE QC MANAGER RESUME**

# Adam J. Forshey Jr

## Professional Qualifications

Mr. Forshey was hired in August 2005 to assist in all phases of various environmental/engineering projects. He is responsible for assisting in report writing, research, and preparing estimates for remediation projects. He has assisted in the writing and editing of work plans and closure reports for multiple projects. Mr. Forshey is also responsible for serving as quality control for various small projects to make sure documentation is maintained.

## Education

Bachelor of Science, Mechanical Engineering, Ohio University, Athens, Ohio, 2005

## Additional Training/Continuing Education

8-Hour HAZWOPER Refresher, Shaw E&I, 2005
U.S. Army Corps of Engineers Construction Quality Management for Contractors (CQC) Training, AGC of Virginia, 2005
40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER), Bechtel Jacobs Company LLC., 2003
RCRA Hazardous Waste Contingency Plan, Bechtel Jacobs Company LLC., 2003
Waste Minimization and Pollution Prevention, Bechtel Jacobs Company LLC., 2002
Nuclear Criticality Safety for Support Personnel, Bechtel Jacobs Company LLC, 2002
Safety Leadership Training, Bechtel Jacobs Company LLC., 2002
RadWorker/RadWorker II, Bechtel Jacobs Company LLC, 2002

## Experience and Background

***08/2005 - Present***
***Engineer 1, Shaw Environmental & Infrastructure, Inc., Virginia Beach, Virginia***

Responsibilities include working under the supervision of engineering project managers on both field and office assignments in all phases of a variety of environmental/engineering projects. Also responsible for assisting with report writing, researching background and hydro geologic information for individual sites, preparing estimates by researching materials and suppliers, serving as a quality control person for various small projects to make sure documentation is maintained, and performing graph and trend analysis for operating remediation systems.

***The following is a summary of key projects:***
Assistant Project Engineer and Quality Control Manager, TO 42 - SPCC Upgrades, 115749, Department of the Navy - Atlantic Division, Camp Lejeune, North Carolina, $5,200,000.00, 01/2006 - Present
Implemented remedial construction activities as required for compliance by the Base wide Integrated Contingency Plan (based on SPCC Upgrades). Upgrades included tank removal/installation, labeling, tank painting and repair, lighting, gauges, and traffic protection bollards. Upgrades also included the installation of secondary containment control structures, spill control gates, boom structures, tank delivery overfill protection, and loading/unloading spill containment structures.

Engineer, Interim Removal Action at Site 8 & SSA 14, 114749, Department of the Navy - Atlantic Division, Naval Weapons Station, Yorktown, Virginia, 10/2005 - Present

Assisted in the preparation and revision of the Project Work Plan for this project involving the sampling and excavation of contaminated soils and site restoration. Work Plan assistance included reviewing and revising Work Plan text, Quality Control Plan, Health and Safety Plan, Field Sampling Plan, and all design drawings/figures. Also created a procurement schedule for the projects equipment and supplies.

Engineer, Interim Removal Action at Site 41B, 118088, Department of the Navy - Atlantic Division, Camp Peary, Williamsburg, Virginia, 10/2005 - Present
Assisted in the preparation and revision of the Project Work Plan for this project involving the sampling and excavation of contaminated soils, demolition of a concrete tank and building, removal of a drainage pipe, and site restoration. Work Plan assistance included reviewing and revising Work Plan text, Quality Control Plan, Health and Safety Plan, Field Sampling Plan, and all design drawings/figures. Also created a procurement schedule for the projects equipment and supplies.

Engineer, Air Sparging/ Soil Vapor Extraction Groundwater Remediation Building LP-20, 112825, Department of the Navy - Atlantic Division, Norfolk Naval Base, Norfolk, Virginia, 10/2005 - Present
Researched, specified, and selected vendors of new rotary screw air compressors for an air sparging/soil vapor extraction system. Also evaluated the compatibility of new compressor systems with remaining piping and equipment.

Engineer, Yorktown Fuel Farm Water Treatment Plant, 115274, Department of the Navy - Atlantic Division, Yorktown, Virginia, 09/2005 - Present
Analyzed and calculated compressed air consumption of equipment in order to determine the effectiveness of air compressors for future plant development. Specified and selected vendors for potential air compressor and air dryer systems. Conducted troubleshooting and specification of various equipment including flow elements, level sensors, pumps, and control valves.

***06/2002 - 09/2003***
***Engineering Intern, Bechtel Jacobs Company LLC., Piketon, Ohio***

Responsibilities included tracking project completion, estimating time requirements for future sites, and serving as a means of communication between management and subcontractors on a phytoremediation project. Also responsible for assisting with the predesign of an in-situ chemical oxidation system which included developing a numerical integrator to theoretically determine the most efficient mixture of oxidant and groundwater, revising AutoCAD drawings of system layout, and performing preliminary fluid flow calculations.

**FIGURE V-1**
**SITE QC MANAGER/REPRESENTATIVE – LETTER OF APPOINTMENT**

Shaw® Shaw Environmental, Inc.

May 18, 2006

Adam Forshey
Shaw Environmental, Inc.
5700 Thurston Avenue, Suite 116
Virginia Beach, VA 23455-3302

RE: Site QC Manager
Contract N62470-03-D-4402
Task Order 025

Dear Mr. Forshey:

This letter will serve as your appointment as the Site Quality Control Manager on the referenced project and will also clarify your duties and authority in this position. In this position, you will be authorized to use available resources to satisfy all applicable requirements of the Program and Task Order Quality Control Plans.

This authorization specifically gives you the authority to direct removal and replacement or correction of nonconforming materials or work and stop work authority when continuation would be unsafe to personnel, harmful to the environment, or which is not in compliance with the contract.

You will be expected to work closely with the Project Manager, Site Supervisor and other project personnel, but you will not be directly responsible to anyone but myself for resolution of quality issues when working in the capacity of Quality Control Manager.

If you have any questions in this matter, please contact me.

Respectfully,

Ernest P. Duke
Program QC Manager
LANTDIV RAC Program

***Exhibits***

# EXHIBIT IV-I
# APPROVED CONSULTANT AND SUBCONTRACTOR LIST

| SUBCONTRACTOR LIST<br>Shaw Environmental, Inc.<br>Site 57<br>Task Order No. 025 | |
|---|---|
| **COMPANY NAME AND ADDRESS** | **DESCRIPTION OF SERVICES PROVIDED** |
| Accutest Laboratories | Chemical Analytical Testing |
| TBD | Transportation and Disposal Services |
| TBD | Asphalt Paving |
| TBD | Hydroseeding |

# EXHIBIT VI-I
# SUBMITTAL REGISTER

| Task Order No. 025<br>Contract No. N62470-03-D-4402 | Project No. 120359<br>Project Title: Site 57 | Revision No. 01<br>FSSI/Shaw |
|---|---|---|

| Spec. Sect. | SD Number and Submittal Description | Spec Paragraph Number/ Work Plan Reference | Approving Authority | Other Reviewers | Transmittal Control No. | Planned Submittal Date | Contractor Action | | | Approving Authority | | | | Date Rcvd from Appr Auth | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Action Code | Date of Action | Date Forwarded to Appr Auth/ from Contr | Date Forward to Other Reviewer | Date Rcvd from Other Reviewer | Action Code | Date of Action | | |
| (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) | (l) | (m) | (n) | (o) | (p) |
| | **Preconstruction Submittals** | | | | | | | | | | | | | | |
| | Work Plan | | G | | | | | | | | | | | | |
| | Project Schedule | Appendix A | G | | | | | | | | | | | | |
| | Erosion and Sediment Control Plan | Appendix B | G | | | | | | | | | | | | |
| | Site Specific Health and Safety Plan | Appendix C | G | | | | | | | | | | | | |
| | Quality Control Plan | Appendix D | G | | | | | | | | | | | | |
| | Field Sampling and Analysis Plan | Appendix E | G | | | | | | | | | | | | |
| | **During Construction Submittals** | | | | | | | | | | | | | | |
| | Waste Characterization Analysis | 3.5 | G | | | | | | | | | | | | |
| | Backfill Chemical Analysis | 3.5 | G | | | | | | | | | | | | |
| | Topsoil Chemical Analysis | 3.5 | G | | | | | | | | | | | | |
| | Facility Permit | 3.7 | | | | | | | | | | | | | |
| | Shipping Waste Manifests | 3.7 | | | | | | | | | | | | | |
| | Backfill Geotechnical Analysis (if determined necessary by the Navy) | 3.8.1 | | | | | | | | | | | | | |
| | Backfill Density Testing (if determined necessary by the Navy) | 3.8.1 | | | | | | | | | | | | | |
| | Seeding, Fertilizing and Mulching | 3.8.3 | | | | | | | | | | | | | |

# EXHIBIT VI-I
# SUBMITTAL REGISTER

| Task Order No. 025<br>Contract No. N62470-03-D-4402 | Project No. 120359<br>Project Title: Site 57 | Revision No. 01<br>FSSI/Shaw |
|---|---|---|

| Spec. Sect. | SD Number and Submittal Description | Spec Paragraph Number/ Work Plan Reference | Approving Authority | Other Reviewers | Transmittal Control No. | Planned Submittal Date | Contractor Action | | | Approving Authority | | | | Date Rcvd from Appr Auth | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Action Code | Date of Action | Date Forwarded to Appr Auth/ from Contr | Date Forward to Other Reviewer | Date Rcvd from Other Reviewer | Action Code | Date of Action | | |
| (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) | (l) | (m) | (n) | (o) | (p) |
| | Coarse Run Aggregate CR-6 Geotechnical Analysis (if determined necessary by the Navy) | 3.8.4 | | | | | | | | | | | | | |
| | CR-6 Density Testing (if determined necessary by the Navy) | 3.8.4 | | | | | | | | | | | | | |
| | Bituminous Concrete Binder (Base) Course | 3.8.4 | | | | | | | | | | | | | |
| | Bituminous Concrete Wearing (Surface) Course | 3.8.4 | | | | | | | | | | | | | |
| | **Post-Construction Submittals** | | | | | | | | | | | | | | |
| | Closeout Report | 3.12 | G | | | | | | | | | | | | |
| | Environmental Conditions Report | 3.2.1 | G | | | | | | | | | | | | |
| | Original Waste Manifests | 3.7 | | | | | | | | | | | | | |
| | As-Built Records | 3.9 | G | | | | | | | | | | | | |
| | Contractor Production Reports | 3.10 | | | | | | | | | | | | | |
| | QC Reports | 3.10 | | | | | | | | | | | | | |
| | QC Meeting Minutes | Appendix D | | | | | | | | | | | | | |

Notes:

Approved By:

G: Government

Blank: QC Manager

Reference; QMP-16.2 Submittal Management Process

ACTION CODES

A: Approved

AN: Approved as Noted

NR: Not Reviewed

RR: Disapproved; Revise and Resubmit

# EXHIBIT VI-2
# LIST OF PERSONNEL AUTHORIZED TO REVIEW & CERTIFY SUBMITTALS

| LIST OF PERSONNEL AUTHORIZED TO REVIEW AND CERTIFY SUBMITTALS<br>FSSI/Shaw<br>Site 57<br>Task Order No. 025 | | |
|---|---|---|
| | SUBMITTAL TYPE: | AUTHORIZED PERSONNEL: |
| Work Plan Submittals | Preconstruction | Project Manager |
| Technical and Documentation Submittals (1) | All Types | Site QC Manager, Program QC Manager and Project Manager |

(1) Note: Site QC Manager shall perform the final review and certification for submittals requiring Government approval. Site QC Manager shall perform the final review and approval for submittals requiring Contractor approval.

# EXHIBIT VIII-1
# TESTING PLAN AND LOG

**TESTING PLAN AND LOG**
**FSSI/Shaw**
**Site 57 – Building 292 TCE Contamination**
**Task Order No. 025**

| CONTRACT NUMBER | | | PROJECT TITLE: Site 42, Olsen Road Landfill | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N62470-03-D-4402 | | | LOCATION: Indian Head, MD | | | | | | | | |
| SPECIFICATION SECTION AND PARAGRAPH NUMBER | ITEM OF WORK | TEST REQUIRED | ACCREDITED/ APPROVED LAB | | SAMPLED BY | TESTED BY | LOCATION OF TEST | | DATE COMPLETED | DATE FORWARDED TO CONTR. OFF. | REMARKS |
| | | | YES | NO | | | ON SITE | OFF SITE | | | |
| Appendix E of the Work Plan | Analysis of contaminated material or liquid for off site disposal | TPH DRO/GRO, TCLP/VOC. TCLP/SVOC & TCLP/Metals (Ign, Corr, React, & Tox), TCLP Pesticides and PCBs as determined necessary | | | | | | | | | Frequency as required by the approved disposal facility. |
| Appendix E of the Work Plan | Post Excavation Confirmation Samples | Confirmation samples tested for arsenic, cis-1,2-DEC, and TCE. | | | | | | | | | To be performed by TtNUS. |
| Appendix E of the Work Plan | Requirements to import backfill and topsoil | TCLP/VOC, TCLP/SVOC, TCLP/Metals & TCLP Pesticides and PCBs as determined necessary | | | | | | | | | Minimum one composite test from each borrow source. |
| Work Plan Sections 3.8.1 & 3.8.4 | Backfill and CR-6 Subbase | ASTM Method D1557 (Modified Proctor), if determined necessary by the Navy. | | | | | | | | | |
| Appendix E of the Work Plan | Topsoil | Test for Organic Content, pH, soluble salts, nitrogen, phosphorous, and potassium | | | | | | | | | |

# EXHIBIT IX-1
# REWORK ITEMS LOG

**REWORK ITEMS LIST**

**FSSI/Shaw**

**Site 57**

**Task Order No. 025**

Contract No. N62470-03-D-4402

Site 57

Location: Indian Head, MD

| NUMBER | DATE IDENTIFIED | DESCRIPTION | CONTRACT REQUIREMENT (Spec. Section and Par. No., Drawing No. and Detail No., etc.) | ACTION TAKEN BY QC MANAGER | RESOLUTION | DATE COMPLETED |
|---|---|---|---|---|---|---|
| | | | | | | |
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# EXHIBIT XI-1
# QUALITY CONTROL INSPECTION PLAN

| QUALITY CONTROL INSPECTION PLAN<br>FSSI/Shaw<br>Site 57<br>Task Order No. 025 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Control Check Verification | | | | | |
| Specification Section | Definable Feature of Work | Activity Number | Date | Preparatory Phase Checklist/Report No. | Date | Initial Phase Checklist/Report No. | Date | Follow-up Phase Checklist/Report No. |
| Work Plan | Mobilization | 01 | | | | | | |
| Work Plan | Site Setup | 02 | | | | | | |
| Work Plan | Utility Relocation | 03 | | | | | | |
| Work Plan | Erosion and Sediment Control Installation | 04 | | | | | | |
| Work Plan | Field Sampling/Off-Site Analysis | 05 | | | | | | |
| Work Plan | Contaminated Material Excavation and Handling | 06 | | | | | | |
| Work Plan | Material Transportation and Disposal | 07 | | | | | | |
| Work Plan | Site Restoration | 08 | | | | | | |

# EXHIBIT XIII-1
# PERSONNEL MATRIX

| FSSI/Shaw<br>Site 57<br>Task Order No. 025 | | | |
|---|---|---|---|
| SPECIFICATION SECTION | SUBMITTALS TO BE REVIEWED BY: | THREE PHASE TO BE PERFORMED BY: | TESTING TO BE PERFORMED BY: |
| All Sections | Site QC Manager, Program QC Manager, or Project Manager(1) | Site QC Manager | Chemical Analysis – Accutest Laboratories |

(1) Note: Site QC Manager shall perform the final review and certification for submittals requiring Government approval. Site QC Manager shall perform the final review and approval for submittals requiring Contractor approval.

***Attachment 1***
***Program Quality Control Plan***

# PROGRAM QUALITY CONTROL MANUAL

FOR

REMEDIAL/REMOVAL ACTION
CONTRACT NO. N62470-03-D-4402

PREPARED FOR:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

PREPARED BY:

SHAW ENVIRONMENTAL, INC
5700 THURSTON AVE SUITE 116
VIRGINIA BEACH, VIRGINIA 23455

## *PROGRAM QUALITY CONTROL PLAN*

### *SIGNATURE PAGE*

---

Ernest P. Duke
Program Quality Control Manager

18 May 2006.
Date

James A Dunn Jr, P.E.
Program Manager

18 May 2006
Date

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# *1.0 INTRODUCTION*

Shaw Environmental, Inc (Shaw) has been selected by the Department of the Navy, Atlantic Division, Naval Facilities Engineering Command (LANTDIV) for performing remedial services at environmentally contaminated sites predominately located at Navy and Marine Corps installations and other government facilities. The sites will consist of those ranked on the Superfund National Priority List (NPL) as well as non-NPL sites regulated under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Underground Storage Tanks (UST), and other sites, which might require remedial action.

Work under this Contract will be performed in the geographical regions of LANTNAVFACENGCOM. These sites are located on the East Coast of the United States but predominately in Virginia, North Carolina, West Virginia, Maryland, District of Columbia, and Puerto Rico, however, this Contract does not preclude performing specific projects in the remaining LANTDIV areas of responsibility which includes the Northeastern U.S., Caribbean, Central America, Europe, and Africa. Work may also be added and performed anywhere outside of LANTNAVFACENGCOM area of responsibility, as required by the Government.

The exact location of individual efforts will be designated on individual Contract Task Orders.

Shaw will provide the personnel, equipment, materials, facilities, and management to respond to multiple requests for environmental support at various sites. These services may include actions, such as, but not limited to, the following:

- Performing remedial actions
- Performing removal actions
- Performing expedited and emergency response actions at sites
- Performing pilot and treatability studies
- Providing facility operation, maintenance and instruction
- Performing other related activities associated with returning sites to safe and acceptable levels.
- Developing work plans
- Range Clean Up and Closure; including Range Sustainability Environmental Program Assessments
- Performing RCRA Closures
- Performing Site Characterizations

- Performing Groundwater Characterization Studies
- Performing emergency/expedited secondary response, contamination assessment and subsequent decontamination/remediation prior to returning to normal operations as well as preparation of work plans and coordination with applicable agencies.

Shaw will perform tasks in accordance with Contract Task Order work statements. The Contract Task Order work statements will be performance-based, describing the requirements in terms of desired outcome of the project with minimal provision of precise details of work to be done. Contract Task Orders shall include various documents, which shall describe the required remedial action and technologies to achieve cleanup. Such documents may include records of decision, remedial investigation and feasibility corrective measure studies, RCRA/CERCLA closure plans, corrective action plans, and drawings and specifications.

Records that furnish documentary evidence of quality shall be specified, prepared and maintained. Such records shall also be legible, identifiable, and available for review. These records will include, but not be limited to, contract documents and changes, as-built records, certifications, Daily Contractor and QC Reports, inspection and test records, analytical data, submittal packages and register, and other quality documents.

# *2.0 QUALITY CONTROL PROGRAM*

## 2.1 QUALITY CONTROL PROGRAM

It is the quality objective of Shaw to establish, implement, and maintain a cost-effective Quality Control (QC) Program, which will ensure that services are provided in a manner that meets regulatory and contractual requirements, while maintaining the highest level of quality and confidence in all work Shaw performs. This will be accomplished through this QC Program that ensures that quality is built into each Contract Task Order and work activity. Quality of services provided will be a commitment of everyone involved with the Program from top management through each person completing the work at the site.

Shaw believes in and promotes an atmosphere of "Do it right the first time," using preventative tools such as those incorporated into this Program QC Plan. Successful performance can then be verified and documented through a system of inspections, testing, and reporting as detailed further within this plan.

Continual quality improvement is also a commitment of Shaw. Development of new Standard Operating Procedures (SOPs) to improve quality and to better facilitate specific requirements will be reviewed and incorporated into the Program when applicable and approved.

## 2.2 PROGRAM QUALITY CONTROL PLAN

This Program Quality Control Plan (PQCP) describes the quality management principles and quality system elements to be implemented within this Contract. It provides the requirements and guidance for development and implementation of site-specific plans and procedures and establishes the responsibilities and authorities of the organization responsible for ensuring quality.

This Plan is established and will be maintained to be responsive to the LANTDIV Contract requirements. It will consist of the QC Organization; QC Program Plan; Project QC Plan; Coordination and Mutual Understanding Meeting; QC meetings; three phases of control; submittal review and approval; testing; completion inspections; and QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with the requirements of this Contract.

## 2.3 PROJECT QUALITY CONTROL PLAN

The Project Quality Control Plan (QCP) will reflect the elements of the QC Program, to the detail and requirements of each site-specific task orders will cover on-site and off-site work and will correspond to the work activities.

## 2.4 QUALITY CONTROL MANAGEMENT

The Program QC Manager will manage this Program. Each Task Order will have a person designated as the Site QC Manger who is then responsible for implementing the Program at the project level.

Management, workers, and those who assess the quality of work must all make their unique contributions to achieve a high level of collective performance and thereby satisfy the expectations of our LANTDIV customer. These contributions shall include timely and effective communications, professional performance, ownership, and cooperation.

The responsibility, authority and the interrelation of all personnel who manage, perform and verify activities affecting quality shall be defined; particularly for personnel who need the organizational freedom and authority to:

a) Initiate action to prevent the occurrence of nonconforming conditions;

b) Identify and report quality deficiencies and problems;

c) Initiate, recommend or provide solutions through designated channels;

d) Verify the implementation of solutions

e) Control further processing, delivery or installation of nonconforming items until the deficiency or unsatisfactory condition has been corrected.

### 2.4.1 Program Quality Control Manager

The Program QC Manager will manage and implement the contract-wide QC Program. Any changes to the established contract-wide QC Program Plan or Project QC Plans shall be at the direction and approval of the QC Program Manager, with concurrence of the Contracting Officer or designated representative. The Program QC Manager will not be required to be on-site during Task Order remedial activities, but shall be readily available for consultation when required by the Contract or the Contracting Officer or designated representative.

### 2.4.2 Site Quality Control Manager

Shaw will utilize trained, experienced Site QC Managers to assist and represent the QC Program Manager in continued implementation and management of the approved Project QC Plans. The Site QC Manager for each Contract Task Order will manage the site-specific QC requirements in accordance with the Project QC Plan. The Site QC Manager is required to attend the coordination and mutual understanding meeting, conduct QC meetings, perform the three phases of control, perform submittal review, perform submittal approval except for submittals designated for Contracting Officer or designated representative approval, ensure testing is performed, and prepare QC certifications and documentation required in this Contract. No work or testing will be performed unless the Program QC Manager, Site QC Manager or designated QC representative is on-site.

In addition to managing and implementing the site-specific QC plan, the Site QC Manager may be assigned duties on a part-time basis and also may serve as the Site Health and Safety Specialist (SSHS) if qualified. When approved in advance by the Program QC Manager and Contracting Officer or designated representative, the Project Superintendent may act in a dual role as the Site QC Manager and the Project Superintendent. In such case, that person will be held responsible for the quality and the requirements of the Project QC Plan. The responsibility of quality control is subject to being revoked by the Program QC Manager or Contracting Officer or designated representative for non-compliance with quality requirements specified in this Plan.

# *3.0 PROGRAM ORGANIZATION*

## 3.1 PROGRAM ORGANIZATION

The Quality Control Program is a part of the overall LANTDIV organization. The LANTDIV Program organization is shown in Figure 3-1. A typical QC organization chart depicting the relationship between the Program QC Manager and the Site QC Manager at the project level is also provided as Figure 3-2.

### 3.1.1 Program QC Manager

The Program QC Manager at the program level will:

- Manage and implement the contract-wide QC Program
- Approve any changes necessary to the established QC Program Plan or Project QC Plans
- Be readily available for consultation when required by the Contract, the contracting officer or designated representative
- Be the point of contact for the QC Program
- Have overall authority to act on QC matters
- Manage the Site QC Managers at site locations
- Have stop work authority
- Have the freedom and independence to resolve quality issues at the program management level
- Attend the coordination and mutual understanding meeting and the QC meetings as applicable
- Perform program QC assessments

#### 3.1.1.1 Program QC Assessments

Program QC assessments will be conducted to evaluate and assess QC program compliance, efficiency and effectiveness. These assessments will be scheduled and performed by the Program QC Manager in accordance with section 5.4 of this PQCP.

#### 3.1.1.2 Resolution of conflicts

If a conflict develops between member of the project staff and the QC organization, the matter will be elevated to the Program QC Manager and Program Manager for resolution. If satisfactory resolution cannot be achieved, the matter will then be elevated to a higher level of management, if necessary.

#### 3.1.1.3 Notification of changes

The Program QC Manager will notify the CO in writing of any proposed change to the Program. All changes will be submitted to the CO for approval within seven (7) days of the proposal change.

### 3.1.2 Site QC Managers

Site QC Managers will be assigned to each site where Task Order quality specific work is being performed. The QC Program will use trained, experienced Site QC Manager to assist and represent the Program QC Manager in continued implementation and enforcement of the approved Project QC Plans. These individuals will report to the Program QC Manager at the program level. The Site QC Manager will coordinate site QC activities with the Resident Officer in Charge of Construction (ROICC), who is generally the Contracting Officer's designated representative.

Site QC Managers are responsible for managing the Project QC Plan (QCP), as well as ensuring that the work is performed in accordance with QCP requirements, corporate policy, procedures, guidelines, and other applicable requirements. The Project QC Manager for each Contract Task Order will:

- Manage the site specific QC requirements in accordance with the Site QC Plan
- Attend the coordination and mutual understanding meeting
- Conduct QC Meetings
- Perform the three phases of control
- Perform submittal review

- Perform submittal approval except for submittals designated for Contracting Officer or designated representative approval
- Ensure testing is performed as required
- Prepare QC certifications and documentation required
- Verify that objective evidence has been provided to document satisfactory performance of the work (i.e. daily reporting and photo documentation)
- Exercise authority to stop work or direct removal and replacement of non-conforming work

### 3.1.3 QC Staff

QC staff members may be assigned to the project to assist and report to the Site QC Manager. The staff size and expertise will be based on the nature, schedule, and quantity of activities being performed. The size of this staff may change as the work activities and stages of progress change.

An Alternate Site QC Manager will be designated in the event that the assigned Site QC Manager will be absent from the site. The alternate will need to be approved by the Program QC Manager and Contracting Officer or designated representative.

QC Assistants may be designated by the QC Manager for large complex projects, for multiple shifts or when additional or routine QC functions are ongoing. Assistants can provide an extension of the QC Managers capabilities to verify compliance and report quality information to the QC Manager. With prior concurrence of the Contracting Officer or designated representative the Assistant can provide that extension of QC for ongoing or routine activities when the Site QC Manager is not present on the site. The Site QC Manager will be responsible for supervising and directing the QC functions of the Assistants at the site and will be readily available to the Assistant for consultation when needed.

Ultimately, the Site QC Manager will maintain responsibility for implementation of the Project QC Plan at the site.

# LANTDIV PROGRAM ORGANIZATION

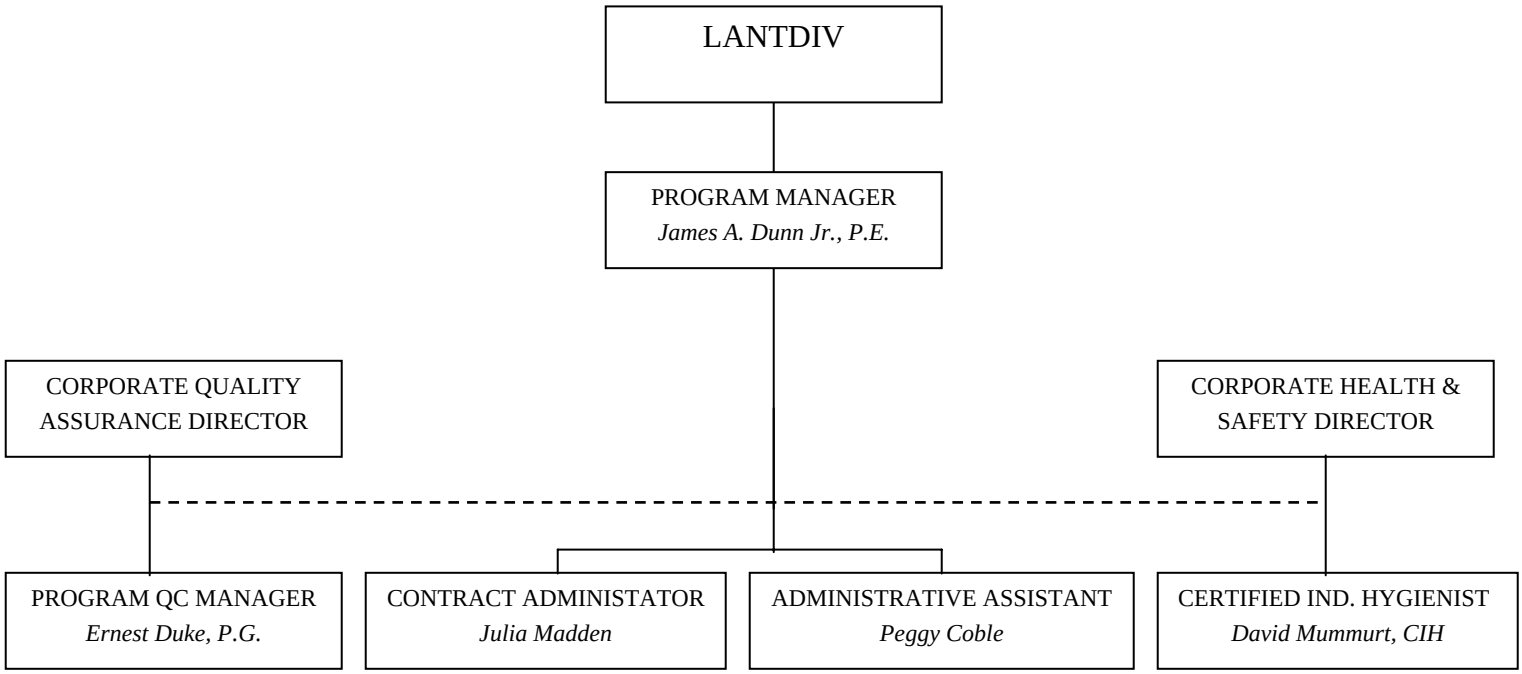


**FIGURE 3-1**
**PROGRAM ORGANIZATION**

# TASK ORDER ORGANIZATION CHART

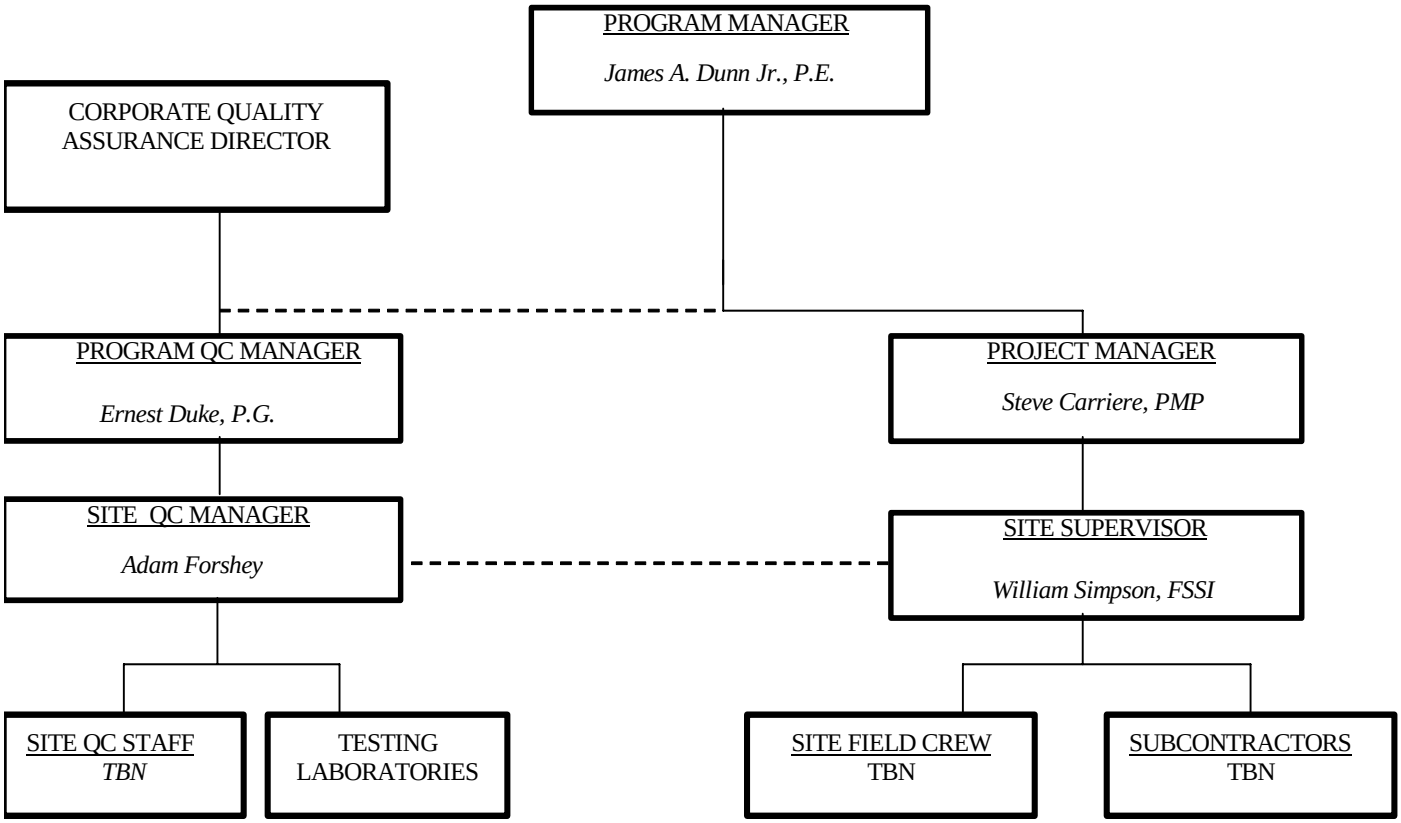


**FIGURE 3-2**

**TASK ORDER ORGANIZATION CHART**

# *4.0 PROJECT QUALITY CONTROL PLAN*

## 4.1 PROJECT QUALITY CONTROL PLAN

Project Quality Control Plan (QCP) will be prepared for each Task Order where applicable. Upon receipt of the TO, a determination is made on the level of quality required in terms of resources and the application of quality program elements. The QCP is then prepared to address the specific activities described in the TO statement of work including the Site-specific Design Drawings and Contract Specifications. No QCP will be prepared when the Site Specific TO does not require such a plan.

The QCP will contain provisions to assure that activities affecting quality are performed under suitably controlled conditions and will be completed in accordance with the requirements of this program.

The QCP will be reviewed and approved at a minimum by the Program Quality Control Manager and the Senior Project Manager. Each QCP will be presented to the Navy as part of this site specific Work Plan for review and approval. In addition, the Navy will be notified in writing prior to any revisions to the approved QCP. Revisions will be subject to the same review and approval process as the original QCP. Each QCP will identify the QC organization and provided for a coordination and mutual understanding meeting; on-going QC meetings; three phase control; submittal management, review and approval; testing; and, QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, and construction and operations in accordance with the Contract.

To assure for the consistency of format and content, a representative site specific QCP has been developed and is provided in Section 2 of the Program Plan. This representative QCP has been designed to accommodate applicable contract requirements, including the required format. The QCP will cover both on-site and off-site work and will include the following major sections:

I. QC organization chart showing the structure and relationship with the production side of the project

II. Name and qualifications, in resume format, of the Site QC Manager

III. A letter signed by a Program QC Manager appointing the Site QC Manager and stating that the Site QC Manager is responsible for implementing the QC program

as described in the Contract. To be included in the letter is the Site QC Manager's authority to direct the correction of non-conforming work and to stop work where continuation would be unsafe to personnel, harmful to the environment or result in a significant degradation of quality.

IV. A listing of outside organizations such as testing laboratories, architects, and consulting engineers that will be employed by the Contractor and a description of the services these firms will provide.

V. Procedures for reviewing, approving, and managing submittals. Provide the names of persons authorized to review and certify submittals prior to approval. Provide the initial submittal of the submittal register as specified and as required by the Contract Task Order.

VI. Testing laboratory information required by the paragraph entitled "Accredited Laboratories" or "Testing Laboratory Requirements," as applicable.

VII. A testing plan and log that includes the tests required, referenced by the specification paragraph number requiring test, the frequency, and the person responsible for each test.

VIII. Procedures to identify, record, track and complete rework items.

IX. Documentation procedures, including proposed report formats.

X. Quality Control Inspection Plan. Provides a list of the definable features of work (DFOW) and specification sections with activity numbers corresponding to the project schedule. The QC Inspection Plan will have provisions for recording the corresponding report and date for each phase of the three-phase control process.

XI. Personnel Matrix listing personnel authorized to review and certify submittals.

### 4.1.1 Preliminary Work Authorized Prior to Approval

No work is authorized to proceed prior to the approval of the Project QC Plan unless specifically authorized by the Contracting Officer or designated representative.

### 4.1.2 Approval

Approval of the Project QC Plan is required prior to the start of field activities. The Contracting Officer or designated representative reserves the right to require changes in the Project QC Plan and operations as necessary to ensure the specified quality of work.

### 4.1.3 Standard Procedures and Guidelines

Standard procedures, including Standard Operating Procedures (SOPs), Quality Management Procedures (QMPs) and industry guidelines will be applied as required and when considered practical. When such procedures and guidelines are required, their application will be identified within appropriate plans.

### 4.1.4 Site Specific Procedures

In certain cases project needs may dictate the application of site specific SOPs, QMPs or a modified industry guideline.

These procedures and guidance documents will be prepared by the appropriate project Team members, i.e., quality procedures by the Site QC Manager, health and safety by the Site Health and Safety Officer, geotechnical by the Project Geotechnical Engineer, etc. They shall be reviewed and approved in accordance with the Team member's respective organization's policy.

### 4.1.5 Site Document Control

Quality Management Procedure (QMP) – 5.1 in Section 3 of this PQCP provides a detailed description of the document control procedure.

## 4.2 COORDINATION AND MUTUAL UNDERSTANDING MEETING

Prior to the start of field activities, the Site QC Manager shall meet with the Contracting Officer or designated representative to discuss the QC program required by this specific TO. The purpose of this meeting is to develop a mutual understanding of the following:

- QC details
- Forms to be used
- Administration of on-site and off-site work

- Coordination of the Contractor's management, production, and the Site QC Manager's duties with the Contracting Officer or designated representative.
- Implementation of the three phases of control for the definable features of work.

As a minimum, the Contractor's personnel required to attend shall include the CTO Manager, Project Superintendent, and Site QC Manager. Minutes of the meeting will be prepared by the Site QC Manager. The QC Site Manager will provide a copy of the minutes to all attendees.

## 4.3 QUALITY CONTROL MEETINGS

After the start of site work, the Site QC Manager shall conduct QC meetings as required by the Contracting Officer or designated representative at the work site with the project superintendent. Meetings conducted will be recorded in the Contractor QC Report. Minutes of the meeting will be prepared by the Site QC Manager and provided to the Contracting Officer or designated representative within 2 working days of the meeting. The Contracting Officer or designated representative may attend any of these meetings. A standard QC meeting agenda will be utilized for these meetings. A copy of the standard agenda is provided as Figure 4.1. As a minimum, the following shall be accomplished at each meeting:

1. Review the minutes of the previous meeting

2. Variance Request / Request for information / Technical Directive Status

3. Schedule and status of work.
    a. Work accomplished since last meeting providing the status within the three phase control.
    b. Work to be accomplished before the next scheduled meeting.
    c. Meeting and inspection schedule for three phases of control.

4. Rework Status
    a. Rework items identified and pending completion
    b. Rework items completed since last meeting

5. Status of Submittals
    a. Submittals reviewed and approved since last meeting
    b. Submittals pending approval

c. Submittals required in the near future

6. Testing to include both on-site and off-site testing.
   a. Testing performed since last meeting
   b. Testing scheduled prior to the next meeting
   c. Test results pending/ received since last meeting

7. Documentation required prior to next meeting

8. Status of as-builts

9. QC and production issues discussed and relation resolutions

10. Other items discussed (i.e. items that may require changes to the Project QC Plan.)

11. Action items

12. Date of next schedule QC meeting

## 4.4 THREE PHASES OF CONTROL

The Site QC Manager will perform the three phases of control for each definable feature of work to ensure that work complies with contract requirements. Definable features of work will be specified in the Project QC Plan approved by the Contracting Officer or designated representative.

The three phases of control identified as the Preparatory, Initial and Follow-up will cover both on-site and off-site work. Each phase is an integral part of quality control for the completion of work to the satisfaction of not only the Navy but also to Shaw and all personnel involved in the activity. The objective of three-phase control is to ensure that adequate preparation is performed prior to beginning a particular task and that each step is controlled from initiation through completion and final acceptance.

The site work for each project will be separated into distinct work activities with separate control requirements. These are identified as the definable features of work. These will correspond to the activities of the project schedule as applicable.

### 4.4.1 Preparatory Phase

The Preparatory Phase ensures proper planning so that established prerequisites are accomplished and that specific controls are acknowledged and present prior to the start of work. The Preparatory meeting will be conducted by the Site QC Manager prior to the start of each definable feature of work and at a minimum attended by the Site Superintendent, Site Safety Officer and Foreman and subcontractor responsible for the completion of the work. The Contracting Officer or designated representative will be notified 2 days prior to the meeting. This meeting will be used to review the necessary steps for completion of the activity and assure that these will achieve the quality requirements of the Contract. Prior to the start of work the site crew completing the work will be informed of the safety hazards and of quality related requirements of the activity. The Preparatory Phase will be documented by the Site QC Manager using the Daily Contractor Quality Control Report. This Daily Contractor Quality Control Report form is provided in Section 4 of this manual. A specific portion of the form applies to the Preparatory Phase.

### 4.4.2 Initial Phase

The Initial Phase will be conducted at the onset of a particular definable feature of work. The Contracting Officer or designated representative will be notified when crews are ready to start work on a definable feature of work. The Site QC Manager will observe the initial segment of the definable feature of work to ensure the work complies with the Contract requirements and is following procedures discussed in the Preparatory Phase. The results of the Initial Phase will be documented in the Daily Contractor Quality Control Report. The Initial Phase will be re repeated when acceptable levels of work are not achieved. Testing completed, as part of the Initial Phase will also be recorded.

### 4.4.3 Follow – up Phase

The Follow-up Phase will verify and document that on-going work is in compliance with the contract requirements and that the quality of workmanship is maintained through the completion of the work. This phase will also ensure that rework items are being corrected. Sufficient detail will be documented on the Daily Contractor Quality Control Report to demonstrate the work was completed as required. Testing completed, as part of the Follow-up Phase will also be recorded.

Quality Management Procedure (QMP) – 10.1, which is located in Section 3 of this Program Plan further defines the three phases of control. The Contractor Quality Control Report forms

and Quality Control Inspection Plan, which will list the definable feature of work in the Project QC Plan, are included in QMP-10.1.

### 4.4.4 Verification and Inspection Activities

Each phase of the Quality Control may use some or all of the following verification process:

a. Field Inspections - Primarily visual examinations, but also may include measurements of materials and equipment being used, techniques employed, and the final products. These inspections confirm that a specific guideline, specification, or procedure for the activity is successfully completed. They are performed during the remediation or construction, activity and after completion of the work with the results of visual verifications documented in the QC Daily Report and/or appropriate checklist.

b. Photo Documentation – Photo documentation provides a photographic record to documents the construction process and verifies completion as specified. These photographs can be used to enhance the final construction report to visually verify the processes. Photographs can also be used to document site conditions encountered during the completion of the work

c. Field Tests - Tests or analyses made at or in the vicinity of the job site in connection with the remedial action. They are performed primarily on samples or in-situ portions of the as-built structure to determine whether construction performance meets the project requirements. Field tests are performed as soon as possible after material receipt or completion of the portion of the constructed work. This testing is to provide prompt confirmation or rejection of the material or constructed work and minimize the potential of having to remove satisfactory work, which has been added to defective material, or work.

d. Laboratory Tests - Testing performed by on-site or off-site laboratories on samples of materials used to characterize materials and confirm performance. These tests are performed as soon as possible after samples are obtained to provide prompt confirmation or rejection of material or the constructed work.

e. Receiving Inspections - Inspections that include a visual examination and measurement of materials obtained from suppliers when they arrive at the site.

They are performed to verify that the materials received meet design specifications, are free of defects, and have not been damaged in transit.

f. Surveys - Surveying includes the establishment of horizontal and/or vertical grade control for construction, establishment of elevation benchmark, reference/location surveys for structures in the vicinity of the job site and topography, as appropriate. Volume/quantity surveys and in-place volumes are also included.

g. Review of Manufacturers Certificates - Certificates obtained from suppliers for selected shipments of materials received are reviewed by the QC staff. They include a statement of the requirement, which the material must meet, verification that the materials meet the requirements, supporting test results, and the quantity supplied.

h. Compilation of Checklists - Checklists required for critical inspections and filled out during the course of the inspection to document inspection results. The Site QC Manager maintains these checklists.

## 4.5 FIELD WORK REPORTING

For each Contract Task Order, the Site QC Manger will deliver the following to the Contracting Officer or designated representative, and other parties as identified through regional distribution listings**:**

- Combined Contractor Production Report/Contract Quality Control Report.
- Testing Plan and Log: One copy at the end of each month.
- Monthly Summary Report of Field Tests: Original and one copy attached to the Contractor Quality Control Report at the end of each month.
- QC Meeting Minutes: One copy to the CO or designated representative within 2 working days of the meeting. Copies will also be provided to attendees of the meeting.
- Rework Items List: One copy by the last working day of the month.

- QC Certifications: As required, for QC Reports, submittals and as further defined in subpart 4.8, QC Certification.

## 4.6 SUBMITTAL MANAGEMENT

It is a program objective to ensure that each required submittal is adequately reviewed and is certified to be in compliance with contract requirements. Each deliverable, referred to as a "submittal" will be identified, acquired, assembled, reviewed for acceptance, and certified to be in compliance with Contract Drawings and Specifications, prior to being presented to the Contracting Officer or designated representative. Prior to certification the responsible party will determine and verify field measurements, materials, field construction criteria, review each submittal and check and coordinate each submittal with requirements of the work and contract documents.

This procedure is applicable to each submittal identified within the Site-specific Task Order (TO), specifications, submittal register and plans to be implemented during the project. Submittals will include shop drawings, product data, samples, and administrative submittals.

The provisions of this procedure shall be applicable to Shaw project personnel, subcontractors, vendors and suppliers. This procedure shall be applicable to both on-site and off-site activities. A more thorough description of the submittal management process is found in QMP – 16.2 in Section 3 of this Program Plan.

The Site QC Manager will be responsible for management of the submittal process including the review, verification, acceptance, processing and approval of submittals which are transmitted for QC organization approval, as well as, the review, verification and certification of submittals requiring Government approval. The Site QC Manager will also be responsible for maintaining and documenting the status of submittals on the approved for use submittal register.

### 4.6.1 Submittals

A submittal is to be considered any document or sample identified within a Task Order, specification, register, or plan which is required to be certified by the QC organization, accepted by an approval authority, or provided for information only. Submittals are required by contract in order to regulate the timely flow of materials to be incorporated into the work. Those submittals that will normally require government approval are: extensions of design, critical materials,

deviations, or those involving equipment whose compatibility with the entire system must be checked.

Types of submittals are classified by definition within the Contract Specification as: shop drawings; product data; samples; or, administrative submittals.

- Shop Drawings. As used in this section, drawings, schedules, diagrams, and other data prepared specifically for this TO, by the Contractor or through the Contractor by way of a subcontractor, manufacturer, supplier, distributor, or other lower tier Contractor, to illustrate a portion of the work.

- Product Data. Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the work, but not prepared exclusively for this TO.

- Samples. Physical examples of products, materials, equipment, assemblies, or workmanship, physically identical to a portion of the work, illustrating a portion of the work or establishing standards for evaluating the appearance of the finished work or both.

- Administrative Submittals. Submittals of data for which reviews and approval will be required to ensure that the administrative requirements of the project are adequately met but not to ensure directly that the work is in accordance with the design concept and in compliance with the contract documents."

Section 3, QMP – 16.2 provides the complete Submittal Management Procedure.

### 4.6.2 Submittal Register

For each Contract Task Order a submittal register will be submitted and maintained. An initial submittal register will be included in the Project QC Plan. The submittal register is to be updated with the status and dates of each submittal. It is an all inclusive status document, which identifies the submittals to be transmitted for timely review and approval. The submittal register is to correspond to the construction schedule, be approved, and must reflect the current status of each submittal within the submittal process. A thorough description of the submitted register and completion process is included in QMP – 16.2.

## 4.7 CONSTRUCTION TESTING

The Site QC Manager will ensure testing is completed as required by the site specific Contract Task Order. The required testing will be defined in the testing plan and log submitted with the Project QC Plan for approval.

### 4.7.1 Testing Laboratory Requirements

An independent testing laboratory qualified to perform sampling and testing required by the contract will be provided. Laboratories performing work in connection with construction testing will be certified to the methods specified by each Contract Task Order.

#### 4.7.1.1 References

The publications listed below form a part of the Contract Specification to the extent referenced.

AMERICAN SOICIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM A 880 | 1989 Criteria for use in Evaluation of Testing Laboratories and Organization for Examination and Inspection of Steel, Stainless Steel, and Related Alloys |
| ASTM C 1077 | 1990 Laboratories Testing Concrete and Concrete Aggregates for Use In Construction and Criteria for Laboratory Evaluation |
| ASTM D 3666 | 1990 (Rev. A) Evaluating and Qualifying Agencies Testing and Inspecting Bituminous Paving Materials |
| ASTM D 3740 | 1988 Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction |
| ASTM E 329 | 1990 Use in the Evaluation of Testing and Inspection Agencies as Used in Construction |
| ASTM E 543 | 1989 (Rev. A) Determining the Qualification of Nondestructive Testing Agencies |

U.S. ARMY CORPS OF ENGINEERS (COE)

U.S. Army Corps of Engineers (COE) "Safety and Health Requirements Manual," EM-385-1-1, September 1996, revised.

NAVAL FACILITIES ENGINEERING SERVICES CENTER (NFESC)

Navy Installation Restoration Chemical Data Quality Manual, SP-2056-Env, September 1999.

### 4.7.2 Accredited/Certified Laboratories

#### 4.7.2.1 Non-Environmental Projects

Acceptable accreditation programs are the National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO) Program, and the American Association for Laboratory Accreditation (AALA) Program. Furnish to the Contracting Officer or designated representative, a copy of the certificate of accreditation, scope of accreditation, and latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation shall include the test methods required by the contract. Any deviation from the above requirements must be approved in writing by the Contracting Officer or designated representative. On-site chemical analysis by mobile laboratories must be performed by laboratories certified by the State (if available) in which the project/site is located.

#### 4.7.2.2 Environmental Projects

Laboratories that Shaw has under contract have performed or are currently performing analysis in support of the Navy’s Installation Program and have undergone successful reviews by other DOD agencies including: AFCEE (Air Force Center for Environmental Excellence) Installation Restoration Program U.S. Air Force; DERP (Defense Environmental Restoration Program) U.S. Army Corps of Engineers; MRD (Missouri River Division) U.S. Army Corps of Engineers; CLP (Contract Laboratory Program) current certification and participation-U.S. Environmental Protection Agency. Other relevant federal agency reviews or approvals other than those listed may be considered, but require Contracting Officer approval.

When analytical work under a specific Task Order is scheduled to be greater than one year in duration, the Contractor is required to submit laboratories performing analytical work for the delivery order for approval per NFESC SP-2056-ENV, September 1999.

- Data Quality Objectives (DQO's) shall be established and named in the Work Plan, utilizing the appropriate DQO designators as defined in NFESC SP-2056-ENV, September 1999.

- Data deliverables shall be as specified in NFESC SP-2056-ENV, September 1999.

- Data validation shall be as specified in NFESC SP-2056-ENV, September 1999. Approximately 10% of analytical data shall be validated, excluding waste characterization and field screening sampling.

- Specific analytical laboratory analysis shall be performed utilizing U.S. Environmental Protection Agency (EPA) methods and quality control. Deviations from this protocol shall be approved by Navy personnel on a project specific basis.

- Laboratories must hold any state approval, certification, or license as may be required by the state in which the sample originates.

Any deviation from the above requirements must be approved in writing by the appointed QA Officer (QAO) of the applicable engineering Field Division/Activity (EFD/A).

#### 4.7.2.3 Non-Navy Projects

Accreditation requirements for laboratories performing work funded by other DoD programs, will be considered on a case-by-case basis, and must be approved in writing by the appointed QAO.

#### 4.7.2.4 Inspection of Testing Laboratories

Prior to approval of non-accredited laboratories, the proposed testing laboratory facilities and records may be subject to inspection by the Contracting Officer or designated representative.

#### 4.7.2.5 Capability Check

The Contracting Officer or designated representative retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this contract.

The Contracting Officer or designated representative retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this contract.

#### 4.7.2.6 Test Results

Shaw will use a chain of custody (COC) form when samples are sent to the testing laboratories. The COC will cite applicable contract requirements, tests, or analytical procedures to be conducted. The COC form is presented in Section 4.0. The actual results received from the laboratory will be accompanied with a signature that will certify that the analysis was completed in accordance with the specified procedures as approved by the accrediting agency. When the acceptance criteria for the analytical results are defined in the TO the cover sheet of the results will be stamped for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the acceptance criteria. When a review of the results is necessary to determine if acceptable to the design use a summary of the results will be attached with possible recommendations. Test results shall be signed by a testing laboratory representative authorized to sign certified test reports. The signed reports, certifications, and other documentation will be furnished to the Contracting Officer or designated representative.

A summary report of field tests will be submitted at the end of each month. A copy of the summary report will be attached to the last Daily Contractor Quality Control Report of each month. For test results involving environmental samples, deliverables shall be defined in the Task Order Work Plan.

## 4.8 QC CERTIFICATIONS

Upon completion of work under a Contract Task Order, the Site QC Manager shall furnish a certificate to the Contracting Officer or designated representative attesting that "the work has been completed, inspected, and tested, and is in compliance with the contract." This statement will be furnished as part of the final completion report for the Task Order.

## 4.9 QC DOCUMENTATION

Current and complete records of on-site and off-site QC program operations and activities will be maintained by the Site QC Manager.

### 4.9.1 Contractor Production Report

Production Reports will be provided for each day that work is performed and will be attached to the Contractor Quality Control Report prepared for the same day accounting for each calendar day throughout the life of the contract. The reporting of work will be identified by terminology consistent with the construction schedule. Contractor Production Reports will be prepared, signed, and dated by the project superintendent and will contain the following information:

a) Date of report, report number, name of Contractor, contract number, title and location of contract, and superintendent present.

b) Weather conditions in the morning and in the afternoon including maximum and minimum temperatures.

c) A list of Contractor and subcontractor personnel on the work site, their trades, employer, work location, description of work performed, and hours worked.

d) A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met including the results on the following:

   (1) Was a job safety meeting held? (If YES, attach a copy of the meeting minutes)

   (2) Were there any lost time accidents? (If YES, attach a copy of the completed OSHA report)

   (3) Was trenching, scaffold, high-voltage electrical, or high work done? (If, YES, attach a statement or checklist showing inspection performed)?

   (4) Was hazardous material or waste released into the environment? (If YES, attach description of incident and proposed action).

e) A list of equipment and material received each day that is incorporated into the job.

f) A list of construction and plant equipment on the work site including the number of hours used, idle and down for repair.

g) Include a "Remarks" section in this report which shall contain pertinent information including directions received, problems encountered during construction, work progress

and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered, and a record of visitors to the work site.

### 4.9.2 Contractor Quality Control Report

Reports will be provided for each day that work is performed and for every 7 consecutive calendar days of no work on the last day of that no-work period. Each calendar day throughout the life of the contract will be accounted for. The reporting of work will be identified by terminology consistent with the construction schedule. Contractor Quality Control Reports will be prepared, signed, and dated by the Site QC Manager and will contain the following information:

a) Identify the control phase and the definable feature of work.

b) Results of the preparatory phase meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Verify in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing plan has been reviewed, and work methods and schedule have been discussed.

c) Results of the initial phase inspection/meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Verify in the report that for this definable feature of work the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the contract, and the required testing has been performed, and include a list of who performed the tests.

d) Results of the follow-up phase inspections held, including the location of the definable feature of work. Verify in the report for this definable feature of work that the work complies with the contract as approved in the initial phase, and that required testing has been performed, and include a list of who performed the tests.

e) Results of the three phases of control for off-site work, if applicable, including actions taken.

f) List rework items identified, but not corrected by close of business.

g) As rework items are corrected, provide a revised rework items list along with the corrective action taken.

h) Include a "Remarks" section in this report which will contain pertinent information including directions received, QC problem areas, deviations from the Project QC Plan, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the Project QC Manager, and corrective action taken by the Contractor.

i) Contractor Quality Control Report certification.

### 4.9.3 Testing Plan and Log

As tests are performed, the Site QC Manager will record on the testing plan and log the date the test was conducted, the date the test results were forwarded to the Contracting Officer or designated representative, and any remarks and acknowledgment that an accredited or Contracting Officer approved testing laboratory was used. Attach a copy of the updated testing plan and log to the last daily Contractor Quality Control Report of each month.

### 4.9.4 Rework Items List

The Site QC Manager will maintain a list of work that does not comply with the contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the Contractor rework items list to the last daily Contractor Quality Control Report of each month. The Contractor will be responsible for including on this list items needing rework including those identified by the Contracting Officer or designated representative.

### 4.9.5 As-Built Records

The Site QC Manager will review the as-built records to ensure that as-built records are kept current on a daily basis and marked to show deviations, made from the Contract Drawings and Specifications. Two sets of as built records (redline drawings) will be maintained at the site. Each deviation will be identified with the appropriate modifying documentation (i.e. VR-002

signed 3/20/03). The Site QC Manager shall initial each deviation or revision. These as-built drawings include buried or concealed structures and utility features revealed during the course of the site work. Upon completion of work, the Site QC Manager shall submit a certificate attesting to the accuracy of the as-built records to the Contracting Officer or designated representative. A copy of the marked set of prints and updated CADD drawings, if required by the TO will be submitted.

Care will be taken with the As-built Records. The records must be maintained with the wording AS-BUILT RECORDS – DO NOT REMOVE OR DEFACE clearly marked on the front.

**FIGURE 4-1**

**QC Meeting Agenda**
**Bi-Weekly QC Meeting**
**Date**
**Work performed from ---- to ----**
**Contract #N62470-02-D-3260 TO**
**(Project Name & Location)**

**Meeting Conducted by:**

## 1. RESULTS OF REVIEW OF THE PREVIOUS QC MEETING MINUTES

## 2. VARIANCE REQUEST/REQUEST FOR INFORMATION/WORK DIRECTIVES STATUS:

**2a. Variance Request and Request for Information Approved Since Last Meeting/Pending Approval**

| VR/RFI | DATE INITIATED | DESCRIPTION | STATUS |
|---|---|---|---|
| | | | |

**2b. Work Directives Approved since Last Meeting/Pending Approval**

| WD No. | DATE INITIATED | DESCRIPTION | STATUS |
|---|---|---|---|
| | | | |

## 3. SCHEDULE AND STATUS OF WORK:

**3a. Work accomplished since last meeting**

| DEFINABLE FEATURE | ACTIVITY | PREPARATORY PHASE DATE | INITIAL PHASE DATE | FOLLOW-UP STATUS | ACTIVITY SCHEDULED COMPLETION |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**3b. Work to be accomplished before the next QC Meeting (includes both on-site and off-site work and testing).**

| SCHEDULED PREPARATORY PHASES PRIOR TO NEXT MEETING | SCHEDULED DATE |
|---|---|
| | |

## 4. REWORK STATUS

**4a. Rework items identified and pending correction**

| DATE IDENTIFIED | DESCRIPTION OF REWORK REQUIRED | ESTIMATED COMPLETION DATE |
|---|---|---|
| | | |

**4b. Rework items completed since last meeting**

| DATE IDENTIFIED | DESCRIPTION OF REWORK REQUIRED | DATE COMPLETED |
|---|---|---|
| | | |

## 5. STATUS OF SUBMITTALS:

**5a. Submittals reviewed and approved since last meeting**

| SPEC. SECTION | TRANSMITTAL # AND SUBMITTAL DESCRIPTION | DATE APPROVED |
|---|---|---|

| | | |
|---|---|---|
| | | |

**5b. Submittals pending approval**

| SPEC. SECTION | TRANSMITTAL # AND SUBMITTAL DESCRIPTION | DATE SUBMITTED | DATE APPROVAL REQUIRED | REQUIRED BY GVMT OR CONTR |
|---|---|---|---|---|
| | | | | |

**5c.Submittals required in the near future**

| SPEC. SECTION | SUBMITTAL DESCRIPTION | ANTICIPATED DATE TO BE SUBMITTED | ESTIMATED DATE REQUIRED | GVMT OR CONTR APPROVAL |
|---|---|---|---|---|
| | | | | |

**6. TESTING:**

**6a. Testing performed since last meeting**

| SPEC. SECTION | DESCRIPTION OF TEST | DATE COMPLETED |
|---|---|---|
| | | |

**6b. Testing scheduled prior to next meeting**

| SPEC. SECTION | DESCRIPTION OF TEST | SCHEDULED DATE |
|---|---|---|
| | | |

**6c.Testing results pending/received since last meeting**

| SPEC. SECTION | DESCRIPTION OF TEST | STATUS |
|---|---|---|
| | | |

**7. DOCUMENTATION:**

**Documentation required prior to next meeting**

| DOCUMENTATION DESCRIPTION | DATE REQUIRED |
|---|---|
| | |
| | |

**8. STATUS OF AS-BUILTS: (Define changes made since last meeting and provide an explanation for as-built drawings that are not up-to-date).**

**9. QC AND PRODUCTION ISSUES DISCUSSED AND RELATED RESOLUTIONS**:

**10.** OTHER ITEMS DISCUSSED:

**11. ACTION ITEMS:**

(Include items that may require revising the QC plan or changes in procedure)

**12. DATE OF NEXT SCHEDULED QC MEETING:**

# *5.0 SHAW PROJECT QUALITY CONTROLS*

## 5.1 DESIGN CHANGE CONTROL

A Program objective is to govern changes in the field by controls, which are commensurate with those normally applied to the original design. This procedure provides a method for requesting field changes where compliance to Task Order Specifications and drawings cannot be met, or where such changes may result in improved or more cost effective alternatives. The Project Manager is responsible to ensure these documents are prepared in a timely manner, acquiring necessary internal reviews and maintaining a status log. The Project QC Manager will review each document for completeness and accuracy of information prior to submitting to the Remediation Project Manager (RPM) and to the Resident Officer in Charge of Construction (ROICC). Once approved, these documents then become part of the contract requirements and can then be incorporated into the work. The QC Manager will also verify the implementation of actions resulting from approved changes including the identification and marking of affecting drawings and specifications. QMP-5.1, Site Document Control provides guidance for assuring all work is completed as approved through any document changes.

Discussed below are several field documents that provide a formal communication and documentation tool. A single form identified as the RAC field form can be used to prepare each of these documents.

### 5.1.1 Request for Information (RFI)

An RFI is submitted when supportive information or clarification of requirements is needed, the RFI provides a formal communication and documentation tool. This RFI then becomes a traceable document that clarifies information contained in the contract documents. The RFI provides no form of authorization, nor does it create additional work, however, the response to an RFI could result in the need for an adjustment to the Task Order price and or schedule.

### 5.1.2 Variance Request (VR)

A VR is to be used to acquire concurrence for a proposed modification or deviation from the Task Order Specification or drawing requirements. VRs are to be used to propose field changes that will not affect the Task Order price or schedule. Changes via a VR should be minor in nature, create no adverse impact on the design or function of the affected area, and not require a formal contract modification for implementation.

### 5.1.3 Technical Directive (TD)

A TD is to be used to document concurrence by the RPM and ROICC for a proposed modification or deviation when there is an increase or decrease to the scope, and/or an increase or decrease to the cost and/or schedule of a portion of the Task Order, which does not result in a change to the overall cost of the Task Order. However, A TD is not to be used to add scope items that were not in the original negotiated scope. Neither can a TD be used to authorize additional funding to the Task Order. A Task Order Modification must be prepared and submitted to authorize additional funding and/or to add scope items.

### 5.1.4 Overtime Authorization (OTA)

When Shaw or its authorized subcontractor anticipates working hours outside the authorized schedule for the Task Order; the RAC field form is to be used to request such authorization.

This RAC field form and additional details for the procedure are provided in QMP-4.1 located in Section 3 of this Program Plan.

### 5.1.5 Design Change Records

As part of change control the Site QC Manager will ensure the as-built drawings and specification, required by the Contract, are kept current on a daily basis to show deviations, which have been made. Each deviation will be identified with the appropriate modifying documentation (i.e. VR-002, signed 3/20/03). The Site QC Manager will initial each variation and each revision. Upon completion of the work deliver the marked set of prints and updated CADD drawings, if required by the TO will be submitted. The Site QC Manager will certify to the accuracy of the as-built drawings prior to submission to the Contracting Officer or designated representative.

## 5.2 NON CONFORMANCE REPORTING

Items (i.e. material, equipment, parts or components) that do not conform to specified requirements will be controlled to prevent inadvertent installation or use. The controls will include identification, reporting, segregating to prevent use, evaluation, disposition and verification of corrective actions. Any project individual may identify a nonconformance by initiating a Nonconformance Report (NCR), provided in QMP-13.1. The status of each NCR

will be maintained by the Site QC Manager on the NCR Tracking Log, also provided in QMP-13.1.

### 5.2.1 Nonconformance Reporting

Each nonconformance shall be documented on a uniquely identified nonconformance report and initially reviewed, and evaluated by the Site QC Manager and TO Manager. The evaluation will be augmented by personnel having demonstrated competence in the specific areas they are evaluating and adequate understanding of the requirements and where possible by the group or organization which established the original requirements. If possible, resolution shall be obtained at the project level with notification communicated to the program level. If resolution cannot be obtained, it shall be elevated to the Program level for further resolution. The disposition, such as use-as-is, reject, repair, or rework of nonconforming items will be identified and documented. Each nonconformance report will be logged on the Rework Items List. Reporting of the nonconformance will conform to the same criteria that are used to report the rework items. The nonconformance is reported if not corrected within the same day that it is observed and reported to the Foreman or Superintendent.

### 5.2.2 Identification

Marking, tagging, or other methods, which do not adversely affect the end use of the items, will identify Nonconforming items. The identification shall be legible and easily recognized. If identification of each nonconforming item is not practical, the container, the package, or segregated area, as appropriate, will be identified.

### 5.2.3 Segregation

Nonconforming items will be segregated, when practical, by placing them in a clearly identified and designated hold area until properly dispositioned. When segregation is impractical or impossible due to physical conditions, such as size, weight, or access limitation, other precautions (such as tagging) will be taken to prevent inadvertent use of nonconforming items.

### 5.2.4 NCR Verification and Closure

Controls will be established to assure that nonconforming items will be promptly and effectively corrected. The underlying causes and the full extent of the potential impacts of nonconforming items will be determined and corrected in order to prevent their recurrence.

The Site QC Manager shall administer the nonconformance system and shall verify that all nonconforming conditions have been dispositioned, closed, and applicable corrective action has been taken.

## 5.3 CORRECTIVE ACTION

### 5.3.1 Corrective Action Process

A corrective action system shall be implemented and include a method for identifying and tracking programmatic deficiencies from the time of discovery through resolution and verification of corrective action. These deficiencies may be categorized as conditions adverse to quality or as significant conditions adverse to quality.

Conditions adverse to quality will be reported to appropriate levels of management, requiring the condition to be investigated and acceptable corrective action taken in a specified time frame. A significant condition adverse to quality is one that if uncorrected, could have a serious effect on safety or operability, and will require immediate action to prevent recurrence, an evaluation regarding similar work, and a root cause determination. A significant condition adverse to quality may generally result in a stop work action. These conditions will be documented and reported using the Corrective Action Request form provided in QMP-14.1 located in Section 3 of this Plan. The Site QC Manager will track the status of each CAR using the CAR Tracking Log, also provided in QMP-14.1.

The corrective action process shall be extended to the performance of subcontractors and suppliers and shall be responsive to feedback and complaints from the customer. Corrective action measures shall emphasize root cause determination and the prevention of recurrence, in all possible cases.

## 5.4 ASSESSMENTS

A comprehensive system of planned and documented quality assessments will be implemented to evaluate the efficiency and effectiveness of the quality program. These quality assessments will be scheduled on the basis of the status and importance of an activity and will be performed in a manner, which addresses both the aspects of performance and compliance. Regularly scheduled assessments may be supplemented by additional assessments when determined necessary by the Program QC Manager.

Quality program assessments will be performed in accordance with written procedures / checklists by trained and experienced personnel who have no direct responsibility for the work activities being evaluated.

During each assessment, activities will be observed and objective evidence will be examined to determine if compliance is being achieved. As a minimum, the following applicable documents and processes will be evaluated during a typical site quality program assessment:

- As-built drawings
- Drawings and specifications
- QC Plan
- Submittal register
- Submittal review and certification
- Daily reports
- Rework items list
- Testing plan and log
- QC meeting minutes

Assessment results will be documented in a formal report identifying both positive and negative findings, as well as providing recommendations for achieving compliance and improving performance. The assessment report will be distributed to the, ROICC, RPM and Shaw Program Manager.

This report will be issued to management having responsibility for the area assessed and will require timely responses for each negative finding. Each response must include the following:

- The steps to be taken to remedy the condition(s)
- Identification of the cause of the condition
- Actions taken to prevent recurrence;
- Date(s) when corrective action will be completed

Each response will be evaluated, accepted or rejected by the Program QC Manager. When the responses have been accepted and implemented, the Program QC Manager, or designee will perform verification. This verification may include the examination of documentation and/or the actual observation of actions performed, as appropriate. When determined necessary, the Program QC Manager will perform a follow-up assessment.

Records including assessment reports, responses and documented verifications will be maintained by the Program QC Manager.

## 5.5 CONTROL OF MEASURING AND TEST EQUIPMENT

When measuring and test equipment (M&TE) are used for activities affecting quality, both in the laboratory and in the field, the calibration and use of such equipment shall be controlled. The control program shall:

(a) Identify, calibrate and adjust all inspection, measuring and test equipment and devices that can affect quality at prescribed intervals, or prior to use, against certified equipment having a known relationship to nationally recognized standards. Where no such standards exist, the basis used for calibration shall be documented:

(b) Establish, document and maintain calibration procedures, including details of equipment type, identification number, location, frequency of checks, check method, acceptance criteria and the action to be taken when results are unsatisfactory;

(c) Ensure that inspection, measuring and test equipment is capable of the accuracy and precision necessary

(d) Identify inspection, measuring and test equipment with a suitable indicator or approved identification record to show the calibration status

(e) Maintain calibration records for inspection, measuring and test equipment

(f) Assess and document the validity of previous inspection and test results when inspection, measuring and test equipment is found to be out of calibration

(g) Ensure that the environmental conditions are suitable for the calibrations, inspections, measurements, and tests being carried out

(h) Ensure that the handling, preservation and storage of inspection, measuring and test equipment is such that the accuracy and fitness for use is maintained

(i) Safeguard M&TE**,** including both test hardware and test software, from adjustments, which would invalidate the calibration setting.

Where test hardware (e.g., jigs, fixtures, templates, patterns) is used as a means of inspection, it shall be checked to ascertain that it is capable of verifying the requisite level of quality prior to release for use during production and installation and it shall be rechecked at prescribed intervals. The Program shall establish the extent and frequency of such checks and shall maintain records as evidence of control.

A systematic program of preventive maintenance shall be in place to minimize M&TE downtime, and document the preventive and remedial measures taken on each piece of M&TE. Preventive maintenance shall be in accordance with the M&TE manufacturers' written instructions.

The respective personnel are responsible to establish procedures for the control and calibration of measuring and test equipment, which is used in engineering activities (e.g., field sampling, equipment, and system testing, etc.) and site activities.

Subcontractors are responsible for establishing, maintaining, and implementing the calibration control program for measuring and test equipment used to demonstrate the conformance of items within their respective contracts.

The QC staff is responsible to verify that only calibrated M&TE is used at the site, and that inspection and test records identify the M&TE used.

## 5.6 PROCUREMENT

Shaw will establish a program for controlling the procurement of items, materials, and subcontracted services. Shaw will ensure that procured items and services meet established requirements and perform as specified in written procurement documents. Prospective suppliers will be evaluated and selected on the basis of the specified criteria. Shaw will ensure that approved suppliers can provide acceptable items and services as required by the Contract and TO requirements. The Contract Task Order (CTO) Manger is responsible for the procurement process and for ensuring the Site QC Manager is apprised of procurement efforts in advance of procurement. The Site QC Manager is responsible to ensure the items and services will achieve the requirements of the TO and that no items are installed prior to approval of applicable submittals. A copy of the procurement documents such as those listed below will be made available to the Site QC Manager prior to procurement and after execution.

The procurement documents will include provisions for the following, as applicable to the scope of work or services:

(a) Scope of Work. A statement of the scope of work to be performed by the subcontractor will be in the procurement documents.

(b) Technical Requirements. Technical requirements will be specified. Where necessary, these requirements will be specified by reference to specifications, codes, regulations, procedures, quality assurance program documents, and statement of work requirements that describe the services to be furnished. The procurement documents will provide for identification of inspection, verification, and acceptance requirements for monitoring and evaluating the supplier's performance.

(c) Quality Assurance Program Requirements. Procurement documents will require that subcontractors have a documented quality system that implements portions or all of the requirements of this PQCP, as applicable. The extent of the suppliers quality system will depend on the type and use of the service being procured.

(d) Right of Access. At each tier of procurement, the procurement documents will provide for access to supplier's facilities and records for inspection or audit by Shaw or its authorized representative.

(e) Documentation Requirements. Procurement documents at each tier of procurement will identify the documentation required to be submitted to Shaw for information, review, or approval and the time of submittal. The retention times and the disposition requirements for specific quality records will be prescribed.

(f) Questionable or Unusable Data. The procurement documents will include the Team's requirements for reporting and approving disposition of questionable or unusable data.

### 5.6.1 Review of Procurement Documents

The Site QC Manager will ensure that site initiated procurement documents and changes transmitted to the prospective supplier include adequate requirements, performance standards, and quality criteria.

The review of changes and their effects will be completed prior to transmittal to the prospective supplier. This review will include the considerations that the appropriate requirements are specified; any additional or modified performance criteria are determined; and, analysis of any exceptions or changes requested or specified by the supplier.

Personnel having access to pertinent information and having an adequate understanding of the requirements and the intent of the procurement documents will perform reviews.

### 5.6.2 Source Evaluation and Selection

The selection of suppliers and subcontractors will be based on an evaluation of their capability to provide items and/or services in accordance with the specified requirements. Measures for evaluating and selecting procurement sources will be documented and may include one or more of the following:

(a) Evaluation of the supplier's history of providing an identical or similar service, which reflects the current capability

(b) Supplier's current quality assurance records supported by documented qualitative and quantitative information that can be objectively evaluated

(c) Supplier's technical and quality capability as determined by a direct evaluation of their facilities and personnel, an evaluation of the effectiveness of their implementation of their quality system, and, in the case of subcontracted analytical data acquisition services, the successful analysis of a set of performance evaluation samples

(d) Submittals pertaining to the items or services to be provided must be approved prior to use or initiation of the work on the project site.

### 5.6.3 Acceptance of Services

The procurement control will include flow down provisions of the contract and site specify TO. The items and services will be required to achieve the same quality requirements of this PQCP. The acceptance methods used (e.g., source verification, receipt inspection, technical verification of data produced) will be verified. Confirmation of specific characteristics will be performed at intervals and to a depth consistent with the service's complexity, quantity and frequency of procurement, and statement of work requirements.

### 5.6.4 Receipt Inspection and Verification

The QC staff will develop and implement procedures for receipt inspection and verification of purchased items. These controls will provide for the following, as applicable:

(a) Verification that the items received is in accordance with purchase order requirements

(b) Inspection for evidence of breakage, damage, or otherwise being unfit for use

(c) Verification that required documentation is received and is acceptable

(d) Verification that the items conform to the supplier's published requirements that were provided, submitted and approved.

SOPs may be utilized for receipt inspection, and verification of purchased items. When necessary, these procedures may also be supplemented by the site-specific instructions. QMP – 10.3 in Section 3 of this PQCP provides more thorough detail and the forms that may be used for receipt inspection.

### 5.6.5 Handling, Storage, Packaging and Shipping

The handling, storage, cleaning, preservation, packaging and shipping of items shall be controlled to prevent damage or deterioration to the level required to achieve the specified performance of the items.

Procurement documents shall include the following:

(a) Requirements for sellers to establish special procedures, when necessary, to ensure cleanliness, identification and proper handling;

(b) Requirements for the preparation of items for shipment, as necessary, to prevent damage or deterioration of the supplied items;

(c) Requirements for material and equipment storage instructions, when specified, to be available at the site well in advance of the arrival of material/equipment.

## 5.7 CUSTOMER PROPERTY

Shaw will exercise care with customer property for use or incorporation into the work product, including materials, equipment and intellectual property while under its control. Shaw shall identify, verify, protect, and maintain customer property. The Project Manager and Superintendent will identify, protect and maintain customer property for which it is responsible. Customer property that is lost, damaged, or otherwise unsuitable for use will be reported to the customer. Acceptance by Shaw does not absolve the customer of the responsibility to provide suitable products. An inventory of customer property will be maintained.

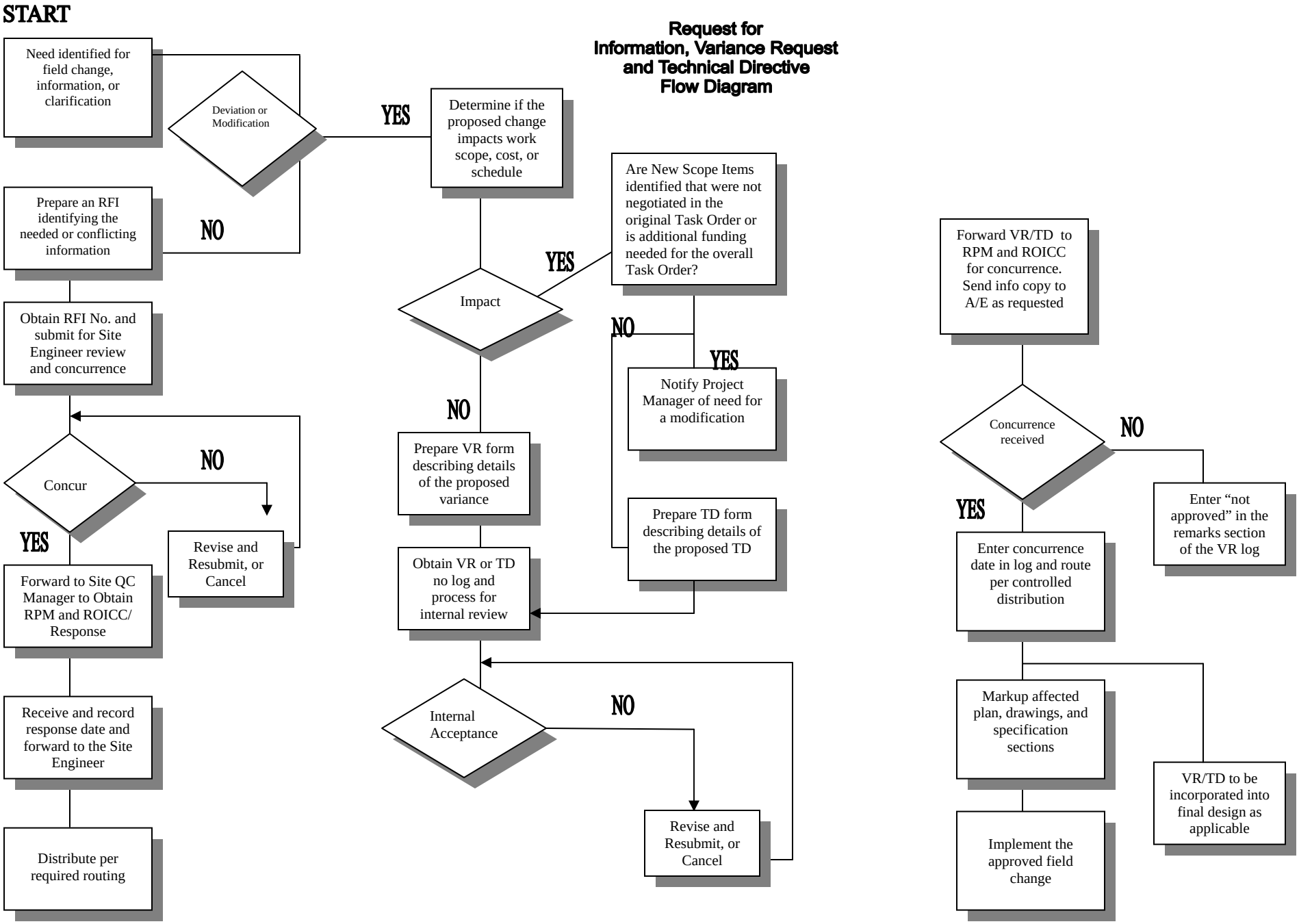
START
Request for Information, Variance Request and Technical Directive Flow Diagram
Need identified for field change, information, or clarification
Deviation or Modification
YES
NO
Determine if the proposed change impacts work scope, cost, or schedule
Prepare an RFI identifying the needed or conflicting information
Obtain RFI No. and submit for Site Engineer review and concurrence
Concur
NO
YES
Revise and Resubmit, or Cancel
Forward to Site QC Manager to Obtain RPM and ROICC/ Response
Receive and record response date and forward to the Site Engineer
Distribute per required routing
Impact
YES
NO
Are New Scope Items identified that were not negotiated in the original Task Order or is additional funding needed for the overall Task Order?
YES
NO
Notify Project Manager of need for a modification
Prepare VR form describing details of the proposed variance
Prepare TD form describing details of the proposed TD
Obtain VR or TD no log and process for internal review
Internal Acceptance
NO
Revise and Resubmit, or Cancel
Forward VR/TD to RPM and ROICC for concurrence. Send info copy to A/E as requested
Concurrence received
NO
YES
Enter "not approved" in the remarks section of the VR log
Enter concurrence date in log and route per controlled distribution
Markup affected plan, drawings, and specification sections
VR/TD to be incorporated into final design as applicable
Implement the approved field change

**Figure 5-1**

# *Appendix E*
# *Field Sampling and Analysis Plan (FSAP)*

**APPENDIX E**

# FIELD SAMPLING AND ANALYSIS PLAN FOR INTERIM REMOVAL ACTION AT SITE 57 – BUILDING 292 TCE CONTAMINATION NAVAL SUPPORT FACILITY INDIAN HEAD INDIAN HEAD, MARYLAND

Contract No. N62470-03-D-4402
Task Order No. 025

Prepared for:

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May 2006
Project No. 120359

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| Attachment 3 | Laboratory Standard Operating Procedures (LCS and MS/MSD Control Limits) |
| Attachment 4 | Accutest Laboratory Quality Systems Manual |


## List of Acronyms

| | |
|---|---|
| BTEX | Benzene, Toluene, Ethylbenzene and Xylenes |
| °C | degrees Celsius |
| CFR | Code of Federal Regulations |
| CLP | Contract Laboratory Program |
| COC | Chain of Custody |
| DoD | Department of Defense |
| FDEP | Florida Department of Environmental Protection |
| FSAP | Field Sampling Analysis Plan |
| GC/MS | Gas Chromatograph/Mass Spectrometer |
| ISO | International Standards Organization |
| LANTDIV | Department of Navy, Atlantic Division |
| LCS | Laboratory Control Samples |
| LIMS | Laboratory Information Management System |
| MB | Method Blank |
| MDE | Maryland Department of the Environment |

| | |
|---|---|
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicates |
| NELAC | National Environmental Laboratories Accreditation Conference |
| NSF-IH | Naval Support Facility, Indian Head |
| NTR | Navy Technical Representative |
| pH | potential of Hydrogen |
| PPE | Personal Protective Equipment |
| PVC | polyvinyl chloride |
| QC | Quality Control |
| RCRA | Resource Conservation and Recovery Act |
| SSHSP | Site-Specific Health and Safety Plan |
| SOPs | Standard Operating Procedures |
| TAT | Turn Around Time |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USEPA | United States Environmental Protection Agency |

# 1.0 Introduction

This Field Sampling and Analysis Plan (FSAP) has been developed to address sampling and analysis procedures for the interim removal action at Site 57 – Building 292 TCE Contamination at the Naval Support Facility, Indian Head (NSF-IH) located in Indian Head, Maryland. FSSI/Shaw has prepared this FSAP in accordance with the Scope of Work (SOW) for Task Order 025 under the Department of Navy, Atlantic Division (LANTDIV) contract Number N62470-03-D-4402.

## 1.1 Types of Sampling

This section discusses the sampling and analysis activities associated with the removal activities at Site 57. Several site activities will require sampling and analysis as identified below.

- **Waste Characterization Sampling:** Representative samples will be obtained from the excavated material staged in the material storage pad at Site 57. The samples will be submitted to an offsite laboratory for characterization. The results of the samples will be evaluated against the Toxicity Characteristic Leaching Procedure (TCLP) Maximum Contaminant Concentrations (40 CFR 261, 6/96) and used to prepare the waste profiles for off-site disposal. In addition, specialized waste may be excavated which requires separate waste characterization such as containerized soils/liquids.
- **Clean Fill Sampling:** Soil samples of the offsite fill material (backfill and topsoil) will be obtained and analyzed for clean fill parameters prior to delivery to the site. All samples will be evaluated against the TCLP Maximum Contaminant Concentrations [40 Code of Federal Regulations (CFR) 261, 6/96].

Sampling procedures will be compliant with USEPA, Maryland Department of Environment (MDE), and applicable Department of Defense (DoD) specifications. The remaining of sections of this FSAP address information that is consistent for any type of field sampling.

# 2.0 Sampling Methods and Procedures

This section identifies the frequencies and the analyses to be performed for each sample collected for the sampling activities.

## 2.1 Waste Characterization Sampling

Approximately 606 cubic yards of material will be excavated from Site 57. Representative samples will be obtained of the waste. The sample results will be used to characterize the waste and to prepare the waste profiles for the disposal documentation. Initially, one discrete waste sample will be collected from each of the locations for this purpose.

Additional sampling and analysis may be required for the disposal facility based on possible changes to the waste stream. The following Field Sampling Standard Operating Procedures (SOPs), provided in Attachment 1, should be used when collecting the waste characterization samples:

- Sample Homogenization, SOP T-FS-010, Revision Date 06/05/2003
- Compositing Samples, SOP-T-FS-011, Revision Date 08/14/03
- Sampling of In-Process Piles, SOP-TFS-106, Revision Date 12/05/03.

The non-disposable sampling equipment will be thoroughly cleaned prior to sampling and between samples using the decontamination procedures described in Section 2.7. Field sampling personnel will wear disposable sampling gloves during sampling and will change gloves between sample locations to minimize the potential for cross-contamination. Other personal protective equipment (PPE) may be required for sampling as per the Site-Specific Health and Safety Plan (SSHSP). Contact with the sample should be avoided to minimize the potential for cross-contamination as described in Section 2.8.

# TABLE 2-1

## Sampling and Analysis Summary

| Sample Location | Sample Point | Matrix | Sampling Frequency | Approx Sample No | Sampling Method | Sampling Equipment | TAT | QC Level | Required Analysis | Analytical Method | Holding Time | Preservatives | Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waste Disposal Sampling | Stockpiled Soil | Soil | 1 per 500 Cubic yards of material | 2 Field Samples | Grab | Steel Bowl | 7 Day (Calendar) | Summary Report | TCLP Volatiles | SW846 1311/8260B | 14 days to leaching/ 14 Days to analysis | Cool to 4° C | 1-4oz jar |
| | | | | | Composite | | | | TCLP Semivolatiles | SW846 1311/8270C | 14 days to leaching/ 40 days analysis | | 3-8oz jar |
| | | | | | | | | | TCLP Pesticide | SW8461311/8081A | | | |
| | | | | | | | | | TCLP Herbicides | SW846 1311/8151A | | | |
| | | | | | | | | | TCLP Metals | SW846 1311/6010B/SW846 7470A | 180 Days/ Hg 28 days | | |
| | | | | | | | | | Ignitability (Flashpoint) | SW846 1010 | 14 Days | | |
| | | | | | | | | | Reactivity | SW846 CHAP 7.3.3.2/ 7.3.4.1 | 7 Days | | |
| | | | | | | | | | Corrosivity as pH | SW846 CHAP 7.3 | Immediate | | |
| | | | | | | | | | PCBs | SW846 8082 | 14 days to extraction/ 40 days analysis | | |
| | | | | | | | | | TPH GRO/DRO | SW846 8015 M | 14 Days to analysis - GRO 14 days to extraction/ 40 days analysis | | |
| Clean Fill Sample | Clean Fill Source | Soil | 1 per clean fill source | 3 samples | Grab | Shovel | 7 Day (Calendar) | Summary Report | TCLP Volatiles | SW846 1311/8260B | 14 days to leaching/ 14 Days to analysis | Cool to 4° C | 1-4oz jar |
| | | | | | | | | | TCLP Semivolatiles | SW846 1311/8270C | 14 days to leaching/ 40 days analysis | | |
| | | | | | | | | | TCLP Pesticide | SW8461311/8081A | | | |
| | | | | | | | | | TCLP Herbicides | SW846 1311/8151A | | | |
| | | | | | | | | | TCLP Metals | SW846 1311/6010B/SW846 7470A | 180 Days/ Hg 28 days | | |
| Decon Water | Decon Water | Water | 1 per 500 gallons | 2 Samples | Grab | Teflon Bailer | 7 Day (Calendar) | Summary Report | TCLP Volatiles | SW846 1311/8260B | 7 days to leaching/ 14 Days to analysis | 1:1 HCL, Cool to 4° C | 3-40 ml voa vials |
| | | | | | Composite | | | | TCLP Semivolatiles | SW846 1311/8270C | 7 days to leaching/ 40 days analysis | Cool to 4° C | 2-1 L Amber |
| | | | | | | | | | TCLP Pesticide | SW8461311/8081A | | Cool to 4° C | 2-1 L Amber |
| | | | | | | | | | TCLP Herbicides | SW846 1311/8151A | | Cool to 4° C | 2-1 L Amber |
| | | | | | | | | | TCLP Metals | SW846 1311/6010B/SW846 7470A | 180 Days/ Hg 28 days | Cool to 4° C | 1-500 ml nalgene |
| | | | | | | | | | Ignitability (Flashpoint) | SW846 1010 | 14 Days | Cool to 4° C | 1-500 ml nalgene |
| | | | | | | | | | Reactivity | SW846 CHAP 7.3.3.2/ 7.3.4.1 | 7 Days | NaOH and Zinc Acetate | 1- 500ml nalgene with NaOH and 1-500 ml Nalgene with |
| | | | | | | | | | Corrosivity as pH | SW846 CHAP 7.3 | Immediate | Cool to 4° C | 1-500 ml nalgene |
| | | | | | | | | | PCBs | SW846 8082 | 7 days to extraction/ 40 days analysis | Cool to 4° C | 2-1 L Amber |
| | | | | | | | | | TPH GRO/DRO | SW846 8015 M | 14 Days to analysis - GRO 7 days to extraction/ 40 days analysis | 1:1 HCL, Cool to 4° C | |

## 2.2 Clean Fill Sampling

Sampling and analysis will be conducted on offsite soil used for the backfill and topsoil materials. One composite soil sample will be obtained from each of the proposed offsite borrow sources and analyzed for the corresponding parameters listed in Table 2-1. The procedures for sample acquisition are provided in Attachment 1.

## 2.3 Liquid Waste Sampling

During activities at the site, containerized water may be generated. This liquid waste may consist of decontamination water and/or water from handling pads. The liquid waste for this site will be collected, properly labeled, and contained until sampling, analysis, and disposal are arranged. The analysis of the container(s) will be performed in accordance with the criteria given in Table 2-1 to determine proper disposal. One sample per liquid type or drum will be collected through the bung port of the drum and placed in the appropriate sample containers for labeling, packaging, and shipment to the offsite laboratory.

## 2.4 Sample Identification and Labeling

Any samples placed into a sample container will be identified by a sample label. The sample label will identify the following information:

- PROJECT NUMBER
- DATE (Month, day, year)
- TIME (Military time)
- SAMPLE NUMBER
- SAMPLE DESCRIPTION
- SAMPLER (Sampler's name)
- PRESERVATIVES
- ANALYSIS REQUIRED (See Table 2-1)

The samples collected on site will be given a unique sample number in accordance with the Sample Nomenclature SOP for Indian Head (Attachment 2). The number will serve to identify

the site, location, and specific sample identification number. The sample number format will be as follows:

XXXXX-ST-SM-NNN

where:

| | |
|---|---|
| XXXXX = | Project Number |
| ST = | Sample type (DW = disposal waste, DL = disposal liquid, DD = disposal drum, CF = clean fill source, TS = top soil) |
| SM = | Sample Matrix (SO=Soil, Aq=Aqueous) |
| NNN = | Sequential number starting at 001 (Sequence number in Sample Log Book) |

Sample location information will be included in the sample description area of the Chain-Of-Custody (COC). Sample sequential numbers are not to be duplicated. Duplicate samples, if required, will be sent to the offsite laboratory as a blind sample (i.e., different sample matrix and number).

## *2.5 Sample Containers, Preservation and Holding Times*

Samples must be placed in sample containers certified by the manufacturer to be pre-cleaned to USEPA specifications. Containers provided by the fixed-base laboratory will be compatible with the matrix and intended analysis, and properly prepared and preserved to maintain sample integrity. Table 2-1 specifies the types of containers needed for each analytical method and matrix.

Physical and chemical preservation includes techniques designed to stabilize the concentrations of analytes in the sample matrix during the time from sample collection through preparation and analysis. All samples shall be preserved by cooling to $4^{o}C \pm 2^{o}C$ immediately after sample collection. Whenever possible, chemical preservatives will come prepared from the laboratory.

The final potential of Hydrogen (pH) of the chemically-preserved samples will be checked using pH paper and the result recorded. The pH paper will not be dipped into the sample container to measure pH, but an aliquot of sample shall be removed for pH testing and then properly disposed. If the pH check indicates pH adjustment is necessary, additional preservative will be added to attain the correct sample pH.

A sample holding time establishes the recommended maximum time that a sample may be held under preservation before extraction and analysis without compromising sample integrity. Preservation techniques and holding times are standardized by the USEPA according to analytical methods. Table 2-1 summarizes the latest information on preservation techniques and holding times for the requested analyses.

Chemical preservation is not usually recommended for solid matrix samples. Unpreserved samples that require preservation by the laboratory should be indicated on the sample label and should be flagged on the COC to identify these samples to the laboratory receiving personnel as requiring special handling.

## *2.6 Field Quality Control Samples*

Field quality control samples are not required (i.e. duplicate samples or equipment blank samples) since the only field samples that are to be collected are for waste characterization disposal identification.

## *2.7 Decontamination*

All sampling equipment (hand shovels, spoons, stainless steel/glass mixing bowls, etc.) will be decontaminated before sampling begins, between each sample location, and prior to leaving the site. The procedures for decontamination of equipment are as follows:

- Remove gross contamination by scraping or brushing.
- Clean with organic free water and phosphate free laboratory detergent (Liquinox™), using a stiff brush to remove all surface contaminants.
- Rinse thoroughly with organic free water and allow to air dry. Do not rinse with deionized/distilled water. If organic free water is not available, allow equipment to air dry.

Decontamination fluids will be collected in properly labeled 55-gallon drums, and staged in a secure area until final disposal, unless other arrangements are made.

## 2.8 Cross-Contamination Minimization

Cross contamination is the introduction of contaminants into the sample through the sampling and/or sample handling procedures. It can cause an otherwise representative sample to become non-representative. The most important means of minimizing cross contamination are as follows:

- Sampling expendables (i.e., sample gloves, glass thieves, tongue depressors, pipettes, string, dip jars, etc.) should not be reused. Used expendables should be labeled so they are not confused with non-contaminated trash.
- Minimum contact should be made between the sampler and the sample medium. For example, a sampler or sample gloves should not touch the sample while loading the sample into the container.
- Sample collection activities should proceed progressively from the least contaminated area to the most contaminated area.
- Sampling equipment should be constructed of Teflon®, stainless steel, or glass that has been properly pre-cleaned for collecting samples. Equipment constructed of plastic or polyvinyl chloride (PVC) should not be used to collect samples for trace organic analyses.
- Any tools used in sampling must be carefully decontaminated prior to first use and after each use.
- Activities that could contaminate samples are prohibited in the sample handling and preparation area. These activities and the possible contaminants include:

| ***Activity*** | ***Possible Contaminants*** |
|---|---|
| Smoking | Poly Aromatic Hydrocarbons |
| Spraying for insects | Pesticides, oils, solvents |
| Spraying for weeds | Herbicides, oils, solvents |
| Refueling | Benzene, toluene, ethylbenzene and xylenes (BTEX) and hydrocarbons |
| Painting and paint stripping | Solvents |

## 2.9 Sample Logbook

It will be necessary for the sampling person or crew to maintain daily field notes in a dedicated bound field logbook. Items that must be included are notes relating to sampling protocol, any changes to the procedures, meetings, instructions, safety precautions, personnel protection, and

activities pertaining to the samples. The person taking notes must be knowledgeable enough about these activities to know which details are important.

Repetition of information recorded in other permanent logs should be avoided, but enough information should be recorded to present a clear and accurate picture of technical activities. At a later date, should a question arise concerning a specific event or a procedure used, it will be answered from these notes. The following information should be logged into the logbooks and/or database:

- Date and time of sampling.
- Sample number, locations, type, matrices, volumes, sample ID and descriptions, type and number of sample containers, names and signatures of individuals performing sampling tasks, COC and air bill numbers, preservatives, date samples were sent, and date results were received.
- Names of laboratories and contacts to which the samples were sent, turn around time (TAT) requested, and data results, when possible.
- Unusual appearance or odor of a sample.
- Weather conditions.
- Additional samples and reasons for collecting them.
- Levels of protection used (with justification).
- Meetings and telephone conversations held with Navy Technical Representative (NTR), regulatory agencies, Project Manager, or Site Superintendent.
- Details concerning any samples split with another agency.

These notes should be dated and signed (each page) for validity. All logbooks will be bound and pre-numbered. All log book entries will be made with indelible ink and legibly written. The language will be factual and objective. No erasures will be permitted. If an incorrect entry is made, the error will be crossed out with a single strike mark, initialed, and dated.

## 2.10 Chain-of-Custody Procedures

Sample custody can be defined as physical possession of samples, having samples within visual range, or having samples located in a restricted access area. Sample possession during all sampling efforts must be traceable from the time of collection until the results are verified and reported. The sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling. The primary piece of documentation to ensure sample custody is the COC Form. Shaw personnel are responsible for providing evidence of sample custody from the time of collection until the laboratory receives the samples. The laboratory will be able to provide documentation of sample custody from that point to sample disposal.

As part of appropriate documentation, all sample bottles will be adequately labeled. The label will present sample identification and collection information. It will be pre-printed from the sample tracking system or completed with indelible ink. At a minimum, all sample labels will include the following sample information:

- Field sample location and unique sample identifier
- Project name and number
- Analysis requested for each bottle
- Method of preservation for each bottle
- Date and time of collection
- Initials of sample technician.

A sample numbering system will be utilized in the field to uniquely identify each sample collected at Site 57 at Indian Head, MD. The sample number will be traceable to the site, location, and depth (where applicable) as described previously in Section 2.4. The sample identification and description will be recorded by the Site Superintendent or representative in the sample collection logs.

### *2.10.1 Field Custody Procedures*

The sampling team with the Site Superintendent will maintain overall responsibility for the care and custody of the collected samples until they are transferred or properly dispatched to the fixed-base laboratory. All shipping or sample transfer activities will be documented.

Transfer of custody and shipping procedures will include:

- The Site Superintendent instructing sampling team personnel in the proper COC procedures before sampling begins.
- A COC entry made in the field for each sample. This document will accompany the samples in shipment, and a copy will be maintained at the site for placement in the project files at the conclusion of field activities. The custody of individual sample containers will be documented by recording each sample identification and the number of bottles on the appropriate COC form.
- COC records initiated in the field will be placed in a plastic bag and taped to the underside of the top of the shipping cooler used for sample transport.
- Each time responsibility for custody of the sample changes, the new custodian will sign and date the record.
- All coolers must be secured at the site with two custody seals prior to transport. Custody seals should be signed and dated by the person relinquishing custody of the samples being shipped. They should be placed over the opening of each cooler so that the cooler cannot be opened without breaking the seal.

### *2.10.2 Laboratory Custody Procedures*

All samples to be analyzed by the fixed-base laboratory will be shipped via overnight courier service. Upon receipt, a representative of the laboratory shall check the integrity of the custody seals, then locate, sign, and date the COC. The laboratory is responsible for verifying that the COC and containers are in agreement. The COC, a Cooler Receipt Form, and information regarding any discrepancies between the COC and bottle labels will be faxed to the Project Chemist prior to preparation for analysis. The Laboratory Information Management System (LIMS) will provide evidence of sample custody from receipt by the laboratory until appropriate disposal.

### *2.11 Packaging, Handling, and Shipment of Samples*

Samples that are collected for offsite laboratory analysis that require overnight shipment will be generally prepared by:

- Sealing the container in an outer Ziploc® storage bag,
- Securely wrapping and taping each collected bottle in bubble wrap (or other similar shock-absorbing material).

At least three sides of the container must be wrapped or surrounded with material when placing the samples into the shipping cooler. Adequate ice will be placed in doubled Ziploc® bags and added to the cooler around and over the top of the sample containers to form a cooling layer. The cooling layer will help ensure proper preservation during shipment. In addition, most samples will have been pre-cooled to the desired temperature prior to packing for shipment. Completed and signed COCs will be placed into the cooler in a protective Ziploc® bag and taped to the underside of the cooler lid. A minimum of two custody seals will be applied across the opening of the cooler and the lid secured by wrapping the cooler with clear plastic packing tape. The cooler will then be ready for shipment according to the methods required by the overnight delivery service. At a minimum, the laboratory address, telephone number, and contact name should be included on the original air bill and, if multiple packages are sent, on each sample cooler.

At all times from the point of sample collection in the field through storage, inventory, preparation, and shipment, the samples must remain sealed, protected from sources of contamination, and adequately preserved by chilling.

As shipping regulations are subject to frequent updates without notification, the sample technician should, at least quarterly, petition a set of applicable shipping regulations from the overnight shipper to be assured of regulatory compliance.

# 3.0 Measurement Performance Criteria

Waste characterization soil sample and clean fill sample results will be evaluated against the TCLP Maximum Contaminant Concentrations (40 CFR 261, 6/96) as listed in Table 3-1.

## 3.1 Analytical Laboratory and Laboratory Certification

Accutest Laboratories Southeast, Inc. located in Orlando, Florida has been chosen to complete the analytical requirements. Accutest Southeast has current standing with National Environmental Laboratories Accreditation Conference (NELAC), and Army Corps validation. Accutest will provide copies to FSSI/Shaw of all current certifications prior to project start up.

### 3.1.1 Laboratory Quality Systems Manual

Accutest has a detailed Quality Systems Manual, Volume VI, Revision II, dated March 2005 that is designed to meet the quality program requirements of NELAC and International Standards Organization (ISO) Guide 25. This Quality Systems Manual is included in Attachment 4.

### 3.1.2 Laboratory Standard Operating Procedures

The laboratory has established SOPs. Each SOP has a specific SOP Number and when revisions are made, a new revision date is applied to the SOP. Distribution of updated SOPs is documented on an SOP cover page. Superseded copies of the SOPs are collected according to the distribution list contained within the SOP cover page. As these documents are updated as required, the staff is trained to apply the changes. The laboratory SOPs are included in Attachment 3. These SOPs provide specific operational instructions on the execution of each quality element. The SOPs also assure that compliance with the requirements of the Quality Systems Manual is achieved. Analytical method SOPs are based upon USEPA approved methods or other recognized standard methods.

### 3.1.3 Laboratory Training Procedures

Laboratory senior management staff retains oversight responsibility for the data integrity program and retains ultimate responsibility for execution of the data integrity program elements.

**Table 3-1**
**Laboratory Limits with TCLP Maximum Contaminant Concentrations**
**Waste Disposal and Clean Fill Samples**
**Site 57**
**Indian Head, Maryland**

| Parameter | CAS Number | Method | Units | TCLP Limit* | Laboratory Reporting Limit | Laboratory Method Detection Limits | Laboratory LCS Limits | Laboratory MS/MSD Limits | Laboratory %RPD |
|---|---|---|---|---|---|---|---|---|---|
| **TCLP Volatiles SW-846 1311 5030B/8260B** | | | | | | | | | |
| Benzene | 71-43-2 | SW846 8260B | mg/l | 0.5 | 0.01 | 0.005 | 80-120 | 72-125 | 7 |
| Chlorobenzene | 108-90-7 | SW846 8260B | mg/l | 100 | 0.02 | 0.005 | 82-112 | 79-113 | 7 |
| Chloroform | 67-66-3 | SW846 8260B | mg/l | 6.0 | 0.02 | 0.005 | 78-118 | 75-120 | 8 |
| Carbon tetrachloride | 56-23-5 | SW846 8260B | mg/l | 0.5 | 0.02 | 0.005 | 69-137 | 56-145 | 12 |
| 1,1-Dichloroethylene | 75-35-4 | SW846 8260B | mg/l | 0.7 | 0.02 | 0.005 | 67-134 | 61-137 | 15 |
| 1,2-Dichloroethane | 107-06-2 | SW846 8260B | mg/l | 0.5 | 0.02 | 0.005 | 68-121 | 64-124 | 7 |
| p-Dichlorobenzene | 106-46-7 | SW846 8260B | mg/l | 7.5 | 0.02 | 0.005 | 77-113 | 74-112 | 7 |
| Methyl ethyl ketone | 78-93-3 | SW846 8260B | mg/l | 200 | 0.1 | 0.025 | 58-127 | 51-128 | 10 |
| Tetrachloroethylene | 127-18-4 | SW846 8260B | mg/l | 0.7 | 0.02 | 0.005 | 75-126 | 70-126 | 9 |
| Trichloroethylene | 79-01-6 | SW846 8260B | mg/l | 0.5 | 0.02 | 0.005 | 80-115 | 73-117 | 10 |
| Vinyl chloride | 75-01-4 | SW846 8260B | mg/l | 0.2 | 0.01 | 0.005 | 70-151 | 63-161 | 18 |
| *Dibromofluoromethane (S)* | | *SW846 8260B* | | | | | *86-115* | | |
| *1,2-Dichloroethane-D4 (S)* | | *SW846 8260B* | | | | | *73-126* | | |
| *Toluene-D8 (S)* | | *SW846 8260B* | | | | | *86-112* | | |
| *4-Bromofluorobenzene (S)* | | *SW846 8260B* | | | | | *83-119* | | |
| **TCLP Semivolatiles SW-846 1311 3510C/8270C** | | | | | | | | | |
| 2-Methylphenol | 95-48-7 | SW846 8270C | mg/l | 200 | 0.05 | 0.02 | 54-91 | 46-100 | 23 |
| 3&4-Methylphenol | | SW846 8270C | mg/l | 200 | 0.05 | 0.02 | 48-86 | 43-100 | 23 |
| Pentachlorophenol | 87-86-5 | SW846 8270C | mg/l | 100 | 0.25 | 0.1 | 50-111 | 44-118 | 16 |
| 2,4,5-Trichlorophenol | 95-95-4 | SW846 8270C | mg/l | 400 | 0.05 | 0.02 | 66-104 | 61-102 | 18 |
| 2,4,6-Trichlorophenol | 88-06-2 | SW846 8270C | mg/l | 2.0 | 0.05 | 0.02 | 60-103 | 55-103 | 21 |
| 1,4-Dichlorobenzene | 106-46-7 | SW846 8270C | mg/l | 7.5 | 0.05 | 0.01 | 60-101 | 51-101 | 23 |
| 2,4-Dinitrotoluene | 121-14-2 | SW846 8270C | mg/l | 0.13 | 0.05 | 0.02 | 60-111 | 60-110 | 16 |
| Hexachlorobenzene | 118-74-1 | SW846 8270C | mg/l | 0.13 | 0.05 | 0.01 | 69-103 | 64-102 | 16 |

| Parameter | CAS Number | Method | Units | TCLP Limit* | Laboratory Reporting Limit | Laboratory Method Detection Limits | Laboratory LCS Limits | Laboratory MS/MSD Limits | Laboratory %RPD |
|---|---|---|---|---|---|---|---|---|---|
| Hexachlorobutadiene | 87-68-3 | SW846 8270C | mg/l | 0.5 | 0.05 | 0.02 | 55-90 | 45-93 | 26 |
| Hexachloroethane | 67-72-1 | SW846 8270C | mg/l | 3.0 | 0.05 | 0.02 | 59-104 | 51-105 | 26 |
| Nitrobenzene | 98-95-3 | SW846 8270C | mg/l | 2.0 | 0.05 | 0.01 | 61-106 | 51-103 | 25 |
| Pyridine | 110-86-1 | SW846 8270C | mg/l | 5.0 | 0.1 | 0.03 | 22-70 | 23-86 | 42 |
| *2-Fluorophenol (S)* | | *SW846 8270C* | | | | | *19-90* | | |
| *Phenol-d5 (S)* | | *SW846 8270C* | | | | | *10-68* | | |
| *2,4,6-Tribromophenol (S)* | | *SW846 8270C* | | | | | *36-137* | | |
| *Nitrobenzene-d5 (S)* | | *SW846 8270C* | | | | | *49-119* | | |
| *2-Fluorobiphenyl (S)* | | *SW846 8270C* | | | | | *45-118* | | |
| *Terphenyl-d14 (S)* | | *SW846 8270C* | | | | | *46-135* | | |
| **TCLP Pesticide SW-846 1311 3510C/8081A** | | | | | | | | | |
| gamma-BHC (Lindane) | 58-89-9 | SW846 8081A | mg/l | 0.4 | 0.0005 | 0.0002 | 69-137 | 75-140 | 21 |
| Chlordane | 12789-03-6 | SW846 8081A | mg/l | 0.03 | 0.005 | 0.0025 | 50-150 | 50-150 | 20 |
| Endrin | 72-20-8 | SW846 8081A | mg/l | 0.02 | 0.001 | 0.0004 | 78-134 | 72-149 | 21 |
| Heptachlor | 76-44-8 | SW846 8081A | mg/l | 0.008 | 0.0005 | 0.0002 | 62-137 | 74-136 | 25 |
| Heptachlor epoxide | 1024-57-3 | SW846 8081A | mg/l | 0.008 | 0.0005 | 0.0001 | 74-130 | 75-138 | 21 |
| Methoxychlor | 72-43-5 | SW846 8081A | mg/l | 10 | 0.001 | 0.0004 | 77-131 | 69-145 | 27 |
| Toxaphene | 8001-35-2 | SW846 8081A | mg/l | 0.5 | 0.025 | 0.015 | 50-150 | 50-150 | 20 |
| ***Tetrachloro-m-xylene (S)*** | | *SW846 8081A* | | | | | ***60-138*** | | |
| ***Decachlorobiphenyl (S)*** | | *SW846 8081A* | | | | | ***31-148*** | | |
| **TCLP Herbicides SW-846 1311/8151A** | | | | | | | | | |
| 2,4-D | 94-75-7 | SW846 8151 | mg/l | 10 | 0.015 | 0.011 | | | |
| 2,4,5-TP (Silvex) | 93-72-1 | SW846 8151 | mg/l | 1.0 | 0.002 | 0.0006 | | | |
| *2,4-DCAA (S)* | | *SW846 8151* | | | | | *23-171* | | |
| **TCLP Metals SW-846 1311 3010A/6010B/7470A** | | | | | | | | | |
| Arsenic | 7440-38-2 | SW846 6010B | mg/l | 5 | 0.02 | 0.0029 | 80-120 | 83-116 | 12 |
| Barium | 7440-39-3 | SW846 6010B | mg/l | 100 | 1.0 | 0.2 | 80-120 | 82-116 | 13 |
| Cadmium | 7440-43-9 | SW846 6010B | mg/l | 1.0 | 0.005 | 0.0006 | 80-120 | 86-119 | 12 |
| Chromium | 7440-47- | SW846 6010B | mg/l | 5 | 0.01 | 0.0005 | 80-120 | 80-115 | 13 |

| Parameter | CAS Number | Method | Units | TCLP Limit* | Laboratory Reporting Limit | Laboratory Method Detection Limits | Laboratory LCS Limits | Laboratory MS/MSD Limits | Laboratory %RPD |
|---|---|---|---|---|---|---|---|---|---|
| | 3 | | | | | | | | |
| Lead | 7439-92-1 | SW846 6010B | mg/l | 5 | 0.05 | 0.0012 | 80-120 | 87-120 | 13 |
| Mercury | 7439-97-6 | SW846 7470A | mg/l | 0.2 | 0.01 | 0.0008 | 80-120 | 84-118 | 10 |
| Selenium | 7782-49-2 | SW846 6010B | mg/l | 1.0 | 0.1 | 0.02 | 80-120 | 84-121 | 13 |
| Silver | 7440-22-4 | SW846 6010B | mg/l | 5.0 | 0.01 | 0.0009 | 80-120 | 77-125 | 14 |
| **PCBs SW-846 3550B 8082** | | | | | | | | | |
| Aroclor 1016 | 12674-11-2 | SW846 8082 | ug/kg | | 17 | 8.3 | 75-123 | 54-138 | 22 |
| Aroclor 1221 | 11104-28-2 | SW846 8082 | ug/kg | | 17 | 13 | | | |
| Aroclor 1232 | 11141-16-5 | SW846 8082 | ug/kg | | 17 | 13 | | | |
| Aroclor 1242 | 53469-21-9 | SW846 8082 | ug/kg | | 17 | 8.3 | | | |
| Aroclor 1248 | 12672-29-6 | SW846 8082 | ug/kg | | 17 | 8.3 | | | |
| Aroclor 1254 | 11097-69-1 | SW846 8082 | ug/kg | | 17 | 8.3 | | | |
| Aroclor 1260 | 11096-82-5 | SW846 8082 | ug/kg | | 17 | 8.3 | 72-124 | 46-138 | 21 |
| Total PCBs | | SW846 8082 | ug/kg | | 35 | | | | |
| *Tetrachloro-m-xylene (S)* | | *SW846 8082* | | | | | *52-136* | | |
| *Decachlorobiphenyl (S)* | | *SW846 8082* | | | | | *49-148* | | |
| **TPH DRO (C10-C28)** | | SW-846 3550B 8015M | mg/kg | | 8.3 | 5 | 62-114 | 31-136 | 36 |
| *o-Terphenyl (S)* | | *SW-846 3550B 8015M* | | | | | *57-115* | | |
| **TPH-GRO (C6-C10)** | | SW-846 5035A 8015M | mg/kg | | 5 | 2.5 | 66-122 | 37-142 | 17 |
| *4-Bromofluorobenzene (S)* | | *SW-846 5035A 8015M* | | | | | *62-135* | | |
| *aaa-Trifluorotoluene (S)* | | *SW-846 5035A 8015M* | | | | | *65-118* | | |
| Cyanide, Total | 57-12-5 | SW846 9014 | mg/kg | | 0.12 | 0.06 | 50-150 | 50-150 | 30 |
| Cyanide, Total (water) | 57-12-5 | SW846 9014 | mg/l | | 0.1 | 0.05 | 75-125 | 70-130 | 20 |
| Sulfide, Total | | EPA 376.1M | mg/kg | | 20 | 20 | 75-125 | 75-125 | 20 |

| Parameter | CAS Number | Method | Units | TCLP Limit* | Laboratory Reporting Limit | Laboratory Method Detection Limits | Laboratory LCS Limits | Laboratory MS/MSD Limits | Laboratory %RPD |
|---|---|---|---|---|---|---|---|---|---|
| Sulfide, Total | | EPA 376.1M | Mg/l | | 2 | 2 | 75-125 | 75-125 | 20 |
| Ignitability (Flashpoint) | | SW846 1010 | Deg. F | | >200 | n/a | n/a | n/a | 38 |
| Corrosivity as pH | | SW846 CHAP7 | | | n/a | n/a | n/a | n/a | 30 |

TCLP Maximum Contaminant Concentrations (40 CFR 261 6/96)*

*Laboratory Generated Limits are subject to change*

Senior laboratory management staff is responsible to provide the resources required to conduct SOP and ethics training and, to operate data integrity evaluation procedures.

Laboratory employees receive technical ethics training during new employee orientation. Additionally, they are required to attend annual ethics refreshment training and to sign an annual ethical conduct agreement, which verifies their understanding of the laboratory's ethics policy and the analysts' ethical responsibilities. Training about data integrity procedures and SOPs is conducted by the individual department's group leaders within the laboratory. All records of training are retained at the laboratory in the individual staff training folders maintained by the laboratory quality assurance officer. All information related to staff qualifications, experience, external training courses, and education are placed into the individual's training file. Verification documentation for laboratory orientation, health and safety, and quality assurance training is also maintained within the training file. Additional training documentation is added to the files soon after additional training occurs. This includes data for initial and continuing demonstrations of proficiency, performance evaluations, study data and notes, and attendance lists from individual and group training sessions.

### *3.1.4 Laboratory Corrective Action and Reporting Procedure*

Routine corrective action is defined as procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters or analytical system specification as defined in the laboratory SOPs. Bench analysts have full responsibility and authority for performing routine corrective action. Routine corrective actions are documented as part of the analytical record.

Defective processes, holding time violations, systematic errors, and quality defects that occur are to be reported immediately by the bench chemist to the section supervisor and a non-conformance record initiated. The section supervisor will notify the designated Shaw Laboratory Project Manager (Heather Wandrey) who will then notify the Shaw LANTDIV Project Chemist. All notifications must be made in a timely manner. The non-conformance record should become part of the analytical record.

### *3.1.5 Laboratory Instrument Calibration Procedures*

Calibrations use a series of reference standards to establish the concentration range for performing quantitative analysis. Method specific procedures for calibration are followed prior

to any analysis and are established in the laboratory SOPs provided in Attachment 3. It is the laboratory's responsibility to maintain logbooks of these calibrations.

#### *3.1.5.1 Initial Calibrations*

Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear calibration curve.

Initial Calibrations are verified using a calibration standard, continuing validity of an existing calibration must be verified prior to sample analysis. The response to the standard must meet the criteria as stated in the laboratory SOPs and indicate that the initial calibration curve remains valid. If the criteria are not achieved, corrective action (re-calibration) is performed before any samples may be analyzed.

#### *3.1.5.2 Continuing Calibration Verifications*

Continuing calibration verification is used on a daily basis to verify whether instrument performance and the quantitation model are relatively unchanged from the day the initial calibration was performed. This process requires testing a known amount of target analyte(s), usually around mid-to-low point of initial calibration, and calculating its value using the quantitation model obtained during the process of initial calibration.

Continuing calibration verification is performed in the beginning of the analytical sequence, then used to verify calibration every ten (10) samples and at the end of the analytical sequence. Such frequency is necessary since the sample matrix is capable of interfering with instrument performance. With the exception of the Gas Chromatograph/Mass Spectrometer (GC/MS) methods, where this is not required; instead, the analytical sequence is restricted to a certain period of time.

In the event of a continuing calibration verification failure, refer to the laboratory method SOP for corrective action, which may include reanalysis of samples.

### *3.2 Laboratory Quality Control Samples*

Prior to the analysis of the field sample, the laboratory analyst must determine that the method is functioning properly. Specific control parameters indicate whether critical processes meet

specified requirements before continuing with the analysis. Method specific control parameters must be established before sample analysis can be conducted. Each of these parameters is related to processes that are under the control of the laboratory and can be adjusted if out of control.

### 3.2.1 Method Blanks (MB)

A method blank (MB) is analyzed during the analysis of any field sample, one per analytical batch. The MB is defined as a sample. It contains the same standards (internal standard, surrogates) and reagents that are added to the field sample during analysis. If the MB contains target analytes at concentrations that exceed the method criteria as defined in the laboratory SOPs, the source of the contamination is eliminated before proceeding with analysis. Corrective action may include re-extraction of sample aliquot and or reanalysis.

### 3.2.2 Laboratory Control Samples (LCS)

Laboratory Control Samples (LCS) are used to monitor laboratory accuracy by calculating the percent recoveries of known spiked compounds. All LCS percent recoveries must be within the specified performance limits. These performance limits are derived from published method specifications or from statistical controls generated from the laboratory method performance data. Table 3-1 lists the performance limits for the project methodology. If the spike accuracy exceeds the performance limits, corrective action, as specified in the laboratory SOP for the method, is performed and verified before continuing with a field sample analysis.

The analysis of samples can be initiated following a successful demonstration of the method operating within established controls. Additional controls are incorporated into the analysis of each sample to determine if the method is functioning with established specifications for each individual sample. Sample Quality Control (QC) data is evaluated and compared to established laboratory performance criteria as defined within the laboratory SOPs. If the criteria are not achieved, the method or the SOP specifies the corrective action required to continue sample analysis. The following three sections discuss sample control parameters.

### 3.2.3 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Matrix Spike (MS)/Matrix Spike Duplicates (MSD) are analyzed once per twenty samples or once for each analytical batch. MS/MSDs are replicate sample aliquots to which the surrogate standard and spike standard are added. The MS/MSDs are then extracted and taken through all

cleanup procedures along with the other samples within the analytical batch to monitor the analytical precision and accuracy for the sample and matrix. Precision and accuracy are method dependent. If precision and accuracy criteria are not achieved, corrective action is required as established in the laboratory SOPs. If the recoveries indicate that the problem is procedure-related, then re-extraction and reanalysis are required. If the recoveries indicate that the failures are sample-related, then the Project Chemist will be contacted and a decision will be made either to report the data as is with a notation in the analytical narrative or to re-extract and re-analyze the samples.

### *3.2.4 Surrogate Spikes (Organic Parameters)*

Surrogate spikes are organic compounds that are similar in behavior to the target analytes but unlikely to be found in nature. They are added to quality control and field samples to measure the method performance for each individual sample. Surrogate accuracy limits are derived form published method specifications or by statistical evaluation of laboratory generated surrogate accuracy data. Accuracy data is compared to the applicable performance limits. If the surrogate accuracy exceeds the performance limits, corrective action, as specified in the method or laboratory SOP, is performed before sample data can be reported. These corrective actions include re-extracting and/or reanalyzing the sample.

### *3.2.5 Internal Standards (Organic Methods)*

Internal standards are retention time and instrument response markers added to every sample to be used as references for quantitation. Their response is compared to reference standards and used to evaluate instrument sensitivity on a sample specific basis. Internal standard retention time is also compared to reference standards to assure that target analytes are capable of being located by their individual relative retention time. If the internal standard retention time criteria (as described in the laboratory SOP) are not met, corrective action is required. If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample reanalyzed. If no instrumentation problem is found, the sample must be reanalyzed. If upon reanalysis the responses are still not within limits, the problem may be considered sample matrix interference.

### *3.2.6 Serial Dilutions (Metals Analysis)*

Serial dilution of metals samples are analyzed to determine if the analytical matrix effects may have impacted the data being reported. If the value of the serially diluted samples does not agree

with the undiluted value with a method specified range, the sample matrix may be causing interference, which may lead to either a high or low bias. If the serial dilution criterion is not achieved as defined with the laboratory SOP, the data should be flagged to indicate possible bias matrix effect.

### 3.2.7 Laboratory Turn-Around Time

All samples for waste disposal characterization and topsoil/backfill analysis as described in Table 3-1 will be analyzed by the laboratory on a seven calendar day turnaround time.

### 3.2.8 Laboratory Reporting Deliverables

All data produced by the laboratory will be required to undergo several levels of review, which will include two levels of management review at the laboratory. Since samples are being collected for waste characterization, the laboratory will be providing a summary report in PDF format which will include the following:

- Signed cover page by Laboratory Director, Harry Behzadi
- Laboratory Analytical Case Narrative
- Sample Summary which will include Client Identification, Laboratory Accession Number, Sampling date and Sampling Time
- Copy of the COC Record
- Copy of Sample Receipt Confirmation Form
- Sample Result Forms I's
- MB Summary Forms, LCS Summary Forms, MS/MSD Forms, and Surrogate Recovery Results will be included.

The laboratory will also submit a Microsoft Excel file containing the data in an electronic deliverable.

### 3.2.9 Laboratory Sample Disposal

All samples will be retained under proper storage conditions for a minimum of 60 days following completion of the analytical report. The laboratory disposes of all laboratory wastes following the requirements of the Resource Conservation and Recovery Act (RCRA). Accutest has

obtained and maintains a waste generator identification number, FLR00001263309002 (FLR designates State of Florida).

Accutest's sample management includes generating a sample disposal list from their LIMS, which lists all samples whose holding period has expired. Data from each sample is compared to the hazardous waste criteria established by the Florida Department of Environmental Protection (FDEP).

Samples containing constituents at concentrations above the criteria are labeled as hazardous, are segregated, and are scheduled for removal from the facility to be disposed as hazardous waste.

### *3.3 Data Verification*

The Shaw LANTDIV Chemist will verify that data has been received for all samples that have been sent to the laboratory. An evaluation of this data will be performed to determine whether the laboratory met the QC requirements as stated in the analytical methods and laboratory SOPs. Analytical results will be compared to TCLP Maximum Contaminant Concentrations (40 CFR 261, 6/96) for the disposal and clean fill samples.

# *Attachment 1*
# *Field Sampling Standard Operating Procedures*

# STANDARD OPERATING PROCEDURE

**Subject: Sample Homogenization**

## 1. PURPOSE

The purpose of this procedure is to establish the method for homogenizing soil, sediment, and other solid or semi-solid matrices so that a uniform matrix is available for sampling. Proper homogenization is very important because it helps ensure that sample aliquots are representative of the whole collected sample and helps minimize sampling error so that other errors included in the measurement process, such as laboratory sample preparation and test measurement, can be better assessed.

## 2. SCOPE

This procedure applies to Shaw Environmental & Infrastructure (Shaw E & I) personnel responsible for the collection of solid matrix samples. The solid matrix must be amenable to mixing. This SOP applies to the collection of solid samples that are to be tested for all analytes except volatile analytes.

## 3. REFERENCES

**3.1** The following are Shaw E & I soil sampling and miscellaneous matrix sampling SOPs to which sample mixing/homogenization may apply:

- T-FS-100 Hand Auger
- T-FS-101 Trowel/Spoon
- T-FS-102 Bulb Planter
- T-FS-103 Soil probe/corer
- T-FS-106 Pile
- T-FS-107 Roll-off
- T-FS-116 Drum
- T-FS-119 Sludge judge
- T-FS-123 Sediment corer

**3.2** The following are examples of approved techniques or methods for performing sample homogenization.

- American Society for Testing and Materials (ASTM), 1998, Reducing Samples of Aggregate to Testing Size, C702.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3, Section E-2, Homogenizing Techniques.

## 4. DEFINITIONS

- **Homogenize**—The use of physical mixing motions to make a uniform sample matrix.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

Sampling equipment materials shall be selected so as to minimize contamination of samples. Sampling equipment shall be either new (never used previously), documented to have been decontaminated, or dedicated to each specific sampling point. Samples for organics analysis should be collected and mixed using glass or stainless steel bowls, trowels, and/or spoons. Samples for metals analysis should be collected and mixed using equipment made of glass or Teflon®.

Certain types of solid matrices may not be amenable to mixing using conventional techniques. For example, certain solids may require grinding and thorough mixing to ensure that the analytes of interest within the sample are homogeneously distributed. It is extremely important that soil and sediment samples be homogenized to ensure that the entire sample is as representative as possible of the media being sampled.

### 6.1 Solid Samples

The following two methods are examples for homogenizing solid samples. Other homogenization techniques may be employed using approved standard methods such as ASTM C702, Reducing Samples of Aggregate to Testing Size.

**Quartering**

- Place the sample on a hard, clean, level surface such as a pan. If such a surface is too small for the desired quantity, a clean sheet of plastic may be used.
- Mix the solid material by turning the entire quantity over three times with a trowel or shovel. For the third time, shovel the material into a cone-shaped pile.
- Carefully press down on the apex of the pile to create a soil layer of uniform thickness and diameter, so that the diameter is approximately 4 to 8 times the thickness and the material in each quarter of the resulting layer is approximately the same as what was in the corresponding quarter from the cone-shaped pile.
- Divide the material in the sample pan or on the plastic into quarters using a shovel or trowel.

- Option 1 – Mix each quarter individually; Two quarters should then be mixed to form halves; the two halves should be mixed to form a homogenous matrix. Option 1 should be repeated if necessary to produce a homogeneous sample.
- Option 2 – Remove two diagonally opposite quarters including any fine material and brush the surface clean; mix and quarter (as per Option 1) the remaining material until the sample media has taken on a uniform appearance.

**Mixing in a Bowl**

- Place the sample in a bowl. Samples for organic analysis should be mixed using bowls and stirrers made of glass or stainless steel, while samples for metals analysis should be mixed using equipment made of glass, stainless steel, or hard plastic. Make sure the bowl is large enough to accommodate the sample, with extra volume to allow for mixing the sample.
- Mix the sample with the stirrer. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over. High moisture samples are more difficult to homogenize. Use an adequate mixing motion for as long as needed to determine by visual observation that the sample media has taken on a uniform appearance.

### 6.2 Aqueous Samples

Aqueous samples do not require homogenization since water is well mixed due to diffusion and bulk convection. If the sample matrix is a viscous liquid, semi-solid, or an aqueous one with suspended solids, the sample shall be thoroughly mixed with a tool of compatible composition for all analyses fractions except volatile analytes. After mixing, immediately transfer the material into the appropriate containers. The sample should be mixed frequently during the container-filling step, in particular if there are a large number of containers, so that the condition of the bulk sampled fluid will be approximately the same when each parameter-specific sample container is filled.

Once a sample has been mixed, it will typically have to be transferred into separate containers for different analyses. However, samples collected for volatile organic compounds, oil and grease, and short-chain organic sulfides analyses may not be homogenized. For these parameters, dedicated samples must be collected without mixing.

## 7. ATTACHMENTS

None.

## 8. FORMS

None.

# STANDARD OPERATING PROCEDURE

**Subject: Compositing**

## 1. PURPOSE

This procedure establishes the method for compositing samples collected in the course of environmental program activities. The objective of this procedure is to provide a standard method for creating composite samples of environmental media. Composites are used to represent the average distribution of properties and can be used to reduce analytical costs or represent well-defined decision boundaries.

## 2. SCOPE

This procedure applies to solid and liquid samples whenever there is a need or desire to perform analysis on a sample representative of a defined boundary (time, area, etc.). Field composite methods are not appropriate for VOC analysis of solids. Composites for these methods must be laboratory derived using either individual grab extracts or other laboratory methods.

## 3. REFERENCES

- U.S. Environmental Protection Agency, 1987, *Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001a, OSWER 9355.0-14, Washington, DC.
- Shaw E & I Standard Operating Procedure T-FS-010, *Sample Mixing/Homogenization*.

## 4. DEFINITIONS

- **Composite Sample**—A sample that is comprised of roughly equal amounts of discrete grabs from a set of sample locations or time/flow increments known as a sample group.
- **Sample Group**—A predetermined number or time/area span of discrete samples, which is composited into one sample for analytical purposes.

## 5. RESPONSIBILITIES

### 5.1. Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

### 5.2. Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient

detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

The discrete samples that are used to prepare a composite sample must be of equal volume and must each be collected in an identical manner. Field documentation must clearly indicate the composite elements on either a map or composite logsheet. There are several types of composite samples.

***Flow-proportioned composite***—Flow-proportioned composite samples are collected proportional to the flow rate during the sampling period by either a time-varying/constant-volume or time-constant/varying-volume method. Flow-proportioned composite samples are typically collected using automatic samplers paced by a flow meter. This sampling method is commonly used for wastewaters.

***Time composite***—A time composite sample is composed of a discrete number of grab samples collected at equal time intervals during the compositing period. Time composite sampling is often used to sample wastewater or streams.

***Volume/mass composite***—A volume/mass composite is composed of a discrete number of grab samples collected at defined volume or mass intervals. Volume/mass composite sampling is often used to sample the output of a process system such as a Thermal Destruction Unit or pug mill.

***Areal composite***—Areal composite samples are samples collected from individual grab samples located on a regularly spaced grid or along a pile at defined locations and depths. Each of the grab samples must be collected in an identical fashion and must be of equal volume.

***Vertical composite***—Vertical composites are composed of individual grab samples collected across a vertical cross section. Like areal composites, the grab samples must be collected in an identical fashion and must be of equal volume. Soils and sediments can be used to create vertical composites.

### 6.1. Solid Composites

- To ensure the integrity of the composite, all discrete grab samples must be collected in an identical manner.
- Composite samples can be created by combining discrete grab samples into the same mixing/holding container as they are collected or by combining and mixing equal aliquots of containerized and homogenized discrete grab samples.
- Remove coarse fragments and organic material from the mixing bowl. Homogenize the sample as per SOP T-FS-010, Sample Mixing/Homogenization.
- Remove sample aliquots and place into the appropriate sample containers for shipment to the laboratory.
- Label the sample and document the sampling event according to the project procedures

### 6.2. Liquid Composites

- Liquid composite samples should be created by combining equal aliquots of discrete samples.
- Assemble the containers that will comprise a given composite.
- Shake or stir the individual containers to homogenize.

- Using clean glass pipets, deliver equal volumes from each grab container to the composite sample container that is to be shipped to the lab. For example, if there are five grab samples, and the composite sample requires 100 mL for the parameter of interest, pipet 20 mL from each of the grab samples into the composite sample container.
- Cap/seal the composite container and shake well. Stirring should be avoided as it increases the risk of introducing contamination to the sample.
- Label, document the event, and ship the sample(s) as required.

## 7. ATTACHMENTS

None.

## 8. FORMS

None.

# STANDARD OPERATING PROCEDURE

**Subject: Sampling of in-process Piles**

## 1. PURPOSE

The purpose of this procedure is to provide a simple and statistically sound method for sampling of small (<500cy) in-process stockpiles on project sites for characterization purposes where state and/or other regulatory or project-specific requirements are not pre-determined. These stockpiles may be the result of soil excavation/segregation, treatment of residual production, or debris segregation.

## 2. SCOPE

This procedure applies to the sampling of in-process stockpiles of less than 500cy in volume where the intent is to determine a *gross average* and UCL for a specific property or parameter set for comparison to decision levels. Examples include determining disposal profiles, overburden reuse determination, treated material confirmation, and backfill usability.

This procedure is *not intended* to provide spatial distribution data of legacy stockpiles or to be used where stockpiles exceed 500cy in volume. In these cases, project/task-specific sampling and analysis designs should be developed based upon the project/task required goals and objectives.

## 3. REFERENCES

- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.
- U.S. Environmental Protection Agency, 1994, *Waste Pile Sampling*, EPA/ERT SOP 2017.
- American Society for Testing and Materials, *Standard Guide for Sampling of Waste Piles*, ASTM D6009.

## 4. DEFINITIONS

- **Stockpile**—Solid material placed into a conical, pyramid, rectangular, windrow, or other elongated shape with sloped sides. Stockpiles may be generated as a result of a treatment process, soil excavation, debris segregation, or other tasks.
- **Composite Sample**—A sample created by the mixing of several discrete samples into one sample representative of the average characteristics of the entity sampled.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

**Safety Note:** *Soil and treated residual stockpiles may contain unstable materials and could collapse or engulf personnel without warning. In addition, slopes can be steep and if wetted could be become hazardous. Personnel should not climb onto any stockpile unless the site ECP determines that is safe to do so. Whenever possible, in-process stockpiles should be sampled in locations accessible from waist to chest high without scaling the pile or with heavy equipment assistance.*

*Debris piles should not be scaled under any circumstances and* ***must*** *be sampled either with long-reach implements or heavy equipment assistance.*

### 6.1 Determine Sample Locations

The procedure for determining sample locations is based upon the collection and compositing of six grab samples from the pile itself. The locations are chosen on a systematic or systematic random design depending upon the pile volume. If VOCs are a concern, including for TCLP, additional grab samples are collected and submitted without compositing for analysis.

1. Determine the stockpile volume. Although the number of grab samples does not vary with volume, the sampling design used to determine grab locations is volume dependent. Therefore, a gross estimate of the pile volume is required. This can be obtained from discussions with operations personnel or based on knowledge of the “batch” size.

   If an operational estimate is not available or plausible, a simple and conservative estimate for typical piles can be obtained by first determining the closest geometric shape(s) of its base, measuring the height/length, and calculating as follows:

   - Conical (typical) pile: V= 1/3 A*H

     Where:

     A= area of base

   - Elongated (windrow): V= A*L

     Where:

     A=area of pile face
     L= length of pile/windrow

2. Determine the number and distance between the measured location points, using Table 1 below.

**Table 1**
**Grab Sample Location Determination**

| Pile Volume (estimated) | Number of Equidistant Points | Number of Selected Locations |
|---|---|---|
| Up to 100cy | 6 | 6 with 3 for VOC (if needed) |
| 100-200cy | 12 | 6 with 3 for VOC (if needed) |
| 200-300cy | 18 | 6 with 3 for VOC (if needed) |
| 300-400cy | 21 | 6 with 3 for VOC (if needed) |
| 400-500cy | 24 | 6 with 3 for VOC (if needed) |
| >500cy | SOP not applicable | SOP not applicable |

3. Starting at a randomly selected point, measure and mark with a flag or stake the required locations from Table 1 along the pile perimeter. If the pile is larger than 100cy, label each marked location assigning a unique number to each one.

4. Referring to Table 1, determine the sample locations for sampling. For piles greater than 100cy use a random number generator to determine the locations to be sampled. This can also be done using a “draw” from numbered slips of paper.

## 6.2 Collect Sample

1. At each selected grab sample location, collect a sample from material approximately waist high. Each sample should be collected from material at least 2 feet into the pile by using a shovel or trowel to first remove the upper crust layer or using a trier to collect the sample and not containerizing the upper 2 feet. Place the material from each grab into a mixing container.

2. If collecting a sample for VOCs, at the selected location obtain the material from the exposed material immediately after removing the upper crust using appropriate methods. VOC samples should not be mixed or composited in the field.

3. If an excavator or other assistance is being used, direct the operator to scoop into the pile at least 2-3 feet and collect the “grab” for each location by collecting material from the upper foot of the bucket contents in three randomly selected spots. Collect VOC samples first.

4. If collecting debris samples, place a piece of each type of waste at the selected sample location into the mixing container. Debris pieces should also be cut or reduced to a manageable size (1-2 inches square) before being mixed. Some debris may be light, and larger volumes may need to be sampled and submitted in order to provide adequate sample mass. This is especially true of PPE and other low-mass waste materials.

5. Once the material from all six sample locations has been obtained, mix and homogenize the composite and place the material into appropriate labeled sample containers. The VOC samples should always remain discrete. In some cases, the laboratory may be instructed to create a VOC-lab composite by combining medium/high level extracts or even combining 5g core sampler aliquots into a TCLP/VOC-(ZHE) test.

## 7. ATTACHMENTS

None

## 8. FORMS

None

***Attachment 2***
***Sample Nomenclature Standard***
***Operating Procedure CT-04, 02/04***

| | | | |
|---|---|---|---|
| NSWC Naval Surface Warfare Center INDIAN HEAD DIVISION<br>Naval Sea Systems Command | **STANDARD OPERATING PROCEDURES** | Number<br>CT-04 | Page<br>1 of 6 |
| | | Effective Date<br>02/04 | Revision<br>0 |
| | | Applicability | |
| | | Prepared | |
| Subject<br>SAMPLE NOMENCLATURE | | Approved | |

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## 1.0 PURPOSE

The purpose of this document is to specify a consistent sample nomenclature system that will facilitate subsequent data management in a cost-effective manner. The sample nomenclature system has been devised such that the following objectives can be attained:

- Sorting of data by matrix.
- Sorting of data by depth.
- Maintenance of consistency (field, laboratory, and data base sample numbers).
- Accommodation of all project-specific requirements.
- Accommodation of laboratory sample number length constraints (maximum of 20 characters).

## 2.0 SCOPE

The methods described in this procedure shall be used consistently for all projects requiring electronic data.

## 3.0 GLOSSARY

None.

## 4.0 RESPONSIBILITIES

**Program Manager** - It shall be the responsibility of the Program Manager (or designee) to inform contract-specific Project Managers of the existence and requirements of this Standard Operating Procedure.

**Project Manager** - It shall be the responsibility of the Project Manager to determine the applicability of this Standard Operating Procedure based on: (1) program-specific requirements, and (2) project size and objectives. It shall be the responsibility of the Project Manager (or designee) to ensure that the sample nomenclature is thoroughly specified in the relevant project planning document (e.g., sampling and analysis plan) and is consistent with this Standard Operating Procedure if relevant. It shall be the responsibility of the project manager to ensure that the Field Operations Leader is familiar with the sample nomenclature system.

**Field Operations Leader** - It shall be the responsibility of the Field Operations Leader to ensure that all field technicians or sampling personnel are thoroughly familiar with this Standard Operating Procedure and the project-specific sample nomenclature system. It shall be the responsibility of the Field Operations Leader to ensure that the sample nomenclature system is used during all project-specific sampling efforts.

## 5.0 PROCEDURES

### 5.1 Introduction

The sample identification (ID) system can consist of as few as 8 but not more than 20 distinct alpha-numeric characters. The sample ID will be provided to the laboratory on the sample labels and chain-of-custody forms. The basic sample ID provided to the lab has three segments and shall be as follows where "A" indicates "alpha," and "N" indicates "numeric":

| A or N<br>3- or 4-Characters | AAA<br>2- or 3-Characters | A or N<br>3- to 6-Characters |
|---|---|---|
| Site Identifier | Sample Type | Sample Location |

Additional segments may be added as needed. For example:

(1) Soil and Sediment Sample ID

| A or N<br>3- or 4-Characters | AAA<br>2- or 3-Characters | A or N<br>3- to 6-Characters | NNNN<br>4-Characters |
|---|---|---|---|
| Site Identifier | Sample Type | Sample Location | Sample Depth |

(2) Aqueous (groundwater or surface water) Sample ID

| A or N<br>3- or 4-Characters | AAA<br>2- or 3-Characters | A or N<br>3- to 6-Characters | NN<br>2-Characters | -A |
|---|---|---|---|---|
| Site Identifier | Sample type | Sample Location | Round Number | Filtered Sample only |

(3) Biota Sample ID

| A or N<br>3- or 4-Characters | AAA<br>2- or 3-Characters | A or N<br>3- to 6-Characters | AA<br>2-Characters | NNN<br>3-Characters |
|---|---|---|---|---|
| Site Identifier | Sample Type | Sample Location | Species Identifier | Sample Group Number |

## 5.2 Sample Identification Field Requirements

The various fields in the sample ID will include but are not limited to the following:

- Site Identifier
- Sample Type
- Sample Location
- Sample Depth
- Sampling Round Number
- Filtered
- Species Identifier
- Sample Group Number

The site identifier must be a three- or four-character field (numeric characters, alpha characters, or a mixture of alpha and numeric characters may be used). A site number is necessary since many facilities/sites have multiple individual sites, SWMUs, operable units, etc. Several examples are presented in Section 5.3 of this SOP.

The sample type must be a two- or three-character alpha field. Suggested codes are provided in Section 5.3 of this SOP.

The sample location must be at least a three-character field but may have up to six-characters (alpha, numeric, or a mixture). The six-characters may be useful in identifying a monitoring well to be sampled or describing a grid location.

The sample depth field is used to note the depth below ground surface (bgs) at which a soil or sediment sample is collected. The first two numbers of the four-number code specify the top interval, and the third and fourth specify the bottom interval in feet bgs of the sample. If the sample depth is equal to or greater than 100, then only the top interval would be represented and the sampling depth would be truncated to

three-characters. The depths will be noted in whole numbers only; further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc.

A two-digit round number will be used to track the number of aqueous samples taken from a particular aqueous sample location. The first sample collected from a location will be assigned the round identifier 01, the second 02, etc. This applies to both existing and proposed monitoring wells and surface water locations.

Aqueous samples that are field filtered (dissolved analysis) will be identified with an "-F" in the last field segment. No entry in this segment signifies an unfiltered (total) sample.

The species identifier must be a two-character alpha field. Several suggested codes are provided in Section 5.3 of this SOP.

The three digit sample group number will be used to track the number of biota sample groups (a particular group size may be determined by sample technique, media type, the number of individual caught, weight issues, time, etc.) by species and location. The first sample group of a particular species collected from a given location will be assigned the sample group number 001 and the second sample group of the same species collected from the same location will be assigned the sample group number 002.

## 5.3 Example Sample Field Designations

Examples of each of the fields are as follows:

Site Identifier - Examples of site numbers/designations are as follows:

A01 - Area of Concern Number 1
125 - Solid Waste Management Unit Number 125
000 - Base or Facility Wide Sample (e.g., upgradient well)
BBG - Base Background

The examples cited are only suggestions. Each Project Manager (or designee) must designate appropriate (and consistent) site designations for their individual project.

Sample Type - Examples of sample types are as follows:

AH - Ash Sample
AS - Air Sample
BM - Building Material Sample
BSB - Biota Sample Full Body
BSF - Biota Sample Fillet
CP - Composite Sample
CS - Chip Sample
DS - Drum Sample
DU - Dust Sample
FP - Free Product
IDW - Investigation Derived Waste Sample
LT - Leachate Sample
MW - Monitoring Well Groundwater Sample
OF - Outfall Sample
RW - Residential Well Sample
SB - Soil Boring Sample
SD - Sediment Sample
SC - Scrape Sample

SG - Soil Gas Sample
SL - Sludge Sample
SP - Seep Sample
SS - Surface Soil Sample
ST - Storm Sewer Water Sample
SW - Surface Water Sample
TP - Test Pit Sample
TW - Temporary Well Sample
WC - Well Construction Material Sample
WP - Wipe Sample
WS - Waste/Solid Sample
WW - Wastewater Sample

Sample Location - Examples of the location field are as follows:

001 - Monitoring Well 1
N32E92 - Grid location 32 North and 92 East
D096 - Investigation derived waste drum number 96

Species Identifier - Examples of species identifier are as follows:

BC - Blue Crab
GB - Blue Gill
CO - Corn
SB - Soybean

## 5.4 Examples of Sample Nomenclature

The first round monitoring well groundwater sample collected from existing monitoring well 001 at SWMU 16 for a filtered sample would be designated as 016MW00101-F.

The second round monitoring well groundwater sample collected from existing monitoring well C20P2 at Site 23 for an unfiltered sample would be designated as 023MWC20P202.

The second surface water sample collected from point 01 at SWMU 130 for an unfiltered sample would be designated as 130SW00102.

A surface soil sample collected from grid location 32 North and 92 East at Site 32 at the 0- to 2-foot interval would be designated as 032SSN32E920002.

A subsurface soil sample from soil boring 03 at SWMU 32 at an interval of 4 to 5 feet bgs would be designated as 032SB0030405.

A sediment sample collected at SWMU 19 from 0 to 6 inches at location 14 would be designated as 019SD0140001. The sample data sheet would reflect the precise depth at which this sample was collected.

During biota sampling for full body analysis the first time a minnow trap was checked at grid location A25 of SWMU 1415 three small blue gills were captured, collected and designated with the sample ID of 1415BSBA25BG001. The second time blue gill were collected at the same location (grid location A25 at SWMU 1415) the sample ID designation given was 1415BSBA25BG002.

Note: No dash (-) or spacing is used between the segments with the exception of the filtered segment. The "F" used for a filtered aqueous sample is preceded by a dash "-F".

## 5.5 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC will be designated using a different coding system. The QC code will consist of a three- to four-segment alpha-numeric code that identifies the sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

| AA | NNNNNN | NN | -F |
|---|---|---|---|
| QC Type | Date | Sequence Number (per day) | Filtered (aqueous only, if needed) |

The QC types are identified as:

TB = Trip Blank
RB = Rinsate Blank (Equipment Blank)
FD = Field Duplicate
AB = Ambient Conditions Blank
WB = Source Water Blank

The sampling time recorded on the Chain-of-Custody Form, labels, and tags for duplicate samples will be 0000 so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the routine sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory). Documentation for all other QC types (TB, RB, AB, and WB) will be recorded on the QC Sample Log sheet (see SOP on Field Documentation).

## 5.6 Examples of Field QA/QC Sample Nomenclature

The first duplicate of the day for a filtered ground water sample collected on June 3, 2000 would be designated as FD06030001-F.

The third duplicate of the day taken of a subsurface soil sample collected on November 17, 2003 would be designated as FD11170303.

The first trip blank associated with samples collected on October 12, 2000 would be designated as TB10120001.

The only rinsate blank collected on November 17, 2001 would be designated as RB11170101.

## 6.0 DEVIATIONS

Any deviation from this SOP must be addressed in detail in the site specific planning documents.

***Attachment 3***
***Laboratory Standard Operating Procedures***
***(LCS and MS/MSD Control Limits)***

# ANALYSIS OF GASOLINE RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR

Prepared by: Rick Watkins Date: 01/05/04

Reviewed by: Norm Farmer Date: 01/06/04

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: GC Volatile Department Date: _____*

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF GASOLINE RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR**

**METHOD REFERENCE: SW846 8015B**

**DEPT: GC**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.1.1 This method is based on a purge and trap gas chromatographic procedure utilizing a flame ionization detector (FID). The method may be utilized to detect petroleum hydrocarbons in the Gasoline Range (GRO), which corresponds to the range of alkanes from $C_6$ to $C_{10}$ and covers a boiling point range of approximately 60 $^oC$ - 170 $^oC$.

1.1.2 Reporting limits (RL) are based on the procedure described in SW846 Chapter 8000, and the lowest calibration standard. Reporting limits may vary depending on matrix complications and sample volumes. Reporting limits for this method are in the range of 0.1 mg/l for aqueous samples and 5.0 mg/kg for solid samples. Solid matrices are reported on a dry weight basis.

1.1.3 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

1.2 Summary

1.2.1 This method is adapted from SW846 method 8015B for Gasoline Range Organics.

1.2.2 Samples are received, stored and analyzed within the appropriate holding times.

1.2.3 Sample preparation is performed in accordance with Accutest SOP OP020 and OP021.

1.2.4 The samples are analyzed on a gas chromatograph equipped with a flame ionization detector (FID).

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## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

2.1.1 Aqueous samples shall be collected in standard 40mL glass screw-cap vials with Teflon-lined silicone septa. Samples are preserved by adjusting the pH to less than 2 with HCl.

2.1.2 Soil and solid samples should be collected according to the procedures described in Method 5035. Samples collected in wide-mouth jars will be preserved in the lab and data qualified accordingly.

2.1.3 Aqueous samples must be stored at 4°C (+/-2) until analysis. Soils prepared by Method 5035 are stored at –10°C until analysis.

2.2 Holding Time

2.2.1 Aqueous samples must be analyzed within 14 days of collection.

2.2.2 Solid and waste samples must be analyzed within 14 days of collection

## 3.0 INTERFERENCES

3.1 High levels of heavier petroleum products may contain some volatile components within the range of retention times for gasoline. As defined by the method, the GRO results include these compounds.

3.2 Samples may become contaminated by diffusion of volatile organics through the container septum during shipment and storage. A reagent water trip blank may serve as a check on shipping and storage conditions.

3.3 Contamination from "carry over" may occur when high and low level samples are sequentially analyzed. The sample syringe and purging device must be rinsed with reagent water, or a suitable solvent (methanol) between samples. When an unusually concentrated sample encountered, a reagent water-blank should be analyzed to check for cross contamination. Low level samples that were analyzed immediately following high level samples should be reanalyzed to confirm quanititation.

3.4 Sparging tubes should be washed with detergent, rinsed with reagent water and dried at 105 C between use.

## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

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4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the method efficiency.

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4.13 Trip Blank: A sample of analyte-free matrix taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples.

## 5.0 REAGENTS

5.1 Reagent water - distilled or deionized - free of interferences.

5.2 Methanol - purge and trap grade or equivalent.

5.3 Gasoline stock standard - Traceable to Certificate of Analysis

5.4 Surrogate Solution - a,a,a-Trifluorotoluene and 4-Bromofluorobenzene

5.5 Spike Solution - Gasoline stock standard

5.6 GRO Defining Mix - a standard consisting of individual gasoline components, including 2-Methylpentane and 1,2,4-Trimethylbenzene. This is used to define the retention time window for GRO.

## 6.0 APPARATUS AND MATERIALS

6.1 Syringes - 5-ml luer-lok gastight syringe

6.2 Microsyringes - 10 ul, 25 ul, 100 ul, 500 ul, and 1000 ul

6.3 Volumetric flasks - 10 ml, 50 ml, 100 ml

6.4 Stainless steel spatula

6.5 Disposable Pasteur pipettes

6.6 Glass vials, capable of holding 5 grams of solid sample and 5 ml methanol

6.7 Gas Chromatograph, equipped with a flame ionization detector, capable of temperature programming

6.8 GC column - 105m x 0.53mm ID, RTX-502.2, 3um film; 75m x 0.45mm ID, DB-VRX, 2.55um film; or equivalent. The column chosen must resolve 2-methylpentane from the methanol solvent front.

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6.9 Autosampler and Concentrator

6.9.1 OI Analytical 4560 Concentrator equipped with a 25cm trap. A Tenax trap has proven to be superior for GRO analysis. Other traps may be used, provided all of the QC criteria in the method are met.

6.9.2 OI Analytical 4552 Autosampler provides unattended automation for up 51 samples. The aqueous samples are transferred to a single sparging vessel that is rinsed with heated reagent water between samples.

6.9.3 OI Analytical MPM 16 Autosampler provides sequential analysis for up to 16 samples. Two MPM 16 autosamplers may be connected in series to provide sequential analysis for up to 31 samples.

6.10 Data system - Capable of peak summation, forced baseline integration, and quantitation using multipoint calibrations.

## 7.0 PROCEDURE

7.1 Standards Preparation

Standards are prepared from commercially available certified reference standards. All standards must be logged in the Volatile Standards Logbook. All standards shall be traceable to their original source.

7.1.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a “Certificate of Analysis” with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor’s expiration date. Once opened, the hold time is reduced to six months or the vendor’s expiration date (whichever is shorter).

7.1.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with methanol. The hold time for intermediate standards is one month or the vendor’s expiration date (whichever is shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

7.1.3 Calibration Standards

Calibration standards for the gasoline range organics are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration near the RL and the remaining standards define the working range of the detector.

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Calibration standard concentrations are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Instrument conditions.

7.2.1 The conditions listed are a guideline, and should be optimized for the instrument and column in use.

7.2.2 GC Conditions

| | |
|---|---|
| Instrument: | HP 5890 |
| Column: | 105m x 0.53mm RTX-502.2, 3.0um film |
| Carrier: | Helium @ 25 psig, 12 ml/min (at 50°C). |
| Temp.Program: | RTX –502.2<br>50°C for 6 min.,<br>20/min. to 180°C (hold 8 mins), then<br>30/min to 240°C for 6 mins |
| | DB-VRX<br>40°C for 5 mins<br>15/min. to 180°C (hold 1 min)<br>30/min. to 220°C for 4 mins |
| Make-up Gas: | Helium @ 18 mi/min. |
| Detector: | Flame Ionization<br>Hydrogen @ 30 ml/min.<br>Air @ 150 ml/min, |
| Injector Temp.: | 220°C |
| Split Flow: | 10 ml/min |
| Detector Temp.: | 240°C |

7.2.3 Purge and Trap Device conditions.

| | |
|---|---|
| Purge Gas: | Helium at 30 ml/min. |
| Trap: | Tenax |
| Sample Temp.: | Aqueous-Ambient |
| Trap Temp.: | <25°C |
| Purge Time: | 12 min Preheat: 170°C |
| Desorb: | 2 min. at 180°C. |
| Bake: | 8 min. at 200°C, with bake bypass off. |

7.3 Sample Preparation

Appropriate volumes of sample are introduced to the GC via a purge-and-trap procedure described in OP 021.

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7.4 Gas Chromatographic Analysis

Instrument calibration consists of two major sections:

Initial Calibration Procedures
Continuing Calibration Verification

7.4.1 Initial Calibration Procedures

Before samples can be run, the chromatographic system must be calibrated, and retention time windows must be determined.

7.4.1.1 External Standard Calibration

A minimum 5-point calibration curve is created for the target analytes using an external standard technique.

Calibration factors (CF) for each analyte are determined as follows:

$$CF = H_{anayte} / C_{analyte}$$

$A_{anayte}$ = height of the analyte
$C_{analyte}$ = concentration of the analyte

The mean CF and standard deviation of the CF are determined for each analyte. The percent relative standard deviation (%RSD) of the response factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of CF X 100) / Mean CF

If the %RSD $\leq$ 20%, linearity through the origin can be assumed and the mean RF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 20% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is $\geq$0.995 ($r^2$ $\geq$0.990) then the curve can be used to quantitate target analytes in the samples.

7.4.1.2 Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The percent difference (%D) for each analyte is checked. The |%D| should be $\leq$ 15% for each analyte. If the |%D| is greater than 15%, a second standard should be

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prepared. If the |%D| is still outside of this range, a new calibration curve may need to be prepared.

7.4.1.3 Retention Time Windows

Retention time windows must be established whenever a new column is installed in an instrument or whenever a major change has been made to an instrument.

Retention time windows are established by injecting all standard mixes three times over the course of 48 to 72 hours and calculating the standard deviation of the retention times of each analyte. For this method, the retention time windows must be calculated for the surrogates, 2-Methylpentane, and 1,2,4-Trimethylbenzene. Plus or minus three times the standard deviation of the retention times is defined as the retention time window of that compound.

Peak identification is based on the retention time of an analyte in the standard (initial or continuing) being used as the mid-point of the retention time window. Time reference peaks (surrogates) are used to correct for run-to-run variations in retention times due to temperature, flow, or injector fluctuations.

The retention time windows should be used as a guide for identifying compounds; however, the experience of the analyst should weigh heavily in the interpretation of the chromatograms. The analyst should monitor the retention times of known peaks (standards and surrogates) throughout an instrument run as an indication of instrument performance.

Because calculated retention time windows are generally very tight (less than ± 0.03 minutes), the retention time windows for the data processing method are generally set wider than the calculated window. This is done to ensure that the software does not miss any potential “hits”. The analyst will then review these “hits” and determine if the retention times are close enough to the retention time of the target analyte to positively identify the peak or to require confirmation.

7.4.2 Continuing Calibration Verification (CCV)

Continuing calibration verification standards for TPH are prepared at various concentrations; at least one CCV must be below the mid-point of the calibration curve. A continuing calibration standard must be analyzed at the beginning and end of each run to verify that the initial calibration is still valid. Additionally a CCV must be analyzed after every 10 samples.

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The percent difference (%D) for each analyte will be monitored. The |%D| must be ≤ 15% for each analyte that is detected in the samples. If the |%D| is greater than 15%, the samples must be reanalyzed.

**Any target analytes that are detected in the samples must be bracketed by acceptable CCV standards; otherwise, the samples must be reanalyzed or the data must be qualified.**

7.4.3 Sample Analysis

7.4.3.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

GRO Window
Initial Calibration Standards (or Initial CCV)
Blank Spike (BS)
Method blank
Samples
Matrix spikes
CCV Standards

7.4.3.2 Each sequence shall begin with establishment of the RT window for GRO. Inject 20 uL of defining mix into a 5-ml luer-lok syringe and analyze. Establish the beginning of the RT window for GRO at the start of the 2-Methylpentane peak. Establish the end of the window immediately after the 1,2,4-Trimethylbenzene peak. The software method must be set up so that the summation of the area of all peaks within the established GRO window (minus the area of any surrogate peaks that elute within the window) is used to calculate the response factor for GRO.

7.4.3.3 Ten microliters of surrogate solution is added to every 5mL of sample in the luer-lok syringe. If the Archon sampler is used, it is programmed to add 1uL of internal standard/surrogate mix to each sample.

7.4.3.4 The automated sampler and concentrator are programmed to purge the sample for 12 minutes and then desorb the sample onto the GC column. After desorbing, the concentrator automatically bakes the trap for 8 minutes to remove any remaining volatiles.

7.4.3.5 If the analyte response exceeds the linear range of the system, the sample must be diluted and reanalyzed if sample is available. Samples should be diluted so that the response falls into the upper half of the calibration curve.

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## 8.0 Quality Assurance / Quality Control

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are generated from in-house data (as points become available) and are updated annually. All limits are listed in the LIMS.

8.1 Surrogates

8.1.1 Bromofluorobenzene and a,a,a-Trifluorotoluene are used as the surrogate standards to monitor the purge efficiency.

A known amount of surrogate standard is added to each sample including the QC set prior to analysis. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for the results to be acceptable.

8.1.2 If the surrogate recoveries are not within the established control limits, the following are required.

8.1.2.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.1.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.1.2.3 If no problem is found, reanalyze the sample.

8.1.2.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference. The data should be qualified as “estimated concentration”.

8.2 Method Blank and Blank Spike

8.2.1 The method blank is de-ionized water or, de-ionized water and methanol (depending on matrix) to which the surrogate standard has been added. The method blank is then analyzed with the other samples to determine any contamination from reagents or glassware. The method blank must be free of any analytes of interest or interferences at one half the required

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reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch reanalyzed.

8.2.2 The blank spike is de-ionized water or, de-ionized water and methanol (depending on matrix) to which the surrogate standard and spike standard have been added. The blank spike is then analyzed along with the other samples to monitor the analyte recovery. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.2.3 If the blank spike recoveries are not within the established control limits, the following are required.

8.2.3.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.2.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.2.3.3 If no problem is found, reanalyze the sample batch.

8.3 Matrix Spike and Matrix Spike Duplicate

8.3.1 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then analyzed along with the other samples to monitor the precision and accuracy of the analytical procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.3.2 If the matrix spike recoveries are not within the established control limits, the following are required.

8.3.2.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

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8.3.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.3.2.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for reanalysis but are an indication of the sample matrix effects. If the blank spike recoveries indicate that the problem may be procedure related, reanalyze the sample batch.

8.3.3 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

$$RPD = [| MS\ Result - MSD\ Result | \ / \ Average\ Result] \times 100$$

The RPD for each analyte should fall within the established control limits. If the RPD falls outside of the established control limits, the department supervisor shall review the data and determine if any corrective action is necessary.

## 9.0 CALCULATIONS

9.1 The area of the TPH in the samples is determined by integrating (baseline to baseline) from the time where 2-Methylpentane starts to the time where 1,2,4-Trimethylbenzene ends. This integration must include any unresolved petroleum "hump". The HP Enviroquant software will automatically correct for the area of the surrogate. If other processing software is used the analyst will have to correct for the area of the surrogate.

9.2 The concentration of each target compound in the original sample is calculated as follows:

$$Water\ (ug/L) = (CONC_{inst}) \times DF$$

$$Soil\ (ug/Kg) = \{[(CONC_{inst}) \times (5 / W_s) \times (V_{MeOH} / A_{MeOH})] \times DF_{MeOH}\} / \%solids$$

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| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean RF, linear curve, or quadratic curve |
| DF | = | Dilution Factor |
| $W_s$ | = | Weight of sample (g) |
| $V_{MeOH}$ | = | Total Volume of MeOH extract |
| $A_{MeOH}$ | = | Aliquot of MeOH extract used |
| $DF_{MeOH}$ | = | Serial Dilution of the MeOH extract |
| %solids | = | Dry weight determination in decimal form |

All soils are reported on a dry weight basis.

## 10.0 SAFETY AND POLLUTION PREVENTION

### 10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

### 10.2 Pollution Prevention

Waste solvents from the sample analysis, methanol extraction, and standards preparation are collected in waste storage bottles and are eventually transferred to the non-chlorinated waste drum.

Old stock standards are disposed of in the waste vial drum.

Samples are archived and stored for 30 days after analysis. Spent aqueous samples and those deemed non-hazardous are rinsed down the drain with large amounts of water.

Aqueous samples that are deemed hazardous are disposed of in the aqueous waste drum. Soil samples are disposed of in the soil waste drum.

## 11.0 REFERENCES

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8015B Revision 2, December 1996

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**ANALYSIS OF VOLATILE ORGANICS BY GC/MS**

Prepared by: Rick Watkins Date: 07/17/03

Reviewed by: Norm Farmer Date: 07/17/03

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: MS Volatile Department Date: _____*

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Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF VOLATILE ORGANICS BY GC/MS**

**METHOD REFERENCE: SW846 8260B**

**DEPT: MS**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.4.1 This method is used to determine the concentrations of various volatile organic compounds in water and solid matrices utilizing a gas chromatograph equipped with a mass spectrometer detector. Routine compounds can be found in Table 1.

1.4.2 Reporting limits (RL) are based on the lowest calibration standard. Reporting limits may vary depending on matrix complications and sample volumes. Reporting limits for this method are in the range of 1.0 ug/l for aqueous samples and 5 ug/kg for solid samples. Solid matrices are reported on a dry weight basis.

1.4.3 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

1.2 Summary

1.4.1 This method is adapted from SW846 method 8260B.

1.4.2 Samples are received, stored and analyzed within the appropriate holding times.

1.4.3 Sample preparation is performed in accordance with Accutest SOP OP020 and OP021.

1.4.4 The samples are analyzed on a gas chromatograph equipped with mass spectrometer detector.

1.4.5 The peaks detected are identified by comparison to characteristic ions and retention times specific to the known target list of compounds.

1.4.6 Additional unknown peaks with a response > 20% of the closest internal standard may be processed through a library search with comparison to a database of approximately 98,000 spectra. An estimated concentration is quantitated by assuming a response factor of 1.

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## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

Aqueous Samples:

2.4.1 Samples shall be collected in standard 40mL vials with Teflon lined silicone septa. HCl is used to adjust the pH of the sample to <2.

2.4.2 The samples must be stored in capped vials, with minimum headspace, at 4°C in an area free of solvent fumes. The size of any bubble caused by degassing upon cooling should not exceed 5-6mm.

Solid Samples:

2.4.3 Special 40mL vials for purge-and-trap of solid samples are described in OP020, as well as the collection and preservation options.

2.2 Holding Time

2.4.1 Aqueous samples are to be analyzed within 14 days of collection, unless otherwise specified by the contract. Samples that are not preserved should be analyzed within 7 days of collection; however, the preservation deficiency must be noted in the report.

2.4.2 Solid and waste samples must be analyzed within 14 days of collection.

## 3.0 INTERFERENCES

3.1 Data from all blanks, samples, and spikes must be evaluated for interferences.

3.2 Impurities in the purge gas, organic compounds out-gassing from the plumbing ahead of the trap, and solvent vapors in the laboratory account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory blanks. The use of non-TFE tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

3.3 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal into the sample during shipment and storage. A trip blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

3.4 Contamination by carry-over can occur whenever high level and low-level samples are sequentially analyzed. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water to check for carry-over.

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## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

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4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

4.13 Trip Blank: A sample of analyte-free matrix taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples.

## 5.0 REAGENTS

5.1 Methanol – purge-and-trap grade or equivalent

5.2 Volatile stock standards – Various mixes, traceable to Certificate of Analysis

5.3 4-Bromofluorobenzene (BFB) – instrument tuning mix

5.4 Surrogate standards –

Dibromofluoromethane
1,2-Dichloroethane-d4
Toluene-d8
4-Bromofluorobenzene

5.5 Internal standards –

Fluorobenzene
Chlorobenzene-d5
1,4-Dichlorobenzene-d4
tert-Butyl alcohol-d10

## 6.0 APPARATUS

6.1 Gas Chromatograph

6.4.1 Gas Chromatograph

The analytical system that is complete with a temperature programmable gas chromatograph and all required accessories, analytical columns, and gases.

6.4.2 The injection port is designed for split-splitless injection with capillary columns. The injection port must have an appropriate interface for sample introduction.

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6.2 Mass Spectrometer

The mass spectrometer must be capable of scanning from 35-300 amu every second or less utilizing 70-volt (nominal) electron energy in the electron impact ionization mode. It must also be capable of producing a mass spectrum that meets all the criteria in section 7.4.1.1 when injecting 50 ng of Bromofluorobenzene (BFB).

6.3 Purge and Trap

6.3.1 The following autosampler models are used for purging, trapping and desorbing the sample into GC column.

- Tekmar LSCII and ALS2016 and ALS2032
- O.I. Model 4560 sample concentrator with 4552 Water/Soil multisampler

6.3.2 The sample purge vial must be designed to accept 5 ml samples with a water column at least 3 cm deep.

6.3.3 Several types of traps are suitable for this method.

- OI #10 consisting of Tenax, Silica gel, Carbon Molecular Sieve

- OI #11(Supelco K) consisting of Carbopak B, Carboxen 1000, Carboxen 1001

The trap should be conditioned according to the manufacturer‘s recommendations.

6.3.4 The desorber should be capable of rapidly heating the trap to the manufacturer recommended desorb temperature.

6.4 Data System

6.4.1 A computer system interfaced to the mass spectrometer that allows for the continuous acquisition and storage of all mass spectral data obtained throughout the duration of the chromatographic program.

6.4.2 The computer utilizes software that allows searching any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted ion Current Profile (EICP).

## 7.0 PROCEDURE

7.1 Standards Preparation

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Standards are prepared from commercially available certified reference standards. All standards must be logged in the Volatile Standards Logbook. All standards shall be traceable to their original source. The standards should be stored at temperatures between –10 °C and -20 °C, or as recommended by the manufacturer.

7.4.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a "Certificate of Analysis" with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor's expiration date. Once opened, the hold time is reduced to six months (one month for gases) or the vendor's expiration date (whichever is shorter).

7.4.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with methanol. The hold time for intermediate standards is one month (one week for gases) or the vendor's expiration date (whichever is shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

7.4.3 Calibration Standards

Calibration standards for the volatile organics are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration at or below the RL and the remaining standards define the working range of the detector.

Calibration standard concentrations are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Instrument Conditions

<u>Gas Chromatograph/ Mass Spectrometer</u>

| | |
|---|---|
| Carrier gas flow | 1.2 mLs/min |
| Transfer line temperature | 220 - 280 C |
| Analyzer temperature | 150 C |

Oven program – 45 °C for 2.0 minutes
10 °C/min to 80 °C for 0 minutes
14 °C/min to 210 °C for 0 minutes
16 °C/min to 240 °C for 4.2 minutes

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7.3 Sample Preparation

7.4.1 Water Samples

A 5ml aliquot of sample is loaded onto the purge-and-trap device and purged for 11 minutes. Detailed procedures are described in SOP OP021.

7.4.2 Solid Samples

A 5-gram aliquot of sample is loaded onto the purge-and-trap device and purged for 11 minutes while heated to 40°C and mechanically agitated. Detailed procedures are described in SOP OP020.

7.4 Gas Chromatographic Analysis

Instrument calibration consists of two major sections:

Initial Calibration Procedures
Continuing Calibration Verification

7.4.1 Initial Calibration Procedures

Before samples can be run, the GC/MS system must be tuned, the injection port inertness must be verified, and the instrument must be calibrated.

7.4.1.1 Tune Verification (BFB)

The instrument should be hardware tuned per manufacturer's instructions. Verify the instrument tune by injecting 2ul (50ng) of BFB solution onto the instrument. The resulting BFB spectra should meet the criteria in the following table.

**BFB KEY IONS AND ION ABUNDANCE CRITERIA**

| Mass | Ion Abundance Criteria* |
|---|---|
| 50 | 15-40% of mass 95 |
| 75 | 30-60% of mass 69 |
| 95 | Base peak, 100% relative abundance |
| 96 | 5-9% of mass 95 |
| 173 | <2% of mass 174 |
| 174 | >50% of mass 95 |
| 175 | 5-9 % of mass 174 |
| 176 | >95% and <101% of mass 174 |
| 177 | 5-9% of mass 176 |

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*Alternate tune criteria (CLP or manufacturers' instructions) may be used, if the method performance is not adversely affected.
Evaluate the tune spectrum using three mass scans from the chromatographic peak and a subtraction of instrument background. This procedure is performed automatically by the HP software by running "autofind" on the BFB peak.

Select the scans at the peak apex and one to each side of the apex. Calculate an average of the mass abundances from the three scans.

Background subtraction is required. Select a single scan in the chromatogram that is absent of any interfering compound peak and no more than 20 scans prior to the elution of BFB. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tuning compound peak.

Alternatively, the average spectra over the entire peak may be used. **All subsequent tune evaluations must use the same procedure that was used for the Initial Calibration.**

If the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are met.

Analysis must not begin until the tuning criteria are met. The injection time of the acceptable tune analysis is considered the start of the 12-hour clock. The same mass spec settings must be used for the calibration standards and samples that were used for the tune evaluation standard.

7.4.1.2 Internal Standard Calibration

A minimum 5-point calibration curve is created for the volatile organic compounds and surrogates using an internal standard technique. Accutest Laboratories routinely performs a 6-point calibration to maximize the calibration range. If a point is omitted from the curve due to poor linearity, the remaining 5 points must be continuous.

Response factors (RF) for each analyte are determined as follows:

$$RF = (A_{anayte} \mathbf{X} C_{istd})/(A_{istd} \mathbf{X} C_{analyte})$$

$A_{anayte}$ = area of the analyte
$A_{istd}$ = area of the internal standard
$C_{analyte}$ = concentration of the analyte
$C_{istd}$ = concentration of the internal standard.

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The mean RF and standard deviation of the RF are determined for each analyte. The percent relative standard deviation (%RSD) of the response factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of RF X 100) / Mean RF

If the %RSD ≤ 15%, linearity through the origin can be assumed and the mean RF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 15% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is ≥0.995 ($r^2$ ≥0.990) then the curve can be used to quantitate target analytes in the samples.

The method also employs a series of Calibration Check Compounds (CCC) and System Performance Check Compounds (SPCC). The %RSD for any CCC must be ≤ 30 % and the average relative response factor for any SPCC must be at least 0.10 or 0.30 (See tables below).

**Calibration Check Compounds (CCC)**

| | |
|---|---|
| Vinyl chloride | 1,1-Dichloroethene |
| Chloroform | 1,2-Dichloropropane |
| Toluene | Ethylbenzene |

**System Performance Check Compounds (SPCC)**

| **Compound** | **Minimum RF** |
|---|---|
| Chloromethane | 0.1 |
| 1,1-Dichloroethane | 0.1 |
| Bromoform | 0.1 |
| 1,1,2,2-Tetrachloroethane | 0.3 |
| Chlorobenzene | 0.3 |

7.4.1.3 Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The ICV must meet the criteria listed in section 7.4.2.3 and 7.4.2.4. If the ICV does not meet this criteria, a second standard should be prepared. If the ICV still does not

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meet this criteria, a new calibration curve may need to be prepared.

7.4.2 Continuing Calibration Verification (CCV)

7.4.2.1 Inject 2ul of the tune evaluation mix at the beginning of each 12-hour shift. Evaluate the resultant peaks against the criteria in sections 7.4.1.1 and 7.4.1.2. The injection time of this standard starts the 12-hour window.

7.4.2.2. Analyze a continuing calibration check standard. Since the method only requires one CCV per analytical batch, the level of the CCV should be varied throughout the week. At least one CCV must be below the mid-point of the calibration curve.

7.4.2.3. The RF of check standard for SPCC compounds must meet the minimum RF requirement as listed in the table.

7.4.2.4. The %D for the CCC compounds must be ≤ 20%. If the CCCs are not part of the target list, then all target analytes must meet the 20 %D criteria.

7.4.2.5. The %D for all other analytes of interest should be ≤ 20%; however, the large number of analytes in this method presents a substantial probability that a few of the analytes will fall outside of this range. The analysis of samples may proceed. However, if a reportable analyte is detected in a sample and the %D for that analyte was greater than 20% in the CCV, the sample will need to be reanalyzed on a system with a passing CCV for that analyte, or the data must be qualified.

7.4.2.6. The criteria in 7.4.2.3 and 7.4.2.4 must be met for the continuing calibration to be considered valid. If the first continuing calibration verification does not meet criteria, a second standard may be analyzed. If the second standard does not meet criteria, the system must be recalibrated.

7.4.2.7. If any of the internal standard area change by a factor of two (-50% to +100%) or retention time changes by more than 30 seconds from the midpoint standard of the last initial calibration, the mass spectrometer must be inspected for malfunctions and corrections made, as appropriate. Corrective action may include re-calibration (initial Calibration) of the instrument.

7.4.3 Sample Analysis

7.4.3.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

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Tune Evaluation Mix
Initial Calibration Standards (or CCV)
QC Samples
Samples

7.4.3.2 One microliter of internal standard/surrogate solution is added to every 5mL of sample in the sparge vessel. Generally, 5mL of sample are transferred to the sparge vessel.

7.4.3.3 After purging, the system will automatically reverse flow and rapidly heat the trap to desorb the sample analytes onto the GC column.

7.4.3.4 Qualitative identification

The target compounds shall be identified by analysts with competent knowledge in the interpretation of mass spectra by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound. The criteria required for a positive identification is:

The sample component must elute at the same relative retention time (RRT) as the daily standard. The RRT of sample component must be within ± 0.06 RRT units of the standard.

All ions present in the standard mass spectra at a relative intensity greater than 10% (major abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

The relative intensities of these ions must agree within ± 30% between the daily standard and sample spectra. (Example: For an ion with an abundance of 50 % in the standard spectra, the corresponding sample abundance must be between 20 and 80%.

Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

If peak identification is prevented by the presence of interferences, the sample must be diluted so that the interference does not mask any analytes.

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7.4.3.5 Quantitative analysis

When a target compound has been identified, concentration will be based on the integrated area of the quantitation ion, which is normally the base peak.

The sample matrix may produce an interference with the primary ion. This may be characterized by an excessive background signal of the same ion, which distorts the peak shape beyond a definitive integration. The interference could also, severely inhibit the response of the internal standard ion. If an interference is apparent the secondary ion can be used to generate a new calibration factor.

If the analyte response exceeds the linear range of the system, the extract must be diluted and reanalyzed. It is recommended that samples be diluted so that the response falls into the middle of the calibration curve.

7.4.3.6 Library search for tentatively identified compounds

If a library search is requested, the analyst should perform a forward library search of the NIST mass spectral library to tentatively identify 10 to 20 non-target compounds.

Guidelines for making tentative identification are:

These compounds should have a response greater than 20% of the nearest internal standard. The response is obtained from the Total Ion Chromatogram.

The search is to include a spectral printout of the best library match for a particular substance. The results are to be interpreted by the analyst.

Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

The relative intensities the major ions should agree within ±20%.

Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

Ions present in the reference spectrum but not in the sample spectrum should be verified by performing further manual

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background subtraction to eliminate the interference created by coeluting peaks and/or matrix interference.

Quantitation of the tentatively identified compounds is obtained from the total ion chromatogram based on a response factor of 1 from the nearest internal standard and is to be tabulated on the library search summary data sheet.

## 8.0 QUALITY ASSURANCE / QUALITY CONTROL

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are updated annually and are listed in the LIMS.

8.1 Internal Standards

Fluorobenzene, Chlorobenzene-d5, 1,4-Dichlorobenzene-d4, and Tert Butyl Alcohol-d10 are used as internal standards for this method. The response of the internal standard in all subsequent runs should be within a factor of two (-50% to +100%) of the internal standard response in the opening CCV for each sequence. On days that an initial calibration is performed, the internal standard responses should be compared to the internal standard responses for the mid-point standard.

8.4.1 If the internal standard responses are not within limits, the following are required.

8.1.1.1 Check to be sure that there are no errors in calculations, integrations, or internal standards solutions. If errors are found, recalculate the data accordingly.

8.1.1.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.1.1.3 If no problem is found, prepare a second aliquot of sample and reanalyze the sample.

8.1.1.4 If upon reanalysis, the responses are still not within limits, the problem is considered matrix interference. The sample may need to be diluted or the results qualified.

8.2 Surrogates

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8.4.1 Dibromofluoromethane, 1,2-Dichloroethane-d4, Toluene-d8, and 4-Bromofluorobenzene are used as the surrogate standards to monitor the efficiency of the purge-and-trap system.

A known amount of surrogate standard is added to each sample including the QC set prior to sparging. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for all surrogates for the results to be acceptable.

8.4.2 If any surrogate recovery is not within the established control limits, the following are required.

8.2.2.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.2.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.2.2.3 If no problem is found, reanalyze the sample.

8.2.2.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference.

8.3 Method Blank and Blank Spike

8.4.1 The method blank is de-ionized to which the surrogate standard has been added. The method blank is then processed along with the other samples to determine any contamination from reagents or glassware. The method blank must be free of any analytes of interest or interferences at ½ the required reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch re-extracted and/or reanalyzed.

8.4.2 The blank spike is de-ionized water to which the surrogate standard and spike standard have been added. The blank spike is then processed along with the other samples to monitor the efficiency of the purge-and-trap procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

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The percent recovery for each analyte of interest should fall within the established control limits for the results to be acceptable. The large number of analytes in this method presents a substantial probability that a few of the analytes will fall outside of the established control limits. Under certain circumstances, reanalysis may not be necessary. Example: Recovery was high and all associated samples were non-detect.

8.4.3 If the blank spike recoveries are not within the established control limits, the following are required.

8.3.3.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.3.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.3.3.3 If no problem is found, the department supervisor shall review the data and determine what further action is necessary.

8.4 Matrix Spike and Matrix Spike Duplicate

8.4.1 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then processed along with the other samples to monitor the precision and accuracy of the purge-and-trap procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.4.2 If the matrix spike recoveries are not within the established control limits, the following are required.

8.4.2.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.4.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

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8.4.2.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for reanalysis, but are an indication of the sample matrix effects. If the blank spike recoveries indicate that the problem may be procedure related, reanalyze the sample batch.

8.4.3 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

RPD = [| MS Result – MSD Result | / Average Result] X 100

The RPD for each analyte should fall within the established control limits. If more than 33% of the RPDs fall outside of the established control limits, the department supervisor shall review the data and determine if any corrective action is necessary.

## 9.0 CALCULATIONS

The concentration of each target compound in the original sample is calculated as follows:

Water (ug/l) = ($CONC_{inst}$) X DF

Soil (ug/kg) = [($CONC_{inst}$) X (5 / $W_I$)] / %solids (*for low level soils)*

Soil (ug/kg) = [($CONC_{inst}$) X ($V_F$ / $V_A$) X (5 / $W_I$ ) X DF] (*for high level soils)*

| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean RF, linear curve, or quadratic curve |
| DF | = | Dilution Factor |
| $V_F$ | = | Volume of methanol extract (ul) |
| $V_A$ | = | Volume of methanol aliquot (ul) |
| $W_I$ | = | Weight of sample (g) |
| %solids | = | Dry weight determination in decimal form |

## 10.0 SAFETY AND POLLUTION PREVENTION

10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and

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many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

10.2 Pollution Prevention

Waste solvents from the sample analysis and standards preparation are collected in waste storage bottles and are eventually transferred to the non-chlorinated waste drum.

## 11.0 REFERENCES

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8260B Revision 2, December 1996

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## TABLE 1

### Routine Target Analytes

Dichlorodifluoromethane
Chloromethane
Vinyl Chloride
Bromomethane
Chloroethane
Trichlorofluoromethane
Ethyl Ether
1,2-Dichloro-1,1,2-trifluoroethane
Acrolein
Freon 113
1,1-Dichloroethene
Acetone
Iodomethane
Carbon Disulfide
Methyl acetate
Methylene Chloride
Methyl Tert Butyl Ether
trans-1,2-Dichloroethene
Acrylonitrile
Hexane
Di-isopropyl ether
Vinyl acetate
1,1-Dichloroethane
ETBE
2-Butanone
2,2-Dichloropropane
cis-1,2-Dichloroethene
Bromochloromethane
Tetrahydrofuran
Chloroform
1,1,1-Trichloroethane
Cyclohexane
Carbon Tetrachloride
1,1-Dichloropropene
TAME
Benzene
1,2-Dichloroethane
Trichloroethene
Methylcyclohexane
1,2-Dichloropropane
Dibromomethane
Bromodichloromethane
2-Chloroethyl vinyl ether
2-Nitropropane
cis-1,3-Dichloropropene
4-Methyl-2-pentanone
Toluene
trans-1,3-Dichloropropene
1,1,2-Trichloroethane
Tetrachloroethene
2-hexanone
1,3-Dichloropropane
Dibromochloromethane
1,2-Dibromoethane
1-Chlorohexane
Chlorobenzene
Ethylbenzene
1,1,1,2-Tetrachloroethane
m,p-Xylene
o-Xylene
Styrene
Bromoform
Isopropylbenzene
Cyclohexanone
1,1,2,2-Tetrachloroethane
trans-1,4-Dichloro-2-Butene
n-Propylbenzene
Bromobenzene
1,2,3-Trichloropropane
1,3,5-Trimethylbenzene
2-Chlorotoluene
4-Chlorotoluene
tert-Butylbenzene
1,2,4-Trimethylbenzene
sec-Butylbenzene
4-Isopropyltoluene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl Chloride
n-Butylbenzene
1,2-Dichlorobenzene
1,2-Dibromo-3-Chloropropane
1,2,4-Trichlorobenzene
Hexachlorobutadiene
Naphthalene
1,2,3-Trichlorobenzene
Tert-Butyl Alcohol
1,4-Dioxane

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**ANALYSIS OF SEMIVOLATILE ORGANICS BY GC/MS**

Prepared by: Norm Farmer Date: 06/03/03

Reviewed by: Rick Watkins Date: 06/03/03

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: MS Semivolatile Department Date: _____*

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF SEMIVOLATILE ORGANICS BY GC/MS**

**METHOD REFERENCE: SW846 8270C**

**DEPT: MS**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.1.1 This method is used to determine the concentrations of various semivolatile organic compounds in water and solid matrices utilizing a gas chromatograph equipped with a mass spectrometer detector. Routine compounds can be found in Table 1.

1.1.2 Reporting limits (RL) are based on the extraction procedure and the lowest calibration standard. Reporting limits may vary depending on matrix complications and sample volumes. Reporting limits for this method are in the range of 5.0 ug/l for aqueous samples and 170 ug/kg for solid samples. Solid matrices are reported on a dry weight basis.

1.1.3 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

1.2 Summary

1.2.1 This method is adapted from SW846 method 8270C.

1.2.2 Samples are received, stored and extracted within the appropriate holding times.

1.2.3 Sample preparation is performed in accordance with Accutest SOP OP006 and OP007.

1.2.4 The extracts are analyzed on a gas chromatograph equipped with mass spectrometer detector.

1.2.5 The peaks detected are identified by comparison to characteristic ions and retention times specific to the known target list of compounds.

1.2.6 Additional unknown peaks with a response > 25% of the closest internal standard may be processed through a library search with comparison to a database of approximately 98,000 spectra. An estimated concentration is quantitated by assuming a response factor of 1.

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## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

2.1.1 Samples shall be collected in amber glass bottles with Teflon lined caps. One-liter bottles are recommended for aqueous samples and 300ml jars are recommended for solid samples.

2.1.2 The samples must be protected from light and refrigerated at 4°C from the time of collection until extraction. The extracts must be stored at -10°C to –20°C until analysis.

2.2 Holding Time

2.2.1 Aqueous samples must be extracted within 7 days of collection.

2.2.2 Solid and waste samples must be extracted within 14 days of collection.

2.2.3 Extracts must be analyzed within 40 days of extraction.

## 3.0 INTERFERENCES

3.1 Data from all blanks, samples, and spikes must be evaluated for interferences.

3.2 Method interferences may be caused by contaminants in solvents, reagents, or glassware. Interferences from phthalate esters can be eliminated by using plastic-free solvent containers and solvent rinsed glassware.

3.3 Other organic compounds, including chlorinated hydrocarbons, petroleum hydrocarbons, and phthalate esters may be coextracted by this method.

3.4 Benzidine and benzaldehyde are extremely reactive in the calibration mix and will quickly break down. If either analyte is detected in a sample it may be necessary to recalibrate the instrument using the individual analyte, and then reanalyze the sample.

## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

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4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

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## 5.0 REAGENTS

5.1 Methylene Chloride – pesticide grade or equivalent

5.2 Semivolatile stock standards – Various mixes, traceable to Certificate of Analysis

5.3 Decafluorotriphenylphosphine mix (DFTPP) – Also contains pentachlorophenol, benzidine and DDT.

5.4 Base/neutral surrogate standards –

Nitrobenzene-d5
2-Fluorobiphenyl
P-Terphenyl-d14

5.5 Acid surrogate standards –

Phenol-d6
2-Fluorophenol
2,4,6-Tribomophenol

5.6 Internal standards –

| | |
|---|---|
| 1,4-Dichlorobenzene-d4 | Naphthalene-d8 |
| Acenaphthene-d10 | Phenanthrene-d10 |
| Chrysene-d12 | Perylene-d12 |

## 6.0 APPARATUS

6.1 Gas Chromatograph

6.1.1 Gas Chromatograph

The analytical system that is complete with a temperature programmable gas chromatograph and all required accessories, analytical columns, and gases.

6.1.2 The injection port is designed for split-splitless injection with capillary columns.

6.2 Mass Spectrometer

The mass spectrometer must be capable of scanning from 35-500 amu every second or less utilizing a 70-volt (nominal) electron energy in the electron impact ionization mode. It must also be capable of producing a mass spectrum that meets all the criteria in section 7.4.1.1 when injecting 50 ng of Decafluorotriphenylphosphine (DFTPP).

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6.3 Data System

6.3.1 A computer system interfaced to the mass spectrometer that allows for the continuous acquisition and storage of all mass spectral data obtained throughout the duration of the chromatographic program.

6.3.2 The computer utilizes software that allows searching any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted ion Current Profile (EICP).

6.3.3 The software should allow for integrating the abundances in any EICP between specific time or scan number limits.

6.3.4 The most recent version of the EPA/NIST mass spectral library should be available.

6.3.5 Data is archived to magnetic tape for long term storage.

6.3.6 DB-5MS Column or equivalent: 30m X 0.25mm X 0.25um

6.3.7 Suitable syringes and glassware for dilutions of standards and extracts.

## 7.0 PROCEDURE

7.1 Standards Preparation

Standards are prepared from commercially available certified reference standards. All standards must be logged in the Semivolatile Standards Logbook. All standards shall be traceable to their original source. The standards should be stored at temperatures between –10 °C and -20 °C, or as recommended by the manufacturer.

7.1.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a “Certificate of Analysis” with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor’s expiration date. Once opened, the hold time is reduced to one year or the vendor’s expiration date (whichever is shorter).

7.1.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with methylene chloride. The hold time for intermediate standards is six months or the vendor’s expiration date (whichever is

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shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

7.1.3 Calibration Standards

Calibration standards for the semivolatile organics are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration at or below the RL and the remaining standards define the working range of the detector.

Calibration standard concentrations are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Gas Chromatograph Conditions

1ul or 2ul autosampler injection

Pulsed splitless or 4:1 split injection

Carrier gas – UHP Helium (1.0 to 1.7 ml/min ramped flow)

Injection port temperature – 280 °C

Transfer line temperature – 280 °C

Source temperature – 230 °C

Quad temperature – 150 °C

Oven program – 40 °C for 2.0 minutes
35 °C/min to 130 °C for 0 minutes
12 °C/min to 320 °C for 1.2 minutes

GC conditions are optimized for each instrument. Actual conditions may vary slightly from those listed above.

7.3 Sample Preparation

7.3.1 Water Samples

A 1000ml aliquot of sample is pH adjusted and extracted with methylene chloride utilizing separatory funnel extraction. The extract is concentrated to 1.0ml.

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7.3.2 Solid Samples

A 30-gram aliquot of sample is extracted with methylene chloride and acetone utilizing pulse sonication. The extract is concentrated to 1.0ml.

7.4 Gas Chromatographic Analysis

Instrument calibration consists of two major sections:

Initial Calibration Procedures
Continuing Calibration Verification

7.4.1 Initial Calibration Procedures

Before samples can be run, the GC/MS system must be tuned, the injection port inertness must be verified, and the instrument must be calibrated.

7.4.1.1 Tune Verification (DFTPP)

The instrument should be hardware tuned per manufacturer's instructions. Verify the instrument tune by injecting 1ul (50ng) of DFTPP solution onto the instrument. The resulting DFTPP spectra should meet the criteria in the following table.

**DFTPP KEY IONS AND ION ABUNDANCE CRITERIA**

| Mass | Ion Abundance Criteria* |
|---|---|
| 51 | 30-60 of mass 198 |
| 68 | <2 % of mass 69 |
| 70 | <2 % of mass 69 |
| 127 | 40-60 % of mass 198 |
| 197 | <1 % of mass 198 |
| 198 | Base peak, 100 % relative abundance |
| 199 | 5-9 % of mass 198 |
| 275 | 10-30 % of mass 198 |
| 365 | >1 % of mass 198 |
| 441 | Present but less than mass 443 |
| 442 | >40 % of mass 198 |
| 443 | 17-23 % of mass 442 |

*Alternate tune criteria (CLP or manufacturers' instructions) may be used, if the method performance is not adversely affected.

Evaluate the tune spectrum using three mass scans from the chromatographic peak and a subtraction of instrument background. This procedure is performed automatically by the HP software by running "autofind" on the DFTPP peak.

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Select the scans at the peak apex and one to each side of the apex. Calculate an average of the mass abundances from the three scans.

Background subtraction is required. Select a single scan in the chromatogram that is absent of any interfering compound peak and no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the tuning compound peak.

Alternatively, the average spectra over the entire peak may be used. **All subsequent tune evaluations must use the same procedure that was used for the Initial Calibration.**

If the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are met.

Analysis must not begin until the tuning criteria are met. The injection time of the acceptable tune analysis is considered the start of the 12-hour clock. The same mass spec settings must be used for the calibration standards and samples that were used for the tune evaluation standard.

7.4.1.2 Injection Port Inertness Verification

DDT, pentachlorophenol, and benzidine must also be evaluated in the tune standard. These compounds are used to assess injection port inertness and column performance.

Pentachlorophenol and benzidine should be present at their normal responses and, no peak tailing should be visible. The tailing factor for Benzidine must be less than 3 and the tailing factor for pentachlorophenol must be less than 5.

DDT breakdown should not exceed 20%. Breakdown is calculated as follows:

$$\%DDT_{BREAKDOWN} = \frac{(\text{DDE Area} + \text{DDD Area}) \times 100}{(\text{DDE Area} + \text{DDD Area} + \text{DDT Area})}$$

If degradation is excessive or peak tailing is noticed, injection port maintenance is required.

This performance test must be passed before any samples or standards are analyzed.

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7.4.1.3 Internal Standard Calibration

A minimum 5-point calibration curve is created for the semivolatile organic compounds and surrogates using an internal standard technique. Accutest Laboratories routinely performs a 6-point calibration to maximize the calibration range. If a point is omitted from the curve due to poor linearity, the remaining 5 points must be continuous.

Response factors (RF) for each analyte are determined as follows:

$$RF = (A_{anayte} \mathbf{X} C_{istd})/(A_{istd} \mathbf{X} C_{analyte})$$

$A_{anayte}$ = area of the analyte
$A_{istd}$ = area of the internal standard
$C_{analyte}$ = concentration of the analyte
$C_{istd}$ = concentration of the internal standard.

The mean RF and standard deviation of the RF are determined for each analyte. The percent relative standard deviation (%RSD) of the response factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of RF X 100) / Mean RF

If the %RSD $\leq$ 15%, linearity through the origin can be assumed and the mean RF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 15% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is $\geq$0.995 ($r^2$ $\geq$0.990) then the curve can be used to quantitate target analytes in the samples.

Benzidine and benzaldehyde are extremely reactive in the calibration mix and will quickly break down. The initial calibration criteria for these two analytes has been increased to a %RSD $\leq$ 35% or a correlation coefficient (r) is $\geq$0.95 ($r^2$ $\geq$0.90) for determining non-detects. However, if either analyte is detected in the samples, the instrument must be recalibrated and the sample must be reanalyzed. It may be beneficial to recalibrate the instrument using the individual analyte, and then reanalyze the sample.

The method also employs a series of Calibration Check Compounds (CCC) and System Performance Check Compounds (SPCC). The %RSD for any CCC must be $\leq$ 30

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% and the average relative response factor for any SPCC must be at least 0.05.

**Calibration Check Compounds (CCC)**

| Base Neutral | Acid |
|---|---|
| 1,4-Dichlorobenzene | Phenol |
| Hexachlorobutadiene | 2,4-Dichlorophenol |
| Acenaphthene | 2-Nitrophenol |
| Fluoranthene | p-Chloro-m-cresol |
| N-Nitrosodiphenylamine | 2,4,6-Trichlorophenol |
| Di-n-octyl phthalate | Pentachlorophenol |
| Benzo (a) pyrene | |

**System Performance Check Compounds (SPCC)**

| Base Neutral | Acid |
|---|---|
| N-Nitroso-di-n-propylamine | 2,4-Dinitrophenol |
| Hexachlorocyclopentadiene | 4-Nitrophenol |

7.4.1.4 Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The ICV must meet the criteria listed in section 7.4.2. If the ICV does not meet this criteria, a second standard should be prepared. If the ICV still does not meet this criteria, a new calibration curve may need to be prepared.

7.4.2 Continuing Calibration Verification (CCV)

7.4.2.1 Inject 1ul of the tune evaluation mix at the beginning of each 12-hour shift. Evaluate the resultant peaks against the criteria in sections 7.4.1.1 and 7.4.1.2. The injection time of this standard starts the 12-hour window.

7.4.2.2. Analyze a continuing calibration check standard. Since the method only requires one CCV per analytical batch, the level of the CCV should be varied throughout the week. At least one CCV must be below the mid-point of the calibration curve.

7.4.2.3. The minimum RF of check standard for SPCC compounds must be 0.05.

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7.4.2.4. The %D for the CCC compounds must be ≤ 20%. If the CCCs are not part of the target list, then all target analytes must meet the 20 %D criteria.

7.4.2.5. The %D for all other analytes of interest should be ≤ 20%; however, the large number of analytes in this method presents a substantial probability that a few of the analytes will fall outside of this range. The analysis of samples may proceed. However, if a reportable analyte is detected in a sample and the %D for that analyte was greater than 20% in the CCV, the sample will need to be reanalyzed on a system with a passing CCV for that analyte, or the data must be qualified.

7.4.2.6. The criteria in 7.4.2.3 and 7.4.2.4 must be met for the continuing calibration to be considered valid. If the first continuing calibration verification does not meet criteria, a second standard may be injected. If the second standard does not meet criteria, the system must be recalibrated.

7.4.2.7. If any of the internal standard area change by a factor of two (-50% to +100%) or retention time changes by more than 30 seconds from the midpoint standard of the last initial calibration, the mass spectrometer must be inspected for malfunctions and corrections made, as appropriate. Corrective action may include re-calibration (initial Calibration) of the instrument.

7.4.3 Sample Extract Analysis

7.4.3.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

Tune Evaluation Mix
Initial Calibration Standards (or CCV)
QC Extracts
Sample Extracts

7.4.3.2 Four microliters of internal standard solution is added to every 100ul of extract in the autosampler vial. Generally, 400ul of extract are transferred to the autosampler vial with a gas tight syringe.

7.4.3.3 One or two microliters (same amount as standards) of extract is injected into the GC by the autosampler. The data system then records the resultant peak responses and retention times.

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7.4.3.4 Qualitative identification

The target compounds shall be identified by analysts with competent knowledge in the interpretation of mass spectra by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound. The criteria required for a positive identification is:

The sample component must elute at the same relative retention time (RRT) as the daily standard. The RRT of sample component must be within ± 0.06 RRT units of the standard.

All ions present in the standard mass spectra at a relative intensity greater than 10% (major abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

The relative intensities of these ions must agree within ± 30% between the daily standard and sample spectra. (Example: For an ion with an abundance of 50 % in the standard spectra, the corresponding sample abundance must be between 20 and 80%.

Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

If peak identification is prevented by the presence of interferences, further cleanup may be required or the extract must be diluted so that the interference does not mask any analytes.

7.4.3.5 Quantitative analysis

When a target compound has been identified, concentration will be based on the integrated area of the quantitation ion, which is normally the base peak.

The sample matrix may produce an interference with the primary ion. This may be characterized by an excessive background signal of the same ion, which distorts the peak shape beyond a definitive integration. The interference could also, severely inhibit the response of the internal standard ion. If an interference is apparent the secondary ion can be used to generate a new calibration factor.

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If the analyte response exceeds the linear range of the system, the extract must be diluted and reanalyzed. It is recommended that extracts be diluted so that the response falls into the middle of the calibration curve.

7.4.3.6 Library search for tentatively identified compounds

If a library search is requested, the analyst should perform a forward library search of the NIST mass spectral library to tentatively identify 10 to 20 non-target compounds.

Guidelines for making tentative identification are:

These compounds should have a response greater than 25% of the nearest internal standard. The response is obtained from the Total Ion Chromatogram.

The search is to include a spectral printout of the best library match for a particular substance. The results are to be interpreted by the analyst.

Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

The relative intensities the major ions should agree within ±20%.

Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

Ions present in the reference spectrum but not in the sample spectrum should be verified by performing further manual background subtraction to eliminate the interference created by coeluting peaks and/or matrix interference.

Quantitation of the tentatively identified compounds is obtained from the total ion chromatogram based on a response factor of 1 from the nearest internal standard and is to be tabulated on the library search summary data sheet.

## 8.0 QUALITY ASSURANCE / QUALITY CONTROL

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are updated annually and are listed in the LIMS.

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8.1 Internal Standards

1,4-Dichlorobenzene-d4, Naphthalene-d8, Acenaphthene-d10, Phenanthrene-d10, Chrysene-d12 and Perylene-d12 are used as internal standards for this method. The response of the internal standard in all subsequent runs should be within a factor of two (-50% to +100%) of the internal standard response in the opening CCV for each sequence. On days that an initial calibration is performed, the internal standard responses should be compared to the internal standard responses for the mid-point standard.

8.1.1 If the internal standard responses are not within limits, the following are required.

8.1.1.1 Check to be sure that there are no errors in calculations, integrations, or internal standards solutions. If errors are found, recalculate the data accordingly.

8.1.1.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.1.1.3 If no problem is found, prepare a second aliquot of extract and reanalyze the sample.

8.1.1.4 If upon reanalysis, the responses are still not within limits, the problem is considered matrix interference. The extract may need to be diluted or the results qualified.

8.2 Surrogates

8.2.1 Nitrobenzene-d5, 2-Fluorobiphenyl, and p-Terphenyl are used as the base neutral surrogate standards and Phenol-d5, 2-Fluorophenol, and 2,4,6-Tribomophenol are used as the acid surrogate standards to monitor the efficiency of the extraction.

A known amount of surrogate standard is added to each sample including the QC set prior to extraction. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for all surrogates for the results to be acceptable.

8.2.2 If any surrogate recovery is not within the established control limits, the following are required. Note: If the samples are being analyzed for only

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base neutral compounds or only acid compounds, then only the relative surrogates need to be monitored.

8.2.2.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.2.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.2.2.3 If no problem is found, re-extract and reanalyze the sample.

8.2.2.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference.

8.3 Method Blank and Blank Spike

8.3.1 The method blank is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard has been added. The method blank is then extracted and taken through all cleanup procedures along with the other samples to determine any contamination from reagents or glassware. The method blank must be free of any analytes of interest or interferences at ½ the required reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch re-extracted and/or reanalyzed.

8.3.2 The blank spike is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard and spike standard have been added. The blank spike is then extracted and taken through all cleanup procedures along with the other samples to monitor the efficiency of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

The percent recovery for each analyte of interest should fall within the established control limits for the results to be acceptable. The large number of analytes in this method presents a substantial probability that a few of the analytes will fall outside of the established control limits. Under certain circumstances, reanalysis may not be necessary. Example: Recovery was high and all associated samples were non-detect.

8.3.3 If the blank spike recoveries are not within the established control limits, the following are required.

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8.3.3.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.3.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.3.3.3 If no problem is found, the department supervisor shall review the data and determine what further action is necessary.

8.4 Matrix Spike and Matrix Spike Duplicate

8.4.1 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then extracted and taken through all cleanup procedures along with the other samples to monitor the precision and accuracy of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.4.2 If the matrix spike recoveries are not within the established control limits, the following are required.

8.4.2.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.4.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.4.2.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for re-extract but are an indication of the sample matrix effects. If the blank spike recoveries indicate that the problem may be procedure related, re-extract and reanalyze the sample batch.

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8.4.3 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

RPD = [| MS Result – MSD Result | / Average Result] X 100

The RPD for each analyte should fall within the established control limits. If more than 33% of the RPDs fall outside of the established control limits, the MS and MSD should be reanalyzed to ensure that there was no injection problem. If upon reanalysis the RPDs are still outside of the control limits, the department supervisor shall review the data and determine if any further action is necessary.

## 9.0 CALCULATIONS

The concentration of each analyte in the original sample is calculated as follows:

Water (ug/l) = $(CONC_{inst})$ X $(V_F / V_I)$ X DF

Soil (ug/kg) = $[(CONC_{inst})$ X $(V_F / W_I)$ X DF] / %solids

| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean RF, linear curve, or quadratic curve |
| DF | = | Dilution Factor |
| $V_F$ | = | Volume of final extract (ul) |
| $V_I$ | = | Volume of sample extracted (ml) |
| $W_I$ | = | Weight of sample extracted (g) |
| %solids | = | Dry weight determination in decimal form |

All soils are reported on a dry weight basis.

## 10.0 SAFETY AND POLLUTION PREVENTION

10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

10.2 Pollution Prevention

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Waste solvents from the sample analysis and standards preparation are collected in waste storage bottles and are eventually transferred to the chlorinated waste drum.

Sample Extracts are archived and stored for 60 days after analysis. Old extracts and standards are disposed of in the waste vial drum.

## 11.0 REFERENCES

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8270C Revision 3, December 1996

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## TABLE 1

### Routine Target Analytes

1,4-Dioxane
N-nitrosodimethylamine
Pyridine
Benzaldehyde
Aniline
bis(2-Chloroethyl)ether
Phenol
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichlorobenzene
Benzyl alcohol
bis(2-chloroisopropyl)ether
2-Methylphenol
Acetophenone
Hexachloroethane
N-Nitroso-di-n-propylamine
3&4-Methylphenol
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
bis(2-Chloroethoxy)methane
Benzoic Acid
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
2,6-Dichlorophenol
Hexachlorobutadiene
Caprolactam
4-Chloro-3-methylphenol
2-Methylnaphthalene
1-Methylnaphthalene
1,2,4,5-Tetrachlorobenzene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
1,1'-Biphenyl
2-Chloronaphthalene
2-Nitroaniline
Acenaphthylene
Dimethylphthalate
2,6-Dinitrotoluene
Acenaphthene
3-Nitroaniline
2,4-Dinitrophenol
Dibenzofuran
2,4-Dinitrotoluene
4-Nitrophenol
2,3,4,6-Tetrachlorophenol
Fluorene
4-Chlorophenyl-phenylether
Diethylphthalate
4-Nitroaniline
4,6-Dinitro-2-methylphenol
n-Nitrosodiphenylamine
1,2-Diphenylhydrazine
4-Bromophenyl-phenylether
Hexachlorobenzene
Atrazine
Pentachlorophenol
Phenanthrene
Anthracene
Carbazole
Di-n-butylphthalate
Fluoranthene
Benzidine
Pyrene
Butylbenzylphthalate
3,3'-Dichlorobenzidine
Benzo[a]anthracene
Chrysene
bis(2-Ethylhexyl)phthalate
Di-n-octylphthalate
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Indeno[1,2,3-cd]pyrene
Dibenz[a,h]anthracene
Benzo[g,h,i]perylene

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# ANALYSIS OF DIESEL RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR

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Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: GC Semivolatile Department Date: _____*

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Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF DIESEL RANGE ORGANICS BY GAS CHROMATOGRAPHY USING FLAME IONIZATION DETECTOR**

**METHOD REFERENCE: SW846 8015B**

**DEPT: GC**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.1.1 This method is used to determine the total petroleum hydrocarbon (TPH) concentration in water, solid, and waste matrices utilizing a gas chromatograph equipped with a flame ionization detector.

1.1.2 TPH for this method is defined as any peaks, including any unresolved hydrocarbon mixtures eluting between Decane (nC10) and Octacosane (nC28). Quantitation is based on a diesel fuel standard.

1.1.3 Reporting limits (RL) are based on the extraction procedure and the lowest calibration standard. Reporting limits may vary depending on matrix complications and volumes. Reporting limits for this method are in the range of 0.25 mg/l for aqueous samples and 8.0 mg/kg for solid samples. Solid matrices are reported on a dry weight basis.

1.1.4 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

1.2 Summary

1.2.1 This method is adapted from SW846 Method 8015B for Diesel Range Organics.

1.2.2 Samples are received, stored and extracted within the appropriate holding times.

1.2.3 Sample preparation is performed in accordance with Accutest SOP OP010 and OP011.

1.2.4 The extracts are analyzed on a gas chromatograph equipped with a flame ionization detector.

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## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

2.1.1 Samples shall be collected in amber glass bottles with Teflon lined caps. One-liter bottles are recommended for aqueous samples and 300ml jars are recommended for solid samples.

2.1.2 Aqueous samples may be preserved with hydrochloric or sulfuric acid to minimize biological degradation.

2.1.3 The samples must be protected from light and refrigerated at 4°C from the time of collection until extraction. The extracts must be stored at 4°C until analysis.

2.2 Holding Time

2.2.1 Aqueous samples must be extracted within 7 days of collection.

2.2.2 Solid and waste samples must be extracted within 14 days of collection.

2.2.3 Extracts must be analyzed within 40 days of extraction.

## 3.0 INTERFERENCES

3.1 Data from all blanks, samples, and spikes must be evaluated for interferences.

3.2 Method interferences may be caused by contaminants in solvents, reagents, or glassware. Interferences from phthalate esters can be eliminated by using plastic-free solvent containers and solvent rinsed glassware.

3.3 Other organic compounds, including chlorinated hydrocarbons, phenols, and phthalate esters may be coextracted by this method. By definition, these compounds are included as TPH.

3.4 Animal and vegetable oils and fats may be removed by silica cleanup.

## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of

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the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

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## 5.0 REAGENTS

5.1 Methylene chloride – pesticide grade or equivalent

5.2 Diesel Stock standard – Traceable to Certificate of Analysis

5.3 Surrogate standard – O-terphenyl

## 6.0 APPARATUS

6.1 Suitable gas chromatograph with splitless injection port and flame ionization detector.

6.2 A data collection and processing system. System must be capable of forced baseline integrations and quantitations using multipoint calibrations.

6.3 DB-5 Column or equivalent: 30m X 0.32mm X 0.25um

6.4 Suitable syringes and glassware for dilutions of standards and extracts.

## 7.0 PROCEDURE

7.1 Standards Preparation

Standards are prepared from commercially available certified reference standards. All standards must be logged in the Semivolatile Standards Logbook. All standards shall be traceable to their original source.

7.1.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a “Certificate of Analysis” with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor’s expiration date. Once opened, the hold time is reduced to one year or the vendor’s expiration date (whichever is shorter).

7.1.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with methylene chloride. The hold time for intermediate standards is six months or the vendor’s expiration date (whichever is shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

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7.1.3 Calibration Standards

Calibration standards for TPH are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration at or below the RL and the remaining standards define the working range of the detector.

Calibration standard concentrations are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Gas Chromatograph Conditions

1-2ul autosampler injection

Carrier gas – UHP Hydrogen

Detector gas – UHP Air (~300 ml/min)

Detector gas – UHP Hydrogen (~30 ml/min)

Injection port temperature – 260 °C

Detector temperature – 320 °C

Oven program – 50 °C for 2.0 minutes
45 °C/min to 120 °C for 0.0 minutes
30 °C/min to 270 °C for 0.0 minutes
25 °C/min to 310 °C for 5.1 minutes

Pressure program – 13.1 psi for 2 minutes
0.5 psi/min to 16.5 psi for 0.0 minutes
2.5 psi/min to 32 psi for 0.0 minutes

GC conditions are optimized for each instrument. Actual conditions may vary slightly from those listed above.

7.3 Gas Chromatograph Conditions (GC Racer Equipped Instrument)

1-2ul autosampler injection

Carrier gas – UHP Helium

Detector gas – UHP Air (~300 ml/min)

Detector gas – UHP Hydrogen (~30 ml/min)

Injection port temperature – 275 to 300 °C

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Detector temperature – 320 °C

Oven program – 50 °C for 2 minutes
65 °C/min to 300 °C for 6.5 minutes

Pressure program – 17.5 psi for 2 minutes
6 psi/min to 52 psi for 0 minutes

GC conditions are optimized for each instrument. Actual conditions may vary slightly from those listed above.

7.4 Sample Preparation

7.4.1 Water Samples

A 1000ml aliquot of sample is extracted with methylene chloride utilizing separatory funnel extraction. The extract is cleaned with silica gel and then concentrated to 1.0ml.

7.4.2 Solid Samples

A 30-gram aliquot of sample is extracted with methylene chloride utilizing pulse sonication. The extract is cleaned with silica gel and then concentrated to 1.0ml.

7.4.3 Waste Samples

A one-gram aliquot of sample is diluted in methylene chloride to 10ml. The extract is then cleaned with silica gel.

7.5 Gas Chromatographic Analysis

Instrument calibration consists of two major sections:

Initial Calibration Procedures
Continuing Calibration Verification

7.5.1 Initial Calibration Procedures

Before samples can be run, the chromatographic system must be calibrated and retention time ranges and windows must be determined.

7.5.1.1 Retention Time Range

A C10 to C28 even numbered alkane standard is used to establish the retention time range. The diesel range is defined by the start of nC10 and the end of nC28. This range is used for all samples and standards. The range must be verified every 12 hours.

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7.5.1.2 External Standard Calibration

Quantitation for this method is based on the response of diesel fuel. A minimum 5-point calibration curve is created for diesel fuel and o-terphenyl (surrogate).

The area of the diesel fuel standard is determined by integrating (baseline to baseline) from the time where nC10 starts to the time where nC28 ends. The HP Enviroquant software will automatically correct for the area of the surrogate. If other processing software is used the analyst will have to correct for the area of the surrogate.

Calibration factors (CF) for diesel are determined at each concentration by dividing the total area of the diesel standard (corrected for the surrogate) by the concentration of the standard. Calibration factors for the surrogate are determined at each concentration by dividing the area of the peak by the concentration of the standard.

The mean CF and standard deviation of the CF are determined for each analyte. The percent relative standard deviation (%RSD) of the calibration factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of CF X 100) / Mean CF

If the %RSD $\leq$ 20%, linearity through the origin can be assumed and the mean CF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 20% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is $\geq$0.995 ($r^2$ $\geq$0.990) then the curve can be used to quantitate target analytes in the samples.

7.5.1.3 Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The percent difference (%D) for each analyte is checked. The |%D| should be $\leq$ 15% for each analyte. If the |%D| is greater than 15%, a second standard should be prepared. If the |%D| is still outside of this range, a new calibration curve may need to be prepared.

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7.5.1.4 Solvent Blank

A solvent blank must be analyzed at the beginning of each 12hr shift to determine the normal baseline rise during a GC run. This amount must be less than the RL. Solvent blanks should also be analyzed after samples with high TPH concentrations to ensure that there is no carryover.

7.5.1.5 Retention Time Windows

Retention time windows must be established whenever a new column is installed in an instrument or whenever a major change has been made to an instrument.

Retention time windows are established by injecting all standard mixes three times over the course of 48 to 72 hours and calculating the standard deviation of the retention times of each analyte. For this method, the retention time windows must be calculated for C10, C28, and o-terphenyl. Plus or minus three times the standard deviation of the retention times is defined as the retention time window of that compound.

Peak identification is based on the retention time of an analyte in the standard (initial or continuing) being used as the mid-point of the retention time window. Time reference peaks (surrogates) are used to correct for run-to-run variations in retention times due to temperature, flow, or injector fluctuations.

The retention time windows should be used as a guide for identifying compounds; however, the experience of the analyst should weigh heavily in the interpretation of the chromatograms. The analyst should monitor the retention times of known peaks (standards and surrogates) throughout an instrument run as an indication of instrument performance.

7.5.2 Continuing Calibration Verification (CCV)

Continuing calibration verification standards for TPH are prepared at various concentrations; at least one CCV must be below the mid-point of the calibration curve. A continuing calibration standard must be analyzed at the beginning and end of each run to verify that the initial calibration is still valid. Additionally a CCV must be analyzed after every 10 samples.

The percent difference (%D) for each analyte will be monitored. The |%D| must be ≤ 15% for each analyte that is detected in the samples. If the |%D| is greater than 15%, the samples must be reanalyzed. **NOTE: If this method is being used to report samples to the State of North Carolina, the |%D| must be ≤ 10% for the CCV.**

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**Any target analytes that are detected in the samples must be bracketed by an acceptable initial calibration curve and acceptable CCV standards; otherwise, the samples must be reanalyzed.**

7.5.3 Sample Extract Analysis

7.5.3.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

Retention Time Standard
Initial Calibration Standards (or Initial CCV)
Solvent Blank
QC Extracts
Sample Extracts
CCV Standards

7.5.3.2 One or two microliters (same amount as standards) of extract is injected into the GC by the autosampler. A splitless injection technique is used. The data system then records the resultant peak responses and retention times.

7.5.3.3 As defined by the method, any peaks (including any unresolved petroleum hump) falling within the retention time range are defined as TPH and must be quantitated. Confirmations are not required for this method.

7.5.3.4 If the petroleum response exceeds the linear range of the system, the extract must be diluted and reanalyzed. It is recommended that extracts be diluted so that the response falls into the middle of the calibration curve.

7.5.3.5 Some petroleum products (gasoline, motor oil, etc) may not fall completely within the diesel range. If a significant amount of the product falls outside the diesel range, it should be noted on the report.

## 8.0 QUALITY ASSURANCE / QUALITY CONTROL

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are updated annually and are listed in the LIMS.

8.1 Surrogates

8.1.1 O-terphenyl is used as the surrogate standard to monitor the efficiency of the extraction and clean-up procedures.

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A known amount of surrogate standard is added to each sample including the QC set prior to extraction. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for the results to be acceptable.

8.1.2 If the surrogate recoveries are not within the established control limits, the following are required.

8.1.2.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.1.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.1.2.3 If no problem is found, re-extract and reanalyze the sample.

8.1.2.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference. The data should be qualified as “estimated concentration”.

8.2 Method Blank and Blank Spike

8.2.1 The method blank is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard has been added. The method blank is then extracted and taken through all cleanup procedures along with the other samples to determine any contamination from reagents or glassware. The method blank must be free of any analytes of interest or interferences at ½ the required reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch re-extracted and/or reanalyzed.

8.2.2 The blank spike is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard and spike standard have been added. The blank spike is then extracted and taken through all cleanup procedures along with the other samples to monitor the efficiency of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

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The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.2.3 If the blank spike recoveries are not within the established control limits, the following are required.

8.2.3.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.2.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.2.3.3 If no problem is found, the department supervisor shall review the data and determine what further action is necessary.

8.3 Matrix Spike and Matrix Spike Duplicate

8.3.1 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then extracted and taken through all cleanup procedures along with the other samples to monitor the precision and accuracy of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.3.2 If the matrix spike recoveries are not within the established control limits, the following are required.

8.3.2.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.3.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.3.2.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for re-extract but are an indication of the sample matrix effects. If the blank

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spike recoveries indicate that the problem may be procedure related, re-extract and reanalyze the sample batch.

8.3.3 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

RPD = [| MS Result – MSD Result | / Average Result] X 100

The RPD for each analyte should fall within the established control limits. If the RPDs fall outside of the established control limits, the MS and MSD should be reanalyzed to ensure that there was no injection problem. If upon reanalysis the RPDs are still outside of the control limits, the department supervisor shall review the data and determine if any further action is necessary.

## 9.0 CALCULATIONS

The area of the TPH in the samples is determined by integrating (baseline to baseline) from the time where nC10 starts to the time where nC28 ends. This integration must include any unresolved petroleum "hump". The HP Enviroquant software will automatically correct for the area of the surrogate. If other processing software is used the analyst will have to correct for the area of the surrogate.

The concentration of the analyte in the original sample is calculated as follows:

TPH Water (mg/l) = ($CONC_{inst}$) X ($V_F$ / $V_I$) X DF

TPH Soil (mg/kg) = [($CONC_{inst}$) X ($V_F$ / $W_I$) X DF] / %solids

| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean RF, linear curve, or quadratic curve |
| DF | = | Dilution Factor |
| $V_F$ | = | Volume of final extract (ml) |
| $V_I$ | = | Volume of sample extracted (ml) |
| $W_I$ | = | Weight of sample extracted (g) |
| %solids | = | Dry weight determination in decimal form |

All soils are reported on a dry weight basis.

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## 10.0 SAFETY AND POLLUTION PREVENTION

### 10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

### 10.2 Pollution Prevention

Waste solvents from the sample analysis and standards preparation are collected in waste storage bottles and are eventually transferred to the chlorinated waste drum.

Sample Extracts are archived and stored for 60 days after analysis. Old extracts and standards are disposed of in the waste vial drum.

## 11.0 References

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8015B Revision 2, December 1996

Florida DEP Method FL-PRO, REV. 1, 11/95

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**ANALYSIS OF ORGANOCHLORINE PESTICIDES BY GAS CHROMATOGRAPHY, ELECTRON CAPTURE DETECTOR**

Prepared by: Norm Farmer Date: 01/06/04

Reviewed by: Mark Erstling Date: 01/09/04

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: GC Semivolatile Department Date: _____*

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF ORGANOCHLORINE PESTICIDES BY GAS CHROMATOGRAPHY, ELECTRON CAPTURE DETECTOR**

**METHOD REFERENCE: SW 846 8081A**

**DEPT: GC**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.1.1 This method is used to determine the concentrations of specific organochlorine pesticides in water and solid matrices utilizing a gas chromatograph equipped with an electron capture detector.

1.1.2 The following compounds can be reported by this method:

Aldrin
Alpha-BHC
Beta-BHC
Delta-BHC
Gamma-BHC (Lindane)
Chlordane (Technical)
Alpha-chlordane
Gamma-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Endrin
Endrin Ketone
Endrin Aldehyde
Heptachlor
Heptachlor Epoxide
Methoxychlor
Toxaphene

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1.1.3 Reporting limits (RL) are based on the extraction procedure and the lowest calibration standard. Reporting limits may vary depending on matrix complications and volumes. Reporting limits for the single peak pesticides in this method are in the range of 0.05 to 0.10 ug/l for aqueous samples and 1.7 to 3.3 ug/kg for solid samples. Solid matrices are reported on a dry weight basis.

1.1.4 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

1.2 Summary

1.2.1 This method is adapted from SW846 method 8081A.

1.2.2 Samples are received, stored and extracted within the appropriate holding times.

1.2.3 Sample preparation is performed in accordance with Accutest SOP OP008 and OP009.

1.2.4 The extracts are analyzed on a gas chromatograph equipped with an electron capture detector.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

2.1.1 Samples shall be collected in amber glass bottles with Teflon lined caps. One-liter bottles are recommended for aqueous samples and 300ml jars are recommended for solid samples.

2.1.2 The samples must be protected from light and refrigerated at 4°C from the time of collection until extraction. The extracts must be stored at 4°C until analysis.

2.2 Holding Time

2.2.1 Aqueous samples must be extracted within 7 days of collection.

2.2.2 Solid and waste samples must be extracted within 14 days of collection.

2.2.3 Extracts must be analyzed within 40 days of extraction.

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## 3.0 INTERFERENCES

3.1 Data from all blanks, samples, and spikes must be evaluated for interferences.

3.2 Method interferences may be caused by contaminants in solvents, reagents, or glassware. Interferences from phthalate esters can be eliminated by using plastic-free solvent containers and solvent rinsed glassware.

3.3 Other organic compounds, including chlorinated hydrocarbons, phenols, and phthalate esters may be coextracted by this method.

3.4 Interferences from sulfur compounds can be eliminated using a tetrabutyl ammonium sulfite (TBA) cleanup. Regional samples are generally high in sulfur content; therefore, all aqueous and solid sample extracts should be sulfur cleaned prior to analysis.

Sulfur cleanup will reduce endrin aldehyde recoveries to less than 20%. If endrin aldehyde is detected, the non-sulfur cleaned aliquot shall be analyzed. If possible, endrin aldehyde will be reported from the non-sulfur cleaned aliquot.

## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever

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possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 REAGENTS

5.1 Hexane – pesticide grade or equivalent

5.2 Pesticide stock standards – Traceable to Certificate of Analysis

5.3 Surrogate standard – TCMX and Decachlorobiphenyl

## 6.0 APPARATUS

6.1 Suitable gas chromatograph equipped with a split-splitless injection port, electron capture detectors, and a data collection and processing system.

6.2 Dual DB-17/DB-1701 Column or equivalent: 30m X 0.32mm X 0.25um

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6.3 Suitable syringes and glassware for dilutions of standards and extracts.

## 7.0 PROCEDURE

7.1 Standards Preparation

Standards are prepared from commercially available certified reference standards. All standards must be logged in the Pesticide Standards Logbook. All standards shall be traceable to their original source.

7.1.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a "Certificate of Analysis" with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor's expiration date. Once opened, the hold time is reduced to one year or the vendor's expiration date (whichever is shorter).

7.1.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with hexane. The hold time for intermediate standards is six months or the vendor's expiration date (whichever is shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

7.1.3 Calibration Standards

Calibration standards for the single peak pesticides are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration at or below the RL and the remaining standards define the working range of the detector.

Standards for the multipeak pesticides (Toxaphene and Technical Chlordane) are made at a single level near the RL.

Calibration standard concentrations for the single peak pesticides are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Gas Chromatograph Conditions

1-2ul autosampler injection

Carrier gas – UHP Helium (2.5 to 3.0 ml/min ramped flow or pulsed injection)

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Detector gas – P-5 (5% methane in argon) (30 - 90 ml/min)

Injection port temperature – 190 °C

Detector temperature – 300 °C

Oven program – 110 °C for 0.5 minutes
25 °C/min to 150 °C for 0 minutes
12.5 °C/min to 260 °C for 0 minutes
30 °C/min to 280 °C for 6.4 minutes

GC conditions are optimized for each instrument. Actual conditions may vary slightly from those listed above.

7.3 Sample Preparation

7.3.1 Water Samples

A 1000ml aliquot of sample is extracted with methylene chloride utilizing separatory funnel extraction. The extract is solvent exchanged into hexane, concentrated to 10.0ml, and sulfur cleaned.

7.3.2 Solid Samples

A 30-gram aliquot of sample is extracted with methylene chloride utilizing pulse sonication. The extract is solvent exchanged into hexane, concentrated to 10.0ml, and sulfur cleaned.

7.4 Gas Chromatographic Analysis

Instrument calibration consists of three major sections:

Initial Calibration Procedures
Daily Calibration Procedures
Continuing Calibration Verification

7.4.1 Initial Calibration Procedures

Before samples can be run, injection port inertness must be verified, the chromatographic system must be calibrated, and retention time windows must be determined.

7.4.1.1 Breakdown Check

Prime the GC by injecting a conditioning standard; this is a pesticide standard that is approximately 20 times the

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concentration of the mid-level standard. This will aid in deactivating the injection port and column.

Endrin and DDT breakdown must be verified at the start of each 12-hour shift. Inject a DDT/Endrin standard that is at a concentration near the mid-point of the curve. Calculate the percent breakdown of each analyte as follows (height may be used instead of area):

$$\%DDT_{BREAKDOWN} = \frac{(\text{DDE Area} + \text{DDD Area}) \times 100}{(\text{DDE Area} + \text{DDD Area} + \text{DDT Area})}$$

$$\%Endrin_{BREAKDOWN} = \frac{(\text{Endrin ketone Area} + \text{Endrin aldehyde Area}) \times 100}{(\text{Endrin ketone Area} + \text{Endrin aldehyde Area} + \text{Endrin Area})}$$

The percent breakdown for both DDT and endrin must not exceed 15%. If breakdown exceeds 15%, instrument maintenance must be performed before any samples can be analyzed.

7.4.1.2 External Standard Calibration

A minimum 5-point calibration curve is created for the single peak pesticides, TCMX, and Decachlorobiphenyl. Toxaphene and chlordane (technical) are calibrated at a single level near the RL.

Calibration factors (CF) for the single peak pesticides and surrogates are determined at each concentration by dividing the area (or height) of each compound by the concentration of the standard.

Quantitation for chlordane is based on the individual peaks in the chlordane standard. Three to six major peaks are used for quantitation purposes. Each individual chlordane peak is assigned the concentration of the total chlordane standard. Toxaphene may be quantitated by total area or by the individual peaks. See method 8081A for additional information.

Calibration factor (CF) for chlordane is determined by dividing the total area (or height) of chlordane (3 to 6 major peaks) by the concentration of the standard. The calibration factor for the toxaphene is determined by dividing the total area (height can not be used) of toxaphene by the concentration of the standard.

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The mean CF and standard deviation of the CF are determined for each analyte. The percent relative standard deviation (%RSD) of the calibration factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of CF X 100) / Mean CF

If the %RSD $\leq$ 20%, linearity through the origin can be assumed and the mean CF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 20% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is $\geq$0.995 ($r^2$ $\geq$0.990) then the curve can be used to quantitate target analytes in the samples.

7.4.1.3 Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The percent difference (%D) for each single peak analyte is checked. The |%D| should be $\leq$ 15% for each analyte. If the |%D| is greater than 15%, a second standard should be prepared. If the |%D| is still outside of this range, a new calibration curve may need to be prepared.

7.4.1.4 Retention Time Windows

Retention time windows must be established whenever a new column is installed in an instrument or whenever a major change has been made to an instrument.

Retention time windows are established by injecting all standard mixes three times over the course of 48 to 72 hours and calculating the standard deviation of the retention times of each analyte. Plus or minus three times the standard deviation of the retention times is defined as the retention time window of that compound.

Peak identification is based on the retention time of an analyte in the standard (initial or continuing) being used as the mid-point of the retention time window. Time reference peaks (surrogates) are used to correct for run-to-run variations in retention times due to temperature, flow, or injector fluctuations.

The retention time windows should be used as a guide for identifying compounds; however, the experience of the analyst

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should weigh heavily in the interpretation of the chromatograms. The analyst should monitor the retention times of known peaks (standards and surrogates) throughout an instrument run as an indication of instrument performance.

Because calculated retention time windows are generally very tight (less than ± 0.03 minutes), the retention time windows for the data processing method are generally set wider than the calculated window. This is done to ensure that the software does not miss any potential "hits". The analyst will then review these "hits" and determine if the retention times are close enough to the retention time of the target analyte to positively identify the peak or to require confirmation.

7.4.2 Daily Calibration Procedures

Prime the GC by injecting a conditioning standard; this is a pesticide standard that is approximately 20 times the concentration of the mid-level standard. This will aid in deactivating the injection port and column.

Analyze a DDT/Endrin breakdown standard as described in section 7.4.1.1. This standard must be analyzed at the start of each 12-hour shift.

Analyze a continuing calibration verification standard (section 7.4.3) for the single peak pesticides. Then analyze the multipeak pesticide standards that are calibrated at a single concentration level. The single point standards must be analyzed every 12 hours; they do not have to be analyzed at the same frequency as the CCV standard.

7.4.3 Continuing Calibration Verification (CCV)

Continuing calibration verification standards for the single peak pesticides are prepared at various concentrations; at least one CCV must be below the mid-point of the calibration curve. A continuing calibration standard must be analyzed at the beginning and end of each run to verify that the initial calibration is still valid. Additionally a CCV must be analyzed after every 10 samples. If toxaphene or technical chlordane is known to be present at the site, the analyst should analyze additional CCVs for these analytes.

The percent difference (%D) for each single peak analyte including the surrogates will be monitored. The |%D| should be ≤ 15% for each analyte. If the |%D| is greater than 15%, the samples may need to be reanalyzed.

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**Any target analytes that are detected in the samples must be bracketed by an acceptable initial calibration curve and acceptable CCV standards; otherwise, the samples must be reanalyzed or the data must be qualified.**

7.4.4 Sample Extract Analysis

7.4.4.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

Conditioning Standard
DDT/Endrin Breakdown Standard
Initial Calibration Standards (or Initial CCV)
Single Point Standards
QC Extracts
Sample Extracts
CCV Standards

7.4.4.2 One or two microliters (same amount as standards) of extract is injected into the GC by the autosampler. A splitless injection technique is used. The data system then records the resultant peak responses and retention times.

7.4.4.3 Tentative identification of an analyte occurs when the peaks from the sample extract fall within the established retention time windows for a calibrated compound on the primary column.

7.4.4.4 If the peaks of interest fall within the retention time windows on the confirmation column, the identification is confirmed. Quantitation of the analyte on the primary and confirmation column should agree within 40%. If the difference is greater than 40% and no obvious reason can be found, the higher result should be reported and flagged as “estimated”; otherwise, the result from the primary column should be reported.

7.4.4.5 If the analyte response exceeds the linear range of the system, the extract must be diluted and reanalyzed. It is recommended that extracts be diluted so that the response falls into the middle of the calibration curve.

7.4.4.6 If peak identification is prevented by the presence of interferences, further cleanup may be required or the extract must be diluted so that the interference does not mask any analytes.

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## 8.0 QUALITY ASSURANCE / QUALITY CONTROL

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are updated annually and are listed in the LIMS.

8.1 Surrogates

8.1.1 Tetrachloro-m-xylene (TCMX) and Decachlorobiphenyl are used as the surrogate standards to monitor the efficiency of the extraction and clean-up procedures.

A known amount of surrogate standard is added to each sample including the QC set prior to extraction. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for both surrogates for the results to be acceptable

8.1.2 If the surrogate recoveries are not within the established control limits, the following are required.

8.1.2.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.1.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.1.2.3 If no problem is found, re-extract and reanalyze the sample.

8.1.2.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference.

8.2 Method Blank and Blank Spike

8.2.1 The method blank is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard has been added. The method blank is then extracted and taken through all cleanup procedures along with the other samples to determine any contamination

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from reagents or glassware. The method blank must be free of any analytes of interest or interferences at ½ the required reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch re-extracted and/or reanalyzed.

8.2.2 The blank spike is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard and spike standard have been added. The blank spike is then extracted and taken through all cleanup procedures along with the other samples to monitor the efficiency of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

The percent recovery for each analyte of interest should fall within the established control limits for the results to be acceptable. The large number of analytes in this method presents a substantial probability that a few of the analytes will fall outside of the established control limits. Under certain circumstances, reanalysis may not be necessary. Example: Recovery was high and all associated samples were non-detect.

8.2.3 If the blank spike recoveries are not within the established control limits, the following are required.

8.2.3.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.2.3.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.2.3.3 If no problem is found, the department supervisor shall review the data and determine what further action is necessary.

8.3 Matrix Spike and Matrix Spike Duplicate

8.3.1 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then extracted and taken through all cleanup procedures along with the other samples to monitor the precision and accuracy of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

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The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.3.2 If the matrix spike recoveries are not within the established control limits, the following are required.

8.3.2.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.3.2.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.3.2.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for re-extract but are an indication of the sample matrix effects. If the blank spike recoveries indicate that the problem may be procedure related, re-extract and reanalyze the sample batch.

8.3.3 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

RPD = [| MS Result – MSD Result | / Average Result] X 100

The RPD for each analyte should fall within the established control limits. If more than 33% of the RPDs fall outside of the established control limits, the MS and MSD should be reanalyzed to ensure that there was no injection problem. If upon reanalysis the RPDs are still outside of the control limits, the department supervisor shall review the data and determine if any further action is necessary.

## 9.0 CALCULATIONS

The concentration of each single peak pesticide or toxaphene (if using the total area technique) in the original sample is calculated as follows:

Water (ug/l) = $(CONC_{inst})$ X $(V_F / V_I)$ X DF

Soil (ug/kg) = [$(CONC_{inst})$ X $(V_F / W_I)$ X DF] / %solids

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| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean CF, linear or quadratic curve, or single point standard |
| DF | = | Dilution Factor |
| $V_F$ | = | Volume of final extract (ml) |
| $V_I$ | = | Volume of sample extracted (ml) |
| $W_I$ | = | Weight of sample extracted (g) |
| %solids | = | Dry weight determination in decimal form |

All soils are reported on a dry weight basis.

The amount of chlordane or toxaphene (if using the multipeak technique) in the samples is determined by averaging the concentration of the major peaks for each multipeak pesticide. The HP Enviroquant software will automatically sum and average the peaks used for each multipeak pesticide.

## 10.0 SAFETY AND POLLUTION PREVENTION

### 10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

### 10.2 Pollution Prevention

Waste solvents from the sample analysis and standards preparation are collected in waste storage bottles and are eventually transferred to the non-chlorinated waste drum.

Sample Extracts are archived and stored for 60 days after analysis. Old extracts and standards are disposed of in the waste vial drum.

## 11.0 REFERENCES

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8081A Revision 1, December 1996

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**ANALYSIS OF POLYCHLORINATED BIPHENYLS BY GAS CHROMATOGRAPHY, ELECTRON CAPTURE DETECTOR**

Prepared by: Norm Farmer Date: 01/06/04

Reviewed by: Mark Erstling Date: 01/09/04

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: QA Department Date: _____

Issued to: GC Semivolatile Department Date: _____*

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Issued to: _____ Date: _____

Effective 7 days after "*" date

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**TEST NAME: ANALYSIS OF POLYCHLORINATED BIPHENYLS BY GAS CHROMATOGRAPHY, ELECTRON CAPTURE DETECTOR**

**METHOD REFERENCE: SW 846 8082**

**DEPT: GC**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Scope and Application

1.1.1 This method is used to determine the polychlorinated biphenyl (PCB) concentrations in water, solid, and waste matrices utilizing a gas chromatograph equipped with an electron capture detector.

1.1.2 PCBs for this method are reported as Aroclors. Aroclors are multi-component mixtures consisting of various chlorinated biphenyl congeners. Quantitation is based on individual Aroclor standards. For the purpose of this SOP, the term Aroclor and PCB may be used interchangeably. The following compounds can be reported by this method:

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262 (optional)
Aroclor 1268 (optional)

1.1.3 Reporting limits (RL) are based on the extraction procedure and the lowest calibration standard. Reporting limits may vary depending on matrix complications and volumes. Reporting limits for this method are in the range of 0.5 ug/l for aqueous samples, 33 ug/kg for solid samples, and 10 mg/kg for oil samples. Solid matrices are reported on a dry weight basis.

1.1.4 The Method Detection Limit (MDL) for each analyte is evaluated on an annual basis for each matrix and instrument. MDLs are pooled for each matrix, and the final pooled MDLs are verified. The verified MDLs are stored in the LIMS and should be lower than the RL.

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1.2 Summary

1.2.1 This method is adapted from SW846 method 8082.

1.2.2 Samples are received, stored and extracted within the appropriate holding times.

1.2.3 Sample preparation is performed in accordance with Accutest SOP OP008 and OP009.

1.2.4 The extracts are analyzed on a gas chromatograph equipped with an electron capture detector.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

2.1.1 Samples shall be collected in amber glass bottles with Teflon lined caps. One-liter bottles are recommended for aqueous samples and 300ml jars are recommended for solid samples.

2.1.2 The samples must be protected from light and refrigerated at 4°C from the time of collection until extraction. The extracts must be stored at 4°C until analysis.

2.2 Holding Time

2.2.1 Aqueous samples must be extracted within 7 days of collection.

2.2.2 Solid and waste samples must be extracted within 14 days of collection.

2.2.3 Extracts must be analyzed within 40 days of extraction.

## 3.0 INTERFERENCES

3.1 Data from all blanks, samples, and spikes must be evaluated for interferences.

3.2 Method interferences may be caused by contaminants in solvents, reagents, or glassware. Interferences from phthalate esters can be eliminated by using plastic-free solvent containers and solvent rinsed glassware.

3.3 Other organic compounds, including chlorinated hydrocarbons, phenols, and phthalate esters may be coextracted by this method. Many of these interferences can be removed by sulfuric acid cleanup.

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3.4 Interferences from sulfur compounds can be eliminated using a tetrabutyl ammonium sulfite (TBA) cleanup. Regional samples are generally high in sulfur content; therefore, all aqueous and solid sample extracts should be sulfur cleaned prior to analysis.

## 4.0 DEFINITIONS

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run.

4.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

4.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

4.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the

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analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.12 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 REAGENTS

5.1 Hexane – pesticide grade or equivalent

5.2 PCB Stock standards – Traceable to Certificate of Analysis

5.3 Surrogate standard – TCMX and Decachlorobiphenyl

## 6.0 APPARATUS

6.1 Suitable gas chromatograph equipped with a split-splitless injection port, electron capture detectors, and a data collection and processing system.

6.2 Dual DB-17/DB-1701 Column or equivalent: 30m X 0.32mm X 0.25um

6.3 Dual RTX CLP/CLP2 Column or equivalent: 30m X 0.32mm X 0.25um

6.4 Suitable syringes and glassware for dilutions of standards and extracts.

## 7.0 PROCEDURE

7.1 Standards Preparation

Standards are prepared from commercially available certified reference standards. All standards must be logged in the Pesticide Standards Logbook. All standards shall be traceable to their original source.

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7.1.1 Stock Standard Solutions

Stock standards are available from several commercial vendors. All vendors must supply a "Certificate of Analysis" with the standard. The certificate will be retained by the lab. Hold time for unopened stock standards is until the vendor's expiration date. Once opened, the hold time is reduced to one year or the vendor's expiration date (whichever is shorter).

7.1.2 Intermediate Standard Solutions

Intermediate standards are prepared by quantitative dilution of the stock standard with hexane. The hold time for intermediate standards is six months or the vendor's expiration date (whichever is shorter). Intermediate standards may need to be remade if comparison to other standards indicate analyte degradation or concentration changes.

7.1.3 Calibration Standards

Calibration standards for PCB 1016 and 1260 are prepared at a minimum of five concentration levels through quantitative dilutions of the intermediate standard. The low standard is at a concentration at or below the RL and the remaining standards define the working range of the detector.

Standards for the remaining five PCBs are made at a single level near the low to mid-point of the curve.

Calibration standard concentrations for PCB 1016 and PCB 1260 are verified by the analysis of an initial calibration verification (ICV) standard.

7.2 Gas Chromatograph Conditions

2ul autosampler injection

Carrier gas – UHP Helium (~2.5 ml/min)

Detector gas – P-5 (5% methane in argon) (30-60 ml/min)

Injection port temperature – 190 °C

Detector temperature – 300 °C

Oven program – 150 °C for 0.5 minutes
25 °C/min to 150 °C for 0 minutes
25 °C/min to 280 °C for 7.3 minutes

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GC conditions are optimized for each instrument. Actual conditions may vary slightly from those listed above.

7.3 Sample Preparation

7.3.1 Water Samples

A 1000ml aliquot of sample is extracted with methylene chloride utilizing separatory funnel extraction. The extract is solvent exchanged into hexane, concentrated to 10.0ml, sulfur cleaned, and acid cleaned.

7.3.2 Solid Samples

A 30-gram aliquot of sample is extracted with methylene chloride utilizing pulse sonication. The extract is solvent exchanged into hexane, concentrated to 10.0ml, sulfur cleaned, and acid cleaned.

7.3.3 Oil Samples

A one-gram aliquot of sample is diluted in hexane to 10ml. The extract may then be sulfur cleaned or acid cleaned.

7.4 Gas Chromatographic Analysis

Instrument calibration consists of three major sections:

Initial Calibration Procedures
Daily Calibration Procedures
Continuing Calibration Verification

7.4.1 Initial Calibration Procedures

Before samples can be run, the chromatographic system must be calibrated, retention time windows must be determined, and pattern recognition standards must be analyzed.

7.4.1.1 External Standard Calibration

Prime the GC by injecting a conditioning standard, this is a high level PCB standard. This will aid in deactivating the injection port and column.

Quantitation for this method is based on the response of individual peaks in each individual PCB standard. Three to six major peaks from each Aroclor are used for quantitation purposes. Each individual PCB peak is assigned the concentration of the total PCB standard.

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A minimum 5-point calibration curve is created for PCB 1016, PCB 1260, TCMX, and Decachlorobiphenyl. PCB 1016 and 1260 are used to establish linearity for all of the PCBs.

The remaining PCBs are calibrated at a single level in the low to mid-point range of the PCB 1016/1260 curve. The single point standards are also used for pattern recognition.

Calibration factors (CF) for PCBs are determined at each concentration by dividing the total area (or height) of the PCB (3 to 6 major peaks) by the concentration of the standard. Calibration factors for the surrogate are determined at each concentration by dividing the area (or height) of the peak by the concentration of the standard.

The mean CF and standard deviation of the CF are determined for each analyte. The percent relative standard deviation (%RSD) of the calibration factors is calculated for each analyte as follows:

%RSD = (Standard Deviation of CF X 100) / Mean CF

If the %RSD $\leq$ 20%, linearity through the origin can be assumed and the mean CF can be used to quantitate target analytes in the samples. Alternatively if the %RSD > 20% a calibration curve of response vs. amount can be plotted. If the correlation coefficient (r) is $\geq$0.995 ($r^2$ $\geq$0.990) then the curve can be used to quantitate target analytes in the samples.

7.4.1.2. Initial Calibration Verification (ICV)

The validity of the initial calibration curve must be verified through the analysis of an initial calibration verification (ICV) standard. The ICV should be prepared at a mid-range concentration. The percent difference (%D) for each single peak analyte is checked. The |%D| should be $\leq$ 15% for each analyte. If the |%D| is greater than 15%, a second standard should be prepared. If the |%D| is still outside of this range, a new calibration curve may need to be prepared.

7.4.1.3 Retention Time Windows

Retention time windows must be established whenever a new column is installed in an instrument or whenever a major change has been made to an instrument.

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Retention time windows are established by injecting all standard mixes three times over the course of 48 to 72 hours and calculating the standard deviation of the retention times of each analyte. Plus or minus three times the standard deviation of the retention times is defined as the retention time window of that compound.

Peak identification is based on the retention time of an analyte in the standard (initial or continuing) being used as the mid-point of the retention time window. Time reference peaks (surrogates) are used to correct for run-to-run variations in retention times due to temperature, flow, or injector fluctuations.

The retention time windows should be used as a guide for identifying compounds; however, the experience of the analyst should weigh heavily in the interpretation of the chromatograms. The analyst should monitor the retention times of known peaks (standards and surrogates) throughout an instrument run as an indication of instrument performance.

Because calculated retention time windows are generally very tight (less than ± 0.03 minutes), the retention time windows for the data processing method are generally set wider than the calculated window. This is done to ensure that the software does not miss any potential “hits”. The analyst will then review these “hits” and determine if the retention times are close enough to the retention time of the target analyte to positively identify the peak or to require confirmation.

Individual PCB peaks must fall within the appropriate retention time windows; however, Aroclor identification is based primarily on individual peak ratios and pattern recognition.

7.4.2 Daily Calibration Procedures

Prime the GC by injecting a conditioning standard, this is a high level PCB standard. This will aid in deactivating the injection port and column.

Analyze a continuing calibration verification standard (section 7.4.3) for PCB 1016 and PCB 1260. Then analyze the PCBs that are calibrated at a single concentration level. The single point standards must be analyzed every 24 hours; they do not have to be analyzed at the same frequency as the CCV standard.

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7.4.3 Continuing Calibration Verification (CCV)

Continuing calibration verification standards for PCB 1016 and PCB 1260 are prepared at various concentrations (CCV standards for other PCBs may be required); at least one CCV must be below the mid-point of the calibration curve. A continuing calibration standard must be analyzed at the beginning and end of each run to verify that the initial calibration is still valid. Additionally a CCV must be analyzed after every 10 samples.

The percent difference (%D) for PCB 1016, PCB 1260, and the surrogates will be monitored. The |%D| should be ≤ 15% for each analyte. If the |%D| is greater than 15%, the samples may need to be reanalyzed.

**Any target analytes that are detected in the samples must be bracketed by an acceptable initial calibration curve and acceptable CCV standards; otherwise, the samples must be reanalyzed or the data must be qualified.**

7.4.4 Sample Extract Analysis

7.4.4.1 Samples are analyzed in a set referred to as an analysis sequence or batch. A batch consists of the following:

Conditioning Standard
Initial Calibration Standards (or Initial CCV)
Single Point Standards
QC Extracts
Sample Extracts
CCV Standards

7.4.4.2 Two microliters (same amount as standards) of extract is injected into the GC by the autosampler. A splitless injection technique is used. The data system then records the resultant peak responses and retention times.

7.4.4.3 Tentative identification of an analyte occurs when the peaks from the sample extract fall within the established retention time windows for a calibrated compound on the primary column. Aroclor identification is determined by comparing the peak ratios of the sample to those of the standards.

7.4.4.4 If the peaks of interest fall within the retention time windows on the confirmation column, the identification is confirmed. Quantitation of the analyte on the primary and confirmation column should agree within 40%. If the difference is greater than 40% and no obvious reason can be found, the higher result should be reported and flagged as “estimated”;

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otherwise the result from the primary column should be reported.

7.4.4.5 If the analyte response exceeds the linear range of the system, the extract must be diluted and reanalyzed. It is recommended that extracts be diluted so that the response falls into the middle of the calibration curve.

7.4.4.6 If peak or pattern identification is prevented by the presence of interferences, further cleanup may be required or the extract must be diluted so that the interference does not mask any analytes.

## 8.0 QUALITY ASSURANCE / QUALITY CONTROL

Accuracy and matrix bias are monitored by the use of surrogates and by the analysis of a QC set that is prepared with each batch (maximum of 20 samples) of samples. The QC set consists of a method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). All control limits are updated annually and are listed in the LIMS.

8.4 Surrogates

8.4.4 Tetrachloro-m-xylene (TCMX) and Decachlorobiphenyl are used as the surrogate standards to monitor the efficiency of the extraction and clean-up procedures.

A known amount of surrogate standard is added to each sample including the QC set prior to extraction. The percent recovery for each surrogate is calculated as follows:

% Recovery = (Sample Amount / Amount Spiked) X 100

The percent recovery must fall within the established control limits for both surrogates for the results to be acceptable.

8.4.5 If the surrogate recoveries are not within the established control limits, the following are required.

8.4.5.1 Check to be sure that there are no errors in calculations, integrations, surrogate solutions or internal standards. If errors are found, recalculate the data accordingly.

8.4.5.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

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8.4.5.3 If no problem is found, re-extract and reanalyze the sample.

8.4.5.4 If upon reanalysis, the recovery is still not within control limits, the problem is considered matrix interference.

8.5 Method Blank and Blank Spike

8.5.4 The method blank is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard has been added. The method blank is then extracted and taken through all cleanup procedures along with the other samples to determine any contamination from reagents or glassware. The method blank must be free of any analytes of interest or interferences at ½ the required reporting level to be acceptable. If the method blank is not acceptable, the problem must be corrected and the entire batch re-extracted and/or reanalyzed.

8.5.5 The blank spike is either de-ionized water or sodium sulfate (depending upon sample matrix) to which the surrogate standard and spike standard have been added. The blank spike is then extracted and taken through all cleanup procedures along with the other samples to monitor the efficiency of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = (Blank Spike Amount / Amount Spiked) X 100

The percent recovery for each analyte of interest should fall within the established control limits for the results to be acceptable. Under certain circumstances, reanalysis may not be necessary. Example: Recovery was high and all associated samples were non-detect.

8.5.6 If the blank spike recoveries are not within the established control limits, the following are required.

8.5.6.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.5.6.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample.

8.5.6.3 If no problem is found, the department supervisor shall review the data and determine what further action is necessary.

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8.6 Matrix Spike and Matrix Spike Duplicate

8.6.4 Matrix spike and spike duplicates are replicate sample aliquots to which the surrogate standard and spike standard have been added. The matrix spike and spike duplicate are then extracted and taken through all cleanup procedures along with the other samples to monitor the precision and accuracy of the extraction procedure. The percent recovery for each analyte is calculated as follows:

% Recovery = [(Spike Amount – Sample Amount) / Amount Spiked] X 100

The percent recovery for each analyte of interest must fall within the established control limits for the results to be acceptable.

8.6.5 If the matrix spike recoveries are not within the established control limits, the following are required.

8.6.5.1 Check to be sure that there are no errors in calculations, integrations, spike solutions or internal standards. If errors are found, recalculate the data accordingly.

8.6.5.2 Check instrument performance. If an instrument performance problem is identified, correct the problem and reanalyze the sample. If the recovery is high due to interfering peaks, it may be possible to get a more accurate recovery by analyzing the sample on a different column type.

8.6.5.3 If no problem is found, compare the recoveries to those of the blank spike. If the blank spike recoveries indicate that the problem is sample related, document this on the run narrative. Matrix spike recovery failures are not grounds for re-extract but are an indication of the sample matrix effects. If the blank spike recoveries indicate that the problem may be procedure related, re-extract and reanalyze the sample batch.

8.6.6 Precision

Matrix spike and spike duplicate recoveries for each analyte are used to calculate the relative percent difference (RPD) for each compound.

RPD = [| MS Result – MSD Result | / Average Result] X 100

The RPD for each analyte should fall within the established control limits. If the RPDs fall outside of the established control limits, the MS and MSD should be reanalyzed to ensure that there was no injection problem. If upon reanalysis the RPDs are still outside of the control limits, the

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department supervisor shall review the data and determine if any further action is necessary.

## 9.0 CALCULATIONS

The amount of the PCB in the samples is determined by averaging the concentration of the major peaks for each individual PCB. The HP Enviroquant software will automatically sum and average the peaks used for each individual Aroclor.

The concentration of each individual PCB peak in the original sample is calculated as follows:

PCB Water (ug/l) = $(CONC_{inst}) \times (V_F / V_I) \times DF$

PCB Soil (ug/kg) = $[(CONC_{inst}) \times (V_F / W_I) \times DF] / \%solids$

| | | |
|---|---|---|
| $CONC_{inst}$ | = | Instrument concentration calculated from the initial calibration using mean CF, linear curve, quadratic curve or single point calibration |
| DF | = | Dilution Factor |
| $V_F$ | = | Volume of final extract (ml) |
| $V_I$ | = | Volume of sample extracted (ml) |
| $W_I$ | = | Weight of sample extracted (g) |
| %solids | = | Dry weight determination in decimal form |

All soils are reported on a dry weight basis.

## 10.0 SAFETY AND POLLUTION PREVENTION

### 10.1 Safety

The toxicity of each reagent and target analyte has not been precisely defined; however, each reagent and sample should be treated as a potential health hazard. Material Safety Data Sheets (MSDS) are available for all reagents and many of the target analytes. Exposure must be reduced to the lowest possible level. Personal protective equipment should be used by all analysts.

### 10.2 Pollution Prevention

Waste solvents from the sample analysis and standards preparation are collected in waste storage bottles and are eventually transferred to the non-chlorinated waste drum.

Sample Extracts are archived and stored for 60 days after analysis. Old extracts and standards are disposed of in the waste vial drum.

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## 11.0 REFERENCES

SW846 Method 8000B Revision 2, December 1996

SW846 Method 8000C Revision 3, March 2003

SW846 Method 8082 Revision 0, December 1996

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**COLD VAPOR ANALYSIS OF MERCURY FOR WATER SAMPLES**

**Effective 7 days after "Approved by" date**

Prepared by:_____Dave Metzgar_____ Date:_11/14/05_

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Annual Review

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**Effective 7 days after "*" date**

**TEST NAME: COLD VAPOR ANALYSIS OF MERCURY FOR WATER SAMPLES**

**METHOD REFERENCE: EPA 245.1, SW-846 7470A**

**INSTRUMENT SERIAL #: 2022**

**DEPARTMENT: METALS**

**DETECTION LIMIT: 0.001 mg/L for waters**

Added Doc Control page, Definitions, MDL sec, expanded sec 1, 6, 7, 8, 9, 10, 11, added instrument serial number, updated sections 7.7, 7.7, 13.2, 7.8.2, 7.8.3, 8.6.6, 7.8, 4.3,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 The method outlined in this SOP is based on EPA method 245.1 and SW846 7470A for waters. The types of samples that can be analyzed include drinking, surface and saline waters, as well as domestic and industrial wastes.

1.2 The mercury is reduced to the elemental state and aerated from the solution in a closed system. The mercury vapor passes through a cell in the light path of an atomic spectrophotometer, where the absorbance is measured as a function of mercury concentration.

## 2.0 PRESERVATION

All liquid samples should be preserved by acidification with nitric acid to a pH of 2 or lower.

## 3.0 HOLDING TIME

All samples should be analyzed within 28 days of the date of collection.

## 4.0 REPORTING and METHOD DETECTION LIMITS

4.1 Reporting Limit. The reporting limit for this method has been established at 0.001 mg/l.

4.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria. Experimental MDLs must be determined annually for this method.

4.3 MDLs should be established for all appropriate methods, using a solution spiked at approximately 3 times the estimated detection limit annually. To determine the MDL values, take seven replicate aliquots of the spiked sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level.

**Note: IDL<MDL<1/2 RDL**

## 5.0 INTERFERENCES

Possible interference from sulfide is eliminated by the addition of potassium permanganate. Concentrations of sulfide as sodium sulfide as high as 20 mg/l do not interfere with mercury recoveries when following this method. High copper concentrations (> 10 mg/l) may also interfere with mercury recoveries. Samples that are high in chloride such as seawater, brine and industrial effluent may require as much as 12.5 ml of additional permanganate.

**Note: When chloride concentrations are high, hydroxylamine sulfate and stannous sulfate should be used in place of corresponding chlorides.**

Finally, certain volatile organic materials will also absorb at this wavelength and can interfere. It can be determined if this type of interference is present by doing a preliminary run without reagents.

## 6.0 APPARATUS

6.1 A Leeman HYDRA AA automated analyzer is used for all analysis. Refer to the instrument manual for further details on this instrumentation.

6.2 Environmental Express Hot Block, 100ml capacity, model SC150

6.3 Environmental Express digestion vessels, SC490

6.4 Class A volumetric pipettes and flasks

6.5 Thermometer

## 7.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. De-ionized water should be used whenever water is required.

7.1 Sulfuric acid, concentrated

7.2 Nitric acid concentrated. This acid must have low mercury content.

7.3 Stannous chloride. To 400 ml of DI water, add 14 ml of conc. sulfuric acid. Dilute to 500 ml and add 50 g of stannous chloride and dissolve. This compound does not dissolve well and should be stirred continuously when in use. Stannous sulfate may be used in place of stannous chloride. Stannous chloride is prepared daily. Lot number is recorded in Hg logbook.

7.4 Sodium chloride-hydroxylamine hydrochloride. Add 120 g of sodium chloride and 120 g of hydroxylamine hydrochloride to 1 liter of water. Mix well, hydroxylamine sulfate may be used in place of hydroxylamine hydrochloride.

7.5 Potassium permanganate. Add 50 g of potassium permanganate to 1 liter of water and mix well. **Caution: Potassium permanganate is a strong oxidizing agent. Handle with care.**

7.6 Potassium persulfate. Add 50.0 g of potassium persulfate to 1 liter of water and mix well. **Caution: Potassium persulfate is a strong oxidizing agent. Handle with care.**

7.7 2% HCl Rinse Solution. 40 mls concentrated HCl, diluted to 2 liters with DI water. 2% HCL solution is prepared daily. Lot number is recorded in Hg logbook.

7.8 Mercury standard solutions are made from a purchased stock solution of 1000 ppm mercury.

7.8.1 10 ppm Hg solution. Using a 10-ml volumetric pipette, add 10 ml of 1000-ppm stock (to be purchased from a vendor such as Fisher) to a 1-liter volumetric flask containing approximately 750 ml of water and 10 ml of concentrated nitric acid. Dilute to volume with water and mix well. This solution must be prepared every 6 months.

7.8.2 100 ppb Hg solution. Using a 10-ml volumetric pipette, add 10 ml of 10 ppm Hg solution to a 1-liter volumetric flask containing approximately 750 ml of water and 10 ml of concentrated nitric acid. Dilute to volume with de-ionized water and mix well. This standard must be prepared every month.

7.8.3 Daily working standards are prepared daily using 100 ppb standard solution (7.8.2)

**Note:** All standards and prepared reagents must be prepared every 6 months or before stock standard expiration date, whichever comes first, except as noted elsewhere in this SOP.

## 8.0 WATER DIGESTION AND ANALYSIS PROCEDURE

Below is a step-by-step procedure for the digestion and analysis of water samples for mercury.

8.1 Make up the standard curve as shown below. Clearly label each digestion vessel with the standard's ID. The standard ID's should be recorded on the data summary sheet.

| ml of 100 ppb Hg solution | ml of DI water | Total µg of Hg |
|---|---|---|
| 0.0 | 50 | 0.0 |
| 0.10 | 50 | 0.02 |
| 0.50 | 50 | 0.10 |
| 1.50 | 50 | 0.30 |
| 2.50 | 50 | 0.50 |
| 3.00 | 50 | 0.60 |

Dilute to the 50ml mark on the digestion vessel. **Note: When running method 245.1, no points may be dropped from the calibration curve.**

8.2 Make up the quality control samples as shown below. Make sure to clearly label each digestion vessel.

| Sample ID | ml of 100ppb Hg solution | ml of DI water | Total µg of Hg |
|---|---|---|---|
| Spike Blank | 1.5 | 50 | 0.30 |
| CCV | 1.5 | 50 | 0.30 |
| Low Check (CRI) | 0.10 | 50 | 0.020 |
| Method Blank | 0.0 | 50 | 0.0 |
| ICV | 1.5 | 50 | 0.30 |

**Note: ICV must be made from a different source.**

| Sample ID | ml of 100 ppb Hg solution | ml of sample | Total µg of Hg |
|---|---|---|---|
| Matrix Spike | 1.5 | 50 | 0.30 + sample |
| Matrix Spike Dup | 1.5 | 50 | 0.30 + sample |
| Duplicate | | 50 | sample |

8.3 If no information is available about the level of mercury in the samples to be analyzed set up a 50-ml sample size. If information is available, select a sample size that will result in an analysis value near the mid-range of

the curve. For TCLP samples, use a 5-ml initial volume. Record the volume used on the sample analysis data sheet.

8.4 To all samples, QC and standards add the following reagents:

- 1.25 ml of concentrated nitric acid
- 2.5 ml of concentrated sulfuric acid
- 5 ml of permanganate solution
- 2 ml of persulfate solution

Swirl the samples well after each addition of reagent. More potassium permanganate solution may be required for some samples. Enough should be added so that the purple color persists for at least 15 minutes.

8.5 Pre-heat the Hot Block to 95 ± 1°C. Place the sample vessels in the Hot Block. Heat the samples for 2 hours. Then remove and cool to room temperature.

8.6 While the samples are digesting, begin setting up the Leeman HYDRA AA mercury analyzer following the steps outlined below. Further details are available in the instrument manual.

8.6.1 Turn the Argon gas on. Check that the vent line is connected to the exhaust hood.

8.6.2 Inspect all pump tubing and replace if necessary. Put the tubing on the cassettes and attach to the pump head, making sure the cassette adjusters are completely tightened. Place the fresh stannous chloride solution in the bottle. Fill the rinse bottle with 2% HCL solution.

8.6.3 Double click on the WINHG icon on the desktop. This will open the WinHg runner. Click on the control tab and click “turn on gas” , “turn on pump”, and “turn on lamp” options.

8.6.4 Go to file (pull down menu) and choose new dataset. Save dataset as Hg-day-month-matrix-run no. (i.e., Hg0405S1).

8.6.5 Click on the **DB ↓ button.** This will open the WinHg Database window. Go to file and choose Hg7470 PROTOCOL. This will be the Protocol (method) used for water and soil analysis. Make sure “Dataset” match on WinHg Runner screen as well as the Database screen.
.

8.6.6 Click on the “STANDARD” tab in WinHgRunner window and click on **S1** through **S6.** Click on the “Rep1” button. Click on the “STAND AUTO” button and calibration will begin.

8.6.6 Calibration is performed by analyzing a series of 5 standards and a blank. While calibration is being performed, type the analysis sequence by clicking on the Rack Editor button. Enter the samples and the appropriate QC. ICV, ICB, CRI, CCV, and CCB, 10 samples, CCV, and CCB, etc. Save the sequence as Hg-day-month-matrix-run number (Hg0405S1). After calibration is performed and accepted (Correlation Coeff. Of >0.995 must be achieved), click on the Sample Tab in WinHgRunner and click on "START NEW BATCH" button. Type the auto-sampler sequence filename as above (ie, Hg0405S1).

**Note:** One calibration point may be dropped for sw846-7470A. This point may be 6.0ppb. (ONLY ONE). If the 6.0ppb point is dropped then 5.0ppb becomes the upper range limit.

8.6.7 In Autosampler Run rack name drop down window, choose the filename you are analyzing. Assign the location of the start and finish cups and click on "RUN AUTO".

## 9.0 QUALITY CONTROL

All QC calculations should be done as outlined in the method. QC limits are compiled by Accutest should be used to determine if a given analysis is valid.

9.1 Method Blank – An acceptable method blank or reagent blank must be analyzed with every batch of samples processed. The method blank must be less than one half the reporting limit. If the method blank is greater than on half of the reporting limit, the samples must be re-digested and reanalyzed with an acceptable method blank. Method blanks are processed with every 20 field samples or with every analysis batch.

9.2 High Standard Check – The high calibration standard must be analyzed for method 245.1. The results of the high standard check must agree within 5% of the true value for the analysis to be valid. If the high standard check fails criteria, the samples must be re-digested and re-analyzed.

9.3 Initial Calibration Verification – An initial calibration verification (ICV) sample must be analyzed after the initial calibration has been performed. This sample must be prepared at or near the midpoint of the initial calibration from a reference material independent from the initial calibration solution. The results of the ICV must agree within 10% of the true value for the analysis to be valid. For method 245.1 the ICV must agree within 5% of the true value for the analysis to be valid. If the ICV fails, a new ICV or initial calibration must be performed and all samples must be re-digested and reanalyzed with an acceptable ICV.

9.4 Continuing Calibration Verification – If more than 10 samples are to be analyzed in a single day, a Continuing Calibration Verification sample prepared at or near the mid point of the initial calibration must be analyzed after every 10$^{th}$ sample and at the end of the analytical run. The results of this analysis must be within 20% of the initial calibration for the CCV analyses to be considered valid. For method 245.1 the results of the CCV must be within 10% of the true value for the analysis to be valid. If the CCV fails, all samples analyzed after the first passing CCV must be re-digested and reanalyzed.

9.5 Low Level Check Standard (CRI) – A standard prepared at the low calibration concentration should be prepared and analyzed with each analytical run. The CRI should agree within 20 percent of the true value to be acceptable. If the CRI does not meet the acceptance criteria, the samples must be re-digested and reanalyzed.

9.6 Blank Spike – A blank spike (BSP) or Laboratory Control Spike (LCS) should be prepared using de-ionized water spiked at the midpoint of the calibration curve. The blank spike must be within 20 percent of the true value for the analysis to be considered valid. For method 245.1 the results of the BSP must be within 15% of the true value for the analysis to be valid. If the blank spike exceeds the acceptance criteria, the samples must be re-digested and reanalyzed. A blank spike is required for every 20 field samples or for each analysis batch. *Note: Samples with Hg non-detected may be reported with Blank Spike recovery biased high*.

9.7 Duplicate – A duplicate of a field sample should be processed and analyzed with each set of 20 field samples. The duplicate results should agree within 20 percent of one another for the analyses to be considered valid. If the duplicate fails the acceptance criteria, the samples should be re-digested and reanalyzed.

9.8 Matrix Spike/Matrix Spike Duplicate – At least on Matrix Spike/Matrix Spike Duplicate pair must be prepared and analyzed with every 20 field samples. The MS/MSD must agree within 25 percent of the true value of the MS/MSD (20 percent Relative Standard Deviation for the MSD) or within the laboratory recovery limits generated using historical data. If the results of the MS/MSD are outside the acceptance criteria, the data should be flagged as possible matrix effect. Alternatively, the use of the Method of Standard Additions (MSA) may be used to calculate the concentration in matrix effected samples.

9.9 When preparing TCLP/SPLP samples, prepare an additional method blank and blank spike from the extraction fluid used to extract the samples. See section 9.1 and 9.6 for acceptance criteria.

9.10 When preparing dissolved metals, an additional method blank must be prepared. The method blank must be filtered through the same filter

media as the samples and then digested as usual. See section 9.1 for acceptance criteria.

## 10.0 DOCUMENTATION REQUIREMENTS

Record the start time, end time and temperature for all digestions on the analysis data sheet. All sample information should be clearly entered on these sheets. In addition, any unusual characteristics of the samples or the digestion procedure should be noted in the comment section. All dilutions must be clearly documented.

## 11.0 SAFETY

The analyst should follow normal safety procedures as outline in the Accutest Laboratory Safety Manual. Particular care should be observed in handling the strong acids and oxidizing agents. Safety glasses and lab coats should be worn at all times in the lab. Gloves should be worn when handling samples.

## 12.0 CALCULATIONS

Below are the calculations, which should be used for water samples. The concentration of the sample in ug should be obtained from the calibration curve.

$$\text{Final concentration in mg/l} = \frac{\text{Concentration of sample in ug}}{\text{Sample volume in ml}}$$

## 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

### 13.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids must be followed. All method users must be familiar with the waste management practices described in Section 13.2.

### 13.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples. Mercury waste must be analyzed prior to disposal. Result must be under TCLP MCL. If result is not

under TCLP MCL waste must be considered hazardous and disposed of accordingly. If waste passes TCLP criteria in can then be neutalized and disposed of.

## 14.0 DEFINITIONS

14.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

14.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

14.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

14.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

14.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

14.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

14.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

14.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

14.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through

all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

14.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

14.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

# METALS BY INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROMETRY (ICP)

Prepared by:_____Dave Metzgar_____ Date:_09/30/05___

Reviewed by:____Ellen Pampel_____ Date:_10/03/05___

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**Effective 7 days after "*" date**

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**TEST NAME: METALS BY INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROMETRY (ICP)**

**INSTRUMENT: TJA TRACE 61E, SERIAL # 470790, #348490**
**AUTOSAMPLER: TJA 300 POSITION, SERIAL # G7245, #C2389**

**METHOD REFERENCES:** SW846 6010B, EPA 200.7

**DEPARTMENT:** Metals

**TEST CODES:** A variety of metals can be analyzed by ICP. These include Ba, Be, Cd, Sn, Cr, Co, Cu, Mn, Mo, Ni, Ag, V, Zn, Al, Ca, Fe, Mg, K, Na. Lower detection limits can be obtained for metals such as As, Pb, Sb, Tl, and Se using the Trace ICP.

**REPORTING LIMITS:** Reporting limits are approximately based on the PQL's for each metal. Refer to Table 1 for current standard reporting limits.

**NOTE: IDL<MDL<1/2 RL**

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is applicable for the determination of metals in water, sludges, sediments, soils.

1.2 Sample matrices are pretreated following SW846 methods for digestion of soil, sediment, sludge or water samples. Refer to specific digestion SOP's for more information on digestion techniques.

1.3 Digested samples are introduced into the TJA Trace ICP, passed through a nebulizer and transported to a plasma torch. The element-specific emission spectra generated are dispersed by a grating spectrophotometer and photosensitive devices measure the intensities of the emission lines.

## 2.0 PRESERVATION

All water samples must be preserved with nitric acid to a pH of less than 2. All soil samples must be stored in a refrigerator at 4$^{o}$C before digestion.

## 3.0 HOLDING TIME

All samples must be analyzed within 6 months of the date of collection.

## 4.0 INTERFERENCES

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Several types of interferences can cause inaccuracies in trace metals determinations by ICP. These interferences are discussed below.

4.1 Spectral interferences are caused by overlap of a spectral line from another element, unresolved overlap of molecular band spectra, background contribution from continuous or recombination phenomena, and background contribution from stray light from the line emission of high concentration elements. Corrections for these interferences can be made by using interfering element corrections, by choosing an alternate analytical line, and/or by applying background correction points.

4.2 Physical interferences can be caused by changes in sample viscosity or surface tension, by high acid content in a sample, or by high dissolved solids in a sample. These interferences can be reduced by making sample dilutions or by analyzing a sample using the method of standard additions.

4.3 Matrix interferences in high solid samples can be overcome by using an internal standard. Yttrium is used for the TJA Trace 61E. The concentration should be sufficient for optimum precision but not so high as to alter the salt concentration of the matrix. The element intensity is used by the instrument as an internal standard to ratio the analyte intensity signals for both calibration and quantitation.

4.4 Chemical interferences are not pronounced with ICP due to the high temperature of the plasma, however if they are present, they can be reduced by optimizing the analytical conditions (i.e. power level, torch height, etc.).

## 5.0 APPARATUS

Currently there are two Thermo Jarrell Ash Trace simultaneous ICP's available for use in the lab. The Trace unit has been optimized to obtain lower detection limits for Arsenic, Selenium, Antimony, Lead, and Thallium. This optimization was done using a horizontal torch, a purge optics system, optimized photomultiplier tubes, and Crawford-Kunselman Noise Reduction techniques. The lines programmed into the Trace system are shown in Table 2. Additional elements and lines may be analyzed using an off-peak analysis function.

## 6.0 REAGENTS

All chemicals listed below are trace metal grade unless otherwise specified. Distilled, deionized water must be used whenever water is required.

6.1 5 ppm Yttrium internal standard, made from ICP quality standard.

6.2 Hydrochloric acid, trace metals grade.

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6.3 Nitric Acid, trace metals grade.

6.4 Standard stock solutions are available from Inorganic Ventures, Spex, Plasma Pure, Ultra, Environmental Express, or equivalent. Note: All standards must be ICP quality standards.

6.5 Calibration Standards. These can be made up by diluting the stock solutions to the appropriate concentrations.

**Note: Standards and prepared reagents must be prepared every 6 months or before stock standard expiration date, whichever comes first.**

6.5.1 For calibration and quantitation an internal standard (Yttrium) is used to limit nebulization problems. If it is known that the samples contain a significantly different acid matrix, the samples should be diluted so that they are in a similar matrix to the curve. If sample concentrations are greater than the linear range, the samples will be diluted and re-analyzed. All sample results are referenced to the calibration blank Yttrium counts. The criteria is 60-125% of the calibration blank counts. If the Yttrium counts fall outside this criteria matrix effects must be suspected and the sample diluted until it meets the criteria.

6.5.2 Standards must be prepared so that there is minimal spectral interference between analytes.

6.5.3 Refer to the standards logbook for the make-up and concentrations of standards and stock solutions being used to calibrate the ICP. Refer to tables 2 through 7 for concentration levels of standards used. Unless otherwise approved, the calibration curve must contain 3 points determined by a blank and a series of standards (mid and high) representing the elements of interest.

**Note: All Ag stock and intermediate solutions must be stored away from direct sunlight.**

6.6 Analytical Quality Control Solutions.

All of the solutions below are prepared by adding either mixed or single element metals solutions to a solution containing 3 percent nitric acid and 5 percent hydrochloric acid and diluting to a fixed final volume with this acid mixture.

6.6.1 Blank (Calibration, ICB, CCB)

This reagent contains Nitric Acid at 3%, and Hydrochloric Acid at 5%.

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6.6.2 Initial Calibration Verification solution.

This standard solution must be made from a different source than the calibration curve. The values for each element must be within the range of the calibration curve. This solution is used to verify the accuracy of the initial calibration. Levels for the ICV standard are shown in Table 4.

6.6.3 Continuing Calibration Verification solution.

The metals concentrations for this standard must be at the mid-point of the calibration curve for each element. Levels for the CCV standard are shown in Table 5.

6.6.4 Interference Element Check Solutions.

These solutions must be analyzed at the beginning of each analytical run to check the interfering element corrections on the instruments.

**Note: If interferences from different elements than those listed below are a problem, the interfering element solutions may be modified.**

6.6.4.1 ICSA Solution.

The ICSA solution contains only the interfering elements. Concentrations are shown below.

| | |
|---|---|
| Al | 500 mg/L |
| Ca | 500 mg/L |
| Fe | 200 mg/L |
| Mg | 500 mg/L |

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6.6.4.2 ICSAB Solution.

The ICSAB solution contains both the interferents and the analytes of interest. Concentrations are shown below.

| | | | |
|---|---|---|---|
| Ag | 1.0 mg/L | Al | 500 mg/L |
| Ba | 0.50 mg/L | Ca | 500 mg/L |
| Be | 0.50 mg/L | Fe | 200 mg/L |
| Cd | 1.0 mg/L | Mg | 500 mg/L |
| Co | 0.50 mg/L | V | 0.50 mg/L |
| Zn | 1.0 mg/L | Pb | 1.0 mg/L |
| Cr | 0.50 mg/L | | |
| Cu | 0.50 mg/L | | |
| Mn | 0.50 mg/L | | |
| Ni | 1.0 mg/L | | |

6.7 CRIA and CRI Standards Solution

The CRIA standard contains the elements of interest at levels equal to our quantitation limits (RL). The CRI standard contains the elements of interest at levels 2x our quantitation limits (RL). Levels for the CRI and CRIA standards are shown in Table 6.

6.8 Matrix Spike, Matrix Spike duplicate, and Spike Blank Solution.

This solution is prepared by adding either mixed or single element metals solutions to a solution containing 3 percent nitric acid and 5 percent hydrochloric acid and diluting to a fixed final volume with this acid mixture. One milliliter of this stock solution should be added to the spike blank, matrix spike, and the matrix spike duplicate before they are digested and brought to a final volume of 50 ml. Levels for the MS and MSD and Spike Blank standard are shown in Table 7.

6.9 Liquid Argon or Argon Gas. (99.999% purity)

Cylinders are provided by GasProducts or other approved vender.

6.10 Yttrium Internal Standard.

For the TJA Trace, an ICP quality yttrium internal standard is used.

## 7.0 PROCEDURE

General procedures on how to operate the TJA Trace are described below. The ThermoSpec software is used to run ICP instrument and it can be accessed either in

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a Windows environment or from a DOS environment. Note: When leaving most menus in the ThermoSpec software, an F9 command is required to save the changes. In order to avoid losing information, make sure that you exit screens by first using this Done/Keep command (F9).

7.1 Before bringing up the instrument, make sure that the lines, the nebulizer, and the spray chamber are clean and that there are no leaks in the torch area. Change the pump tubing if worn. Check Argon tank for adequate pressure to last a full day of analysis.

**NOTE: The purge TJA Trace requires that the argon be continuously flowing through optics even when the instrument is not being used. The waste reservoir should also be checked to ensure that it doesn't overflow. Empty reservoir only to level that would enable waste tubing to remain submerged.**

7.2 Turn on the re-circulating cooler.

7.3 Tighten the clamps on the peristaltic pump.

7.4 Put a new solution of acid rinse into the rinse reservoir. (Note: the composition of the rinse solution may be periodically changed to minimize sample introduction problems and sample carryover.)

7.5 Enter the Thermospec software and go to the SETUP menu. Then move to the Plasma Control Panel option. Ignite the instrument by entering Start-up (F1) and then enter F9 to continue. After the plasma is ignited wait about 15 seconds for plasma to stabilize. Hit Esc to go back to main menu and go into analysis to set plasma parameters. This allows plasma parameters (i.e.- aux. Pressure, pump rate, etc.) to be set according to levels listed in the method being used.

7.6 Make sure that the sample tip is in the rinse solution and then let the instrument warm up for at least 60 minutes. If a yttrium internal standard is being used, make sure that sufficient solution is in place to last the length of the run and that the standard is being properly introduced into the sample introduction system. Check with the lab supervisor for additional details.

**NOTE: While the instrument is warming up, the samples that are to be analyzed should be collected together along with the required quality control. A copy of the metals prep batch should be included with each run.**

7.7 After the instrument has warmed up, the nebulizer should be optimized. The procedures for the TJA Trace are given below.

7.7.1 For the TJA Trace, the nebulizer position and pressure should also be adjusted to achieve the highest signal to background ratio.

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To do this, go the method OPTNEB. Adjust the nebulizer pressure to the point between 25 and 35 PSI (normally approximately 28 psi) where the intensity is highest in relation to the lowest RSD. Then physically adjust the glass nebulizer in the spray chamber by rotating it or moving it in and out until the highest intensity is obtained for the 5 ug/ml As standard. This procedure is to be used only when the nebulizer is removed from the spray chamber.

7.7.1.1 For the TJA Trace, it is recommended that the torch placement optimization be checked whenever the torch is removed and replaced or whenever there is a decrease in sensitivity. This can be done using the TA program :\STATION\BIN>TA. Aspirate a blank into the instrument and measure the intensity using the TA program. Adjust the torch position using the manual thumbscrews in the compartment to the left of the nebulizer compartment. The torch should be positioned to obtain the lowest intensity reading for the blank.

7.8 Next profile the instrument by aspirating a 5 ppm As solution. Normally, the automatic profile program will properly profile the instrument. However, the manual profile program can be used if the instrument profile has drifted significantly. The profile can be done as an option from the SETUP menu or an option from the OPERATION menu. The peak width, peak intensity, peak position, analyst's initials, and date are recorded in a logbook after each profile has been accepted.

7.9 Move to the DEVELOPMENT menu and go to the Methods option. Open the analytical program that you will be using and move to the Method Info option (F3). Type in the file name that will be used to save the run data next to the space marked Analysis Data File. The name should be in the form of instrument ID, date in the order month/date, matrix identifier, and run number. For example, the first mixed (water and soil) analysis on Dec. 1 on the TJA Trace would be designated R1201M1.

7.10 Go to the OPERATION menu. If you are going to be running samples using the auto sampler, then set up the auto sampler table to be used for the analysis using the auto sampler setup option. Make sure to reference the proper analysis program in the auto sampler table. Also make sure to include all dilutions factors for serial dilutions or other required dilutions in the auto sampler table. Note: You can set up a new auto sampler table for another run while your current run is going using Windows. When the software is properly set up, Alt/Tab will take you from Thermospec into Windows.

7.11 Calibrate the instrument. Unless otherwise approved, the calibration curve must contain 3 points determined by a blank and a series of standards

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representing the elements of interest. Three exposures will be used with a %RSD <5%. The resulting correlation coefficient must be >0.995. If the calibration curves do not meet these criteria analysis must be terminated, the problem corrected, and instrument recalibrated. (Note: the calibration standards may be included in the auto sampler program or they may be run separately.) Also see table 8 for typical run sequence.

7.12 After the instrument is properly calibrated, begin by reanalyzing the high standard(s) for each element. (Note: The standards can be combined into one solution for this analysis). The analyzed value must be within 5 percent of the true value or that element must be re calibrated.
Note: High standard shall be used for 200.7 only. After the high standards are analyzed, the ICV check standard shall be run. For the ICV, all elements to be reported must be within 5 percent for 200.7 and 10 percent for 6010 of the true values. If the ICV fails, analysis shall be terminated and the instrument recalibarated.

7.13 After analyzing the ICV, the ICB must be analyzed. The results of the ICB must be less than ½ the reporting limit. If the ICB is not less than ½ the reporting limit for each element then the reporting limit for all samples must be raised to two times the background concentration.

7.14 Before analyzing any real samples the CRI must be analyzed. The CRI contains the elements of interest at 2x the reporting limit. For all elements the results must be within 30 percent of the true value. If the CRI fails, analysis should be terminated and the instrument recalibrated. The only exception is if the CRI fails high and all sample results are less than the reporting limit. In this case the results can be reported and footnoted "possible positive bias, but all sample results are <RL.".

7.14.1 A low level CRIA will also be analyzed at the reporting limit. The CRIA acceptance criteria are at ± 20% for all elements. If the CRIA fails high and all sample results are less than the reporting limit the results can be reported and footnoted "possible positive bias, but all sample results are <RL." If the CRIA fails low, all RL's will be elevated to the CRI level.

7.15 Before analyzing any real samples, the interfering element solutions (ICSA, ICSAB) must be checked. For all spiked elements, the analyzed results must be within 20 percent of the true results. For unspiked elements, the interfering element solutions must be +/- the reporting limit for each element.

7.16 After the initial analytical quality control has been analyzed, the samples and the preparation batch quality control shall be analyzed. Each sample analysis should be a minimum of 3 readings using at least a 5 second integration time. Between each sample, flush the nebulizer and the solution uptake system with a blank rinse solution for at least 90 seconds or for the

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required period of time to ensure that analyte memory effects are not occurring.

7.17 Analyze the continuing calibration verification solution and the continuing calibration blank after every tenth sample and at the end of the sample run. If the CCV solution is not within 10 percent of the true value, for method 6010 and 5 percent for method 200.7 the CCV shall be reanalyzed to confirm the initial value. If the CCV is not within criteria of the true value after the reanalysis, no samples can be reported in the area bracketed by the failing CCV. If the CCB is not less than one half the reporting limit for each element then the reporting limit for those samples after the passing CCB and before the next passing CCB must be raised to two times the background concentration.

7.18 One sample per preparation batch, or whenever matrix interferences are suspected for a batch of samples, a serial dilution should be prepared. For the serial dilution, a 1:5 dilution should be made on the sample. The results of the 1:5 dilution shall agree within 10 percent of the true value as long as the sample and the dilution result are greater than 10 times the method detection limit or greater than 50 times the IDL. If the results are outside these criteria then the proper footnote should be entered into LIMS.

7.19 For any readings that exceed the linear range for a given element, the sample shall be diluted and re-analyzed. After a high reading, the sample following the high one must be examined for possible carryover. Verification may be done by rinsing the lines with an acid solution and then rereading the sample. A limit check table may be built into the autosampler file so that samples exceeding the standardization range are flagged on the raw data.

7.20 After the run is completed, convert the data file to an ASCII format using the Enable Program installed on the ICP computer. The data can be converted using the form EXTRACT.WPF. Save the converted file on a network drive(C:\FILENAME.ASC) using the file naming system described above, adding the designation “IR” at the beginning of the filename to designate ICP.

7.21 The data can be evaluated by running an automated data evaluation program, which will help to generate quality control summary pages. Each run should be evaluated as quickly as possible to make sure that all required quality control has been analyzed.

7.22 At the end of the analysis day the ICP must be shutdown using the following sequence.

a) Rinse tip in a solution of 3% nitric acid, 5% HCl for 10 minutes and in DI water for 20 minutes. (Note: a stronger acid solution may be needed depending on the matrix of the samples that were analyzed.)

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b) Turn off the plasma using the Plasma Control Option under the SETUP menu. F7 initiates the automatic shutdown procedure.

c) Release the tension on the pump tubing.

d) Turn off the cool flow.

e) Turn off the monitor.

## 8.0 QUALITY CONTROL

This section outlines the minimum QA/QC operations necessary to satisfy the analytical requirements for method SW846 6010.

8.1 High Standard Check.

After the instrument is properly calibrated, the high standard(s) shall be reanalyzed for each element. (Note: The standards can be combined into one solution for this analysis). The analyzed value must be within 5 percent of the true value or that element should be recalibrated. (Note: For method 200.7 only.)

8.2 Initial Calibration Verification Standard (ICV).

After each calibration, a standard from a different source than the calibration standard shall be analyzed. For the ICV, all elements to be reported must be within 10 percent of the true value for 6010B and within 5 percent for 200.7. If the ICV is outside these criteria then the analysis must be terminated and the instrument recalibrated.

8.3 Continuing Calibration Blank/Initial Calibration Blank.

Analyze the Initial calibration blank solution at the beginning of each run and the continuing calibration blank after every tenth sample and at the end of the sample run. If the ICB/CCB is not less than one half the reporting limit for each element the reporting limit for those samples must be raised to greater than 2 times the background concentration.

8.4 Low Standard Check (CRI).

The CRI standards contain the elements of interest at 2x the reporting detection limit. The CRI acceptance criteria are at ± 30% for all elements. If the CRI fails, analysis should be terminated and the instrument recalibrated. The only exception is if the CRI fails high and all sample results are less than the reporting limit. In this case the results can be reported and footnoted “possible positive bias, but all sample results are <RL.”.

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8.4.1 Low Level Check (CRIA).

A low level CRIA will also be analyzed at the reporting limit. The CRIA Acceptance criteria are at ± 20% for all elements. If the CRIA fails high and all sample results are less than the reporting limit the results can be reported and footnoted "possible positive bias, but all sample results are <RL." If the CRIA fails low, all RL's will be elevated to the CRI level.

8.5 ICSA and ICSAB

Analyze the ICSA and ICSAB at the beginning and end of each run following the analysis of the CRI. For all spiked elements, the analyzed results must be within 20 percent of the true results. For unspiked elements, the interfering element solutions must be +/- the reporting limit for each element. If the ICSA and/or the ICSAB falls outside this criteria the problem must be corrected and the instrument recalibrated or data footnoted in LIMS system.

8.6 Continuing Calibration Verification.

Analyze the continuing calibration verification solution and the continuing calibration blank after every tenth sample and at the end of the sample run. If the CCV solution is not within 10 percent of the true value, for method 6010 and 5 percent for method 200.7 the CCV must be reanalyzed to confirm the initial value. If the CCV is not within criteria of the true value after the reanalysis, no samples can be reported in the area bracketed by the failing CCV.

8.8 Method Blank.

The laboratory must digest and analyze a method blank with each set of samples. A minimum of one method blank is required for every batch. The method blank must contain elements at less than one half the reporting limit for each element. If the method blank contains elements over that limit, the reporting limit for those samples must be raised to greater than 2 times the background concentration. The exception to this rule is when the samples to be reported contain greater than 10 times the method blank level. In addition, if all the samples are less than a client required limit and the method blank is also less than that limit, then the results can be reported as less than that limit.

8.9 Spike Blank Sample.

The laboratory must digest and analyze a spike blank sample with each set of samples. A minimum of one spike blank sample is required for every 20 samples. Blank Spikes must be within 20% of the true value. If

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the lab control is outside of the control limits for a reportable element, all samples must be re-digested and reanalyzed for that element. The exception is if the lab control recovery is high and the results of the samples to be reported are less than the reporting limit. In that case, the sample results may be reported with no flag.

8.10 Matrix Spike and Matrix Spike Duplicate.

The laboratory must add a known amount of each analyte to a minimum of 1 in 20 samples. The matrix spike recovery is calculated as shown below and should be within 25% of the true value. The control limits for the matrix spike recovery are calculated on an annual basis and are used to assess whether a spike is in control in regards to Accutest control limits. If a matrix spike is out of control, then the results should be flagged with the appropriate footnote. If the matrix spike amount is less than one fourth of the sample amount, then the sample cannot be assessed against the control limits and should be footnoted to that effect. Note: Both the matrix spike amount and the sample amount are calculated to the IDL for any given element. Any value less than the IDL is treated as zero.

((Spiked Sample Result - Sample Result)/Amount Spiked) x 100 = matrix spike recovery

8.11 Matrix Duplicate.

The laboratory must digest a duplicate sample for a minimum of 1 in 20 samples. The relative percent difference (RPD) between the duplicate and the sample should be assessed and should be $\leq$ 20%. The control limits for the duplicate recovery are calculated on an annual basis and are used to assess whether a duplicate is in control. If a duplicate is out of control, then the results should be flagged with the appropriate footnote. If the sample and the duplicate are less than 5 times the reporting limits and are within a range of $\pm$ the reporting limit, then the duplicate is considered to be in control. Note: Both the duplicate amount and the sample amount are calculated to the IDL for any given element. Any value less than the IDL is treated as zero.

8.11 Serial Dilution Analysis.

For one sample per preparation batch, or whenever matrix interferences are suspected for a batch of samples, a serial dilution should be prepared. For the serial dilution, a 1:5 dilution should be made on the sample. The results of the 1:5 dilution should agree within 10 percent of the true value as long as the sample and the dilution result are greater than 10 times the method detection limit and/or greater than 50 times the IDL. If the dilution does not agree, then the sample should be post –

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digestion spiked at a level no less than 10 times but no greater than 100 times the sample concentration or flagged as interference. Serial dilution is performed instead of post digestion spike in accordance with method.

Alternatively, in cases where a sample has demonstrated physical or chemical interferences, which preclude the sample from being reported without a dilution, a serial dilution can be done from the diluted sample, and the sample can be reported from the dilution. For example, a sample that failed the serial dilution criteria using the undiluted sample and a 1:5 dilution, may pass the serial dilution criteria using a 1:2 dilution and a 1:10 dilution. In that case, the sample would be reported from the 1:2 dilution and the results would be footnoted that a dilution was required due to matrix interference. The calculation to be used for serial dilutions is shown below.

((Sample Result - Serial Dil. Result)/Sample Result) x 100 = Serial Dilution RPD

**NOTE: An Alternate to using the method of standard additions is the internal standard technique. (SW846-6010B, Rev2, 12/96, page 15).**

8.12 Method Detection Limits (MDLs).

MDLs should be established for all analytes, using a solution spiked at approximately 3 times the estimated detection limit. To determine the MDL values, take seven replicate aliquots of the spiked sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level. MDLs should be determined approximately once per year or whenever there is a significant change in the background or instrument response. Please refer to Accutest QA SOP QA020, current revision.

8.13 Linear Calibration ranges.

The upper limit of the linear calibration ranges must be established for all elements by determining the signal responses from a minimum of three concentration standards, one of which is close to the upper limit of the linear range. The linear calibration range, which may be used for the analysis of samples should be judged by the analyst from the resulting data. Linear calibration ranges should be determined whenever there is a significant change in instrument response and every 12 months for those analytes that periodically approach their linear limit.

8.14 MDL Check Standard

An MDL check standard will be analyzed at the time of the annual MDL

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study. The concentration of the MDL check standard should be 2x-3x the statistical MDL. This is a qualatative check, the analyte needs to be detected only. If the analyte is not detected, the concentration of the MDL check standard must be increased until the analyte is detected. This then becomes the current MDL.

## 9.0 GLASSWARE CLEANING

All glassware must be washed with soap and tap water and then rinsed with 5% nitric acid. It must then be rinsed at least 3 times with deionized water.

## 10.0 DOCUMENTATION REQUIREMENTS

Refer to the Laboratory Quality Assurance Manual for documentation requirements.

## 11.0 SAFETY

The analyst must follow normal safety procedures as outlined in the Accutest Laboratory Safety Manual which includes the use of safety glasses and lab coats. In addition, all acids are corrosive and must be handled with care. Flush spills with plenty of water. If acids contact any part of the body, flush with water and contact the supervisor. Follow proper safety precautions when working with gas cylinders.

## 12.0 CALCULATIONS

For water samples, the following calculations should be used. Refer to the QC section for the calculations to be used for the QC samples.

original sample concentration of metal (ug/l) =

$$\frac{\text{(conc. in the digestate (ug/l)) x (final digestate volume (ml))}}{\text{(initial sample volume (ml))}}$$

For soil samples, the following calculations should be used.

concentration of the metal in the dry sample (mg/kg) =

$$\frac{\text{(conc. in the digestate (mg/l) x final digestate volume(L))}}{\text{(sample wt. (kg)) x (\% solids/100)}}$$

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## 13.0 INSTRUMENT MAINTENANCE

Recommended periodic maintenance includes the items outlined below. All maintenance must be recorded in the instrument maintenance log.

13.1 Change the pump tubing weekly or as needed.

13.2 Clean the filter on the recirculating pump approximately once a month and dust off the power supply vents as needed.

13.3 Clean the nebulizer, torch, and injector tube as needed.

13.4 Change the sampler tip as needed .

13.5 Clean the re-circulating pump lines every 3 months or as needed.

13.6 Clean the slides on the autosampler with methanol and wipe them with a KimWipe saturated with Teflon spray as needed.

13.7 For the TJA Trace, check and clean the following filters as needed:
- 2 filters on the back of the polychromator controller compartment
- one filter on the back of the power source
- one filter below the torch compartment

## 14.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

14.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids must be followed. All method users must be familiar with the waste management practices described in Section 14.2.

14.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples. All ICP waste must be analyzed prior to disposal. The results must be under the TCLP MCL's, if they are not then the waste must be labpacked and considered hazardous waste. After waste passes TCLP criteria it can be neutralized and disposed of.

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## 15.0 DEFINITIONS

15.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

15.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

15.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

15.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

15.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

15.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

15.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

15.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

15.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through

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all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

15.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

15.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

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**TABLE 1: REPORTING LIMIT BY ELEMENT**

| Analyte | Water | Soil | TCLP |
|---|---|---|---|
| | Reporting Limit (ug/L) | Reporting Limit (mg/kg) | Reporting Limit (mg/L) |
| | | | |
| Tin | 50 | 5 | |
| Aluminum | 200 | 20 | |
| Antimony | 5 | 6 | |
| Arsenic | 10 | 0.5 | 0.05 |
| Barium | 200 | 20 | 1.0 |
| Beryllium | 4 | 0.5 | |
| Cadmium | 5 | 0.4 | 0.005 |
| Calcium | 1000 | 500 | |
| Chromium | 10 | 1 | 0.010 |
| Cobalt | 50 | 5 | |
| Copper | 25 | 2.5 | |
| Iron | 300 | 10 | |
| Lead | 5 | 10 | 0.05 |
| Magnesium | 5000 | 500 | |
| Manganese | 15 | 1.5 | |
| Nickel | 40 | 4.0 | |
| Potassium | 5000 | 500 | |
| Selenium | 10 | 1 | 0.05 |
| Silver | 10 | 1 | 0.010 |
| Sodium | 5000 | 500 | |
| Thallium | 10 | 1 | |
| Vanadium | 50 | 5 | |
| Zinc | 20 | 2 | |
| Molybdenum | 50 | 5 | |

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**TABLE 2. TJA TRACE ANALYSIS LINES**

| Element | Wavelength |
|---|---|
| | |
| Al | 308.215 |
| As | 189.042 |
| Ca | 317.933 |
| Fe | 271.441 |
| Mg | 279.078 |
| Mn | 257.610 |
| Pb | 220.353 (a) |
| Se | 196.026 (a) |
| Tl | 190.864 |
| V | 292.402 |
| Ag | 328.068 |
| Ba | 493.409 |
| Be | 313.042 |
| Cd | 226.502 |
| Co | 228.616 |
| Cr | 267.716 |
| Cu | 324.753 |
| K | 766.491 |
| Na | 588.991 |
| Ni | 231.604 |
| Sb | 206.838 |
| Zn | 213.856 |
| Mo | 202.030 |
| Sn | 189.989 |

(a) This element has two lines at this wavelength so that Crawford-Kunselman Noise Reduction techniques can be applied.

**TABLE 3: HIGH STANDARD LEVELS**
**NOTE: MID LEVEL STANDARD IS ½ THE CONCENTRATION OF THE HIGH SATNDARD**

| Element | Conc. |
|---|---|
| | ug/l |
| Al | 80000 |
| As | 4000 |
| Ca | 80000 |
| Fe | 80000 |
| Mg | 80000 |
| Mn | 4000 |
| Pb | 4000 |
| Se | 4000 |
| Tl | 4000 |
| V | 4000 |
| Ag | 500 |
| Ba | 4000 |
| Be | 4000 |
| Cd | 4000 |
| Co | 4000 |
| Cr | 4000 |
| Cu | 4000 |
| K | 80000 |
| Na | 80000 |
| Ni | 4000 |
| Sb | 4000 |
| Zn | 4000 |
| Mo | 4000 |
| Sn | 4000 |

**TABLE 4: ICV STANDARD LEVELS**

| Element | Conc. |
|---|---|
| | ug/l |
| Al | 40000 |
| As | 2000 |
| Ca | 40000 |
| Fe | 40000 |
| Mg | 40000 |
| Mn | 2000 |
| Pb | 2000 |
| Se | 2000 |
| Tl | 2000 |
| V | 2000 |
| Ag | 250 |
| Ba | 2000 |
| Be | 2000 |
| Cd | 2000 |
| Co | 2000 |
| Cr | 2000 |
| Cu | 2000 |
| K | 40000 |
| Na | 40000 |
| Ni | 2000 |
| Sb | 2000 |
| Zn | 2000 |
| Mo | 2000 |
| Sn | 2000 |

**TABLE 5: CCV STANDARD LEVELS**

| Element | Conc.l |
|---|---|
| | ug/l |
| Al | 40000 |
| As | 2000 |
| Ca | 40000 |
| Fe | 40000 |
| Mg | 40000 |
| Mn | 2000 |
| Pb | 2000 |
| Se | 2000 |
| Tl | 2000 |
| V | 2000 |
| Ag | 250 |
| Ba | 2000 |
| Be | 2000 |
| Cd | 2000 |
| Co | 2000 |
| Cr | 2000 |
| Cu | 2000 |
| K | 40000 |
| Na | 40000 |
| Ni | 2000 |
| Sb | 2000 |
| Zn | 2000 |
| Mo | 2000 |
| Sn | 2000 |

**TABLE 6: CRI STANDARD LEVELS**

**NOTE: CRIA AT 1/2X THESE LEVELS**.

| Element | Conc. |
|---|---|
| | ug/l |
| Al | 400 |
| As | 20 |
| Ca | 2000 |
| Fe | 600 |
| Mg | 10000 |
| Mn | 30 |
| Pb | 10 |
| Se | 20 |
| Tl | 20 |
| V | 100 |
| Ag | 20 |
| Ba | 400 |
| Be | 10 |
| Cd | 10 |
| Co | 100 |
| Cr | 20 |
| Cu | 50 |
| K | 10000 |
| Na | 10000 |
| Ni | 80 |
| Sb | 10 |
| Zn | 40 |
| Mo | 100 |
| Sn | 100 |

**TABLE 7: BLANK SPIKE, MATRIX SPIKE AND MATRIX SPIKE DUPLICATE LEVELS**

| Element | Conc. |
|---|---|
| | ug/l |
| Al | 29000 |
| As | 2000 |
| Ca | 25000 |
| Fe | 27000 |
| Mg | 25000 |
| Mn | 500 |
| Pb | 500 |
| Se | 2000 |
| Tl | 2000 |
| V | 500 |
| Ag | 50 |
| Ba | 2000 |
| Be | 50 |
| Cd | 50 |
| Co | 500 |
| Cr | 200 |
| Cu | 250 |
| K | 25000 |
| Na | 25000 |
| Ni | 500 |
| Sb | 500 |
| Zn | 500 |
| Mo | 1000 |
| Sn | 1000 |

**TABLE 8: TYPICAL RUN SEQUENCE**

**BLANK** **<5%RSD (3 EXPOSURES) AND CORRELATION COEFFICIENT >0.995**
**MID**
**HIGH**

HIGH STD (200.7 ONLY)
ICV
ICB
CRIA
CRI
ICSA
ICSAB
CCV
CCB
MB
SB
SAMPLE1
DUPLICATE
SERIAL DILUTION
MATRIX SPIKE
MATRIX SPIKE DUPLICATE
SAMPLE2
SAMPLE3
SAMPLE4
CCV
CCB
SAMPLE5
SAMPLE6
SAMPLE7
SAMPLE8
SAMPLE9
SAMPLE10
SAMPLE11
SAMPLE12
SAMPLE13
SAMPLE14
CRI
ICSA
ICSAB
CCV
CCB
ETC.

# DIGESTION OF SOILS FOR ICP ANALYSIS

**Effective 7 days after "Approved by" date**

Prepared by:_____Dave Metzgar_____ Date:_11/09/05_

Reviewed by:____Svetlana Izosimova_____ Date:_11/11/05_

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Effective 7 days after "*" date

**TEST NAME: DIGESTION OF SOILS FOR ICP ANALYSIS**

**METHOD REFERENCE: 3050B**

**DEPARTMENT: METALS**

**REPORTING LIMIT: Not applicable**

Added Doc Control page, Definitions, expanded sec 1, 5, 7, 10,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is applicable for the digestion of sediments, soils, sludges and solid wastes. After digestion, the samples can be analyzed by ICP. This digestion method is based upon SW846 method 3050B and the CLP soil digestion method.

1.2 An aliquot of a homogenized soil is digested with repeated additions of nitric acid and hydrogen peroxide. The volume is reduced to 5 ml and then hydrochloric acid is added and the sample is refluxed for 15 minutes. The sample is cooled to room temperature and diluted to 50 ml. If particulate matter is present, the sample is filtered.

## 2.0 PRESERVATION

Non-aqueous samples should be refrigerated at the time of receipt.

## 3.0 HOLDING TIME

All samples should be digested and analyzed within 6 months of the time of collection.

## 4.0 INTEREFRENCES

Sludge and soil samples can contain diverse matrix types, which may contain a variety of interference. Spiked samples can be used to determine if this interference is adequately treated in the digestion process. For discussion of other interference, refer to specific analytical methods.

## 5.0 APPARATUS

The apparatus needed for this digestion procedure are listed below. It should be noted that hot plates and beakers with watch glasses may be used in place of the digestion block and digestion tubes.

5.1 Hot plate - able to maintain a temperature of 90-95$^0$C.

5.2 Beakers- 250 ml

5.3 Automatic pipette dispensing bottles

5.4 100 ml volumetric flask

5.5 Glass funnels

5.6 Fisher filter paper, P4, Whatman 41 or equivalent

5.7 Top loader balance- capable of accurately weighing 0.01g

5.8 Graduated cylinder

5.9 Thermometer- capable of measuring to at least 125$^0$C

5.10 Environmental Express Hot Block- capable of maintaining a temperature of 90-95°C.

5.11 Polypropylene digestion cups- 50 ml

5.12 Environmental Express Filtermate

5.13 Fisherbrand wooden tongue depressors

## 6.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. Deionized water should be used whenever water is required.

6.1 Hydrochloric acid, Fisher Trace grade or equivalent

6.2 Nitric acid, Fisher Trace grade or equivalent

6.3 Hydrogen peroxide, 30%

6.4 Metals spiking solutions. CPI Multi element or equivalent made with 5%HNO3 and a trace of HF; Inorganic Ventures 5000 mg/l Mineral solution; and 100 mg/l Mo and Sn solution.

## 7.0 PROCEDURE

7.1 Using a tongue depressor, weigh out approximately 0.5g wet, homogeneous sample into a digestion vessel. The sample should be weighed out using a top loader balance. The sample should be thoroughly stirred before weighing out the representative sample. Discard rocks, sticks, etc. from the sample. The sample identification must be accurately recorded on the digestion vessel and sample digestion log. In addition to the samples, a matrix spike, matrix spike duplicate, spike blank, duplicate and a method blank should be set up with each batch of 20 samples. For batches of 10 samples and less no matrix spike duplicate is necessary. Refer to Table 1 for the spiking solution levels to use for each matrix spike and spike blank. For the method and spike blank, 0.5 g of Teflon chips should be used.

**Note: Higher levels should be used if the sample is expected to contain high levels of metals. In general, high spike is 10 times the concentration of the low spike.**

7.2 Add 2.5 ml of concentrated nitric acid to all quality control and samples

7.3 Place the labeled digestion vessels into the heating apparatus. Heat the samples at a gentle reflux 10-15 minutes. Allow the samples to cool.

7.4 Add an additional 2.5 ml of concentrated nitric acid to all quality control and samples. Heat the samples at a gentle reflux for an additional 30 minutes. Cool.

7.4.1 If brown fumes are generated, which indicates oxidation of sample by HNO3, then repeat step 7.4 until no brown fumes are present.

7.4.2 Allow sample to evaporate to 5 ml without boiling or heat at 90 - 95°C without boiling for 2 hours.

**Note: Do not allow sample to dry.**

7.5 Cool. Add 2 ml of water and 3 ml of 30% hydrogen peroxide to each sample and reflux until effervescence subsides.

7.6 Continue to add 30% hydrogen peroxide in 1-ml aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged.

**Note: Do not add more than a total of 10 ml of 30% hydrogen peroxide.**

7.6.1 Allow sample to evaporate to 5 ml or heat at 90 - 95°C for 2 hours. Note: Do not allow sample to dry.

7.7 Cool. Add 5 ml of concentrated HCl and reflux for an additional 15 minutes.

7.8 Allow the sample to cool. Dilute to final volume of 50 mls using DI water, cap and shake vessel. If particulate matter is present, uncap the vessel and filter using Environmental Express Filtermate apparatus or equivalent. The method blank and spike blank for the filtered sample's prep group must be filtered as well. The sample is now ready for analysis by ICAP.

## 8.0 QC REQUIREMENTS:

For each digestion batch of 20 samples, a matrix spike, a matrix spike duplicate, a duplicate, a spike blank (LCS), and a method blank should be prepared. High level spikes may also be prepared if higher levels of metals are expected in the samples. Re-digestion is suggested for QC that does not meet the Accutest QC limits. The appropriate lab supervisor or lab manager will notify the analyst of samples that need re-digestion.

## 9.0 GLASSWARE CLEANING:

All glassware should be washed with soap and tap water and then soaked in a 5% nitric acid bath. It should then be rinsed at least 3 times with de-ionized water.

## 10.0 DOCUMENTATION REQUIREMENTS:

All digestion information should be completed in the Metals Digestion Log. The information required includes, the sample identification (including bottle number), the initial sample weight, the final sample volume, the acids (including the lot number and manufacturer), the spikes used, the temperature, the thermometer ID, the digestion vessel lot number, the filter lot number, and the digestion date. The analyst should write additional information such as unusual sample characteristics in the comment section.

## 11.0 SAFETY:

The analyst should follow normal safety procedures as outlined in the Accutest Laboratory Safety Manual which includes the uses of safety glasses and lab coats. In addition, all acids are corrosive and should be handled with care. Flush spills with plenty of water. If acids contact any part of the body, flush with water and contact supervisor.

## 12.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

### 12.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids must be followed. All method users must be familiar with the waste management practices described in Section 12.2.

### 12.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

**TABLE 1: ICP METALS SPIKING LEVELS**

| ELEMENT . | INITIAL CONC (ppm) | VOLUME USED (ml) | FINAL CONC (mg/l) | FINAL VOL. (ml) |
|---|---|---|---|---|
| Ba | 200 | 1.0 | 4.0 | 50 |
| Be | 5 | 1.0 | .10 | 50 |
| Cd | 5 | 1.0 | .10 | 50 |
| Cr | 20 | 1.0 | .40 | 50 |
| Cu | 25 | 1.0 | .50 | 50 |
| Co | 50 | 1.0 | 1.0 | 50 |
| Mn | 50 | 1.0 | 1.0 | 50 |
| V | 50 | 1.0 | 1.0 | 50 |
| Zn | 50 | 1.0 | 1.0 | 50 |
| As | 200 | 1.0 | 4.0 | 50 |
| Se | 200 | 1.0 | 4.0 | 50 |
| Pb | 50 | 1.0 | 1.0 | 50 |
| Ti | 200 | 1.0 | 4.0 | 50 |
| Sb | 50 | 1.0 | 1.0 | 50 |
| Mo | 100 | 0.5 | 1.0 | 50 |
| Sn | 100 | 0.5 | 1.0 | 50 |
| Al | 200/5000 | 1.0/0.25 | 27 | 50 |
| Fe | 200/5000 | 1.0/0.25 | 29 | 50 |
| Mg | 5000 | 0.25 | 25 | 50 |
| Ca | 5000 | 0.25 | 25 | 50 |
| K | 5000 | 0.25 | 25 | 50 |
| Na | 5000 | 0.25 | 25 | 50 |
| Ag | 5 | 1.0 | .10 | 50 |
| Ni | 50 | 1.0 | 1.0 | 50 |

**DIGESTION OF WATER SAMPLES FOR METALS ANALYSIS BY ICP**

**Effective 7 days after "Approved by" date**

Prepared by: ____Dave Metzgar_____ Date: ___11/09/05__

Reviewed by: _____Svetlana Izosimova_____ Date: ___11/11/05__

Annual Review

Reviewed by:_____Date:_____

Reviewed by:_____Date:_____

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**TEST NAME: DIGESTION OF WATER SAMPLES FOR METALS ANALYSIS BY ICP**

**METHOD REFERENCE: SW846 3010A, EPA 200.7, SM 3030C**

**DEPARTMENT: METALS**

**REPORTING LIMIT: NOT APPLICABLE**

**SUMMARY OF CHANGES:** Added Document Control cover page, MDL sec, Definitions, expanded sec 8, 9, 11, 13, Expanded section 2.0, updated 200.7 criteria.

## 1.0 SCOPE AND APPLICATION, SUMMARY

This method is applicable for the digestion of aqueous samples, TCLP extracts and wastes that contain small amounts of suspended solids. After digestion, the samples can be analyzed by ICP. This digestion method is based upon SW846 method 3010A and the EPA water digestion method.

Reduced volume version of method 200.7, March 1983 is used for the 200.7 digestion procedure. This approach that use the same reagents and molar ratios is acceptable by the regulatory agents provided it meets the quality control and performance requirements stated in the method.

Acid Extractable Metals by method SM3030C 18$^{th}$ Edition 1992 modified volumes.

## 2.0 PRESERVATION

All samples should be preserved with nitric acid to a pH of <2 at the time of collection. All sample pH are checked in sample receiving. For method 200.7 if samples are received with a pH >2 they must be preserved to pH <2 and held for 16 hours prior to metals digestion. Please refer to sample receiving SOP for further instructions.

## 3.0 HOLDING TIME

All samples should be digested and analyzed within 6 months of the time collection.

Samples being digested by method 3030C must be prepared within 72 hours of collection.

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## 4.0 REPORTING and METHOD DETECTION LIMITS

See analytical SOP

## 5.0 INTERFERENCE

Organic substances in a matrix may cause interference if the sample is not digested rigorously enough. In addition, high levels of acids in the final digestate may cause interference in the analysis. This interference can be avoided by choosing the appropriate digestion method and by bringing the sample to an appropriate final volume. For a discussion of other interference, refer to specific analytical methods.

## 6.0 APPARATUS

The apparatus needed for this digestion procedure are listed below.

**NOTE: It should be noted that hot plates and beakers with watch glasses might be used in place of the digestion block and digestion tubes.**

6.1 Hot Plate- capable of maintaining a temperature of 90°-95°C

6.2 Beakers- 250 ml

6.3 Automatic pipette bottles

6.4 100 ml volumetric flasks

6.5 Glass funnels

6.6 Fisher P4 filter paper or equivalent

6.7 Watch glass

6.8 Graduated cylinder- 100 ml

6.9 Thermometer- capable of measuring a temperature of at least $125^0$C

6.10 Environmental Express Hot Block-capable of maintaining a temperature of 90-95°C.

6.11 Polypropylene digestion cups- 50ml

6.12 Environmental Express Filtermate

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## 7.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. De-ionized water should be used whenever water is required.

7.1 Hydrochloric acid. Fisher Trace grade or equivalent

7.2 Nitric acid. Fisher Trace grade or equivalent

7.3 Metals spiking solutions: CPI Multielement spiking solution or equivalent made with 5% HNO3 and a trace of HF Inorganic Ventures 5000 mg/l Mineral solution and 100 mg/l Mo and Sn solution.

## 8.0 PROCEDURE

8.1 Measure out 50 ml of each sample into a labeled digestion vessel. The sample may be measured by using a graduated cylinder or by using the calibrated digestion tube. Make sure that the sample identifications are accurately recorded on the digestion vessels and in the sample digestion log. In addition to the samples, a matrix spike (MS), matrix spike duplicate (MSD), duplicate, spike blank and a method blank should be set up with each batch of 20 samples. For the method and spike blank, 50 ml of de-ionized water should be used. Refer to Table 1 for the spiking solution levels to use for each MS, MSD and spike blank.

**NOTE: If higher levels of metals are expected in the samples, then higher level spikes should also be set up.**

8.1.1 When preparing TCLP samples, prepare an additional method blank and blank spike from the extraction fluid used for the samples. See section 8.8 and 8.9 of current METSOP 100 for acceptance criteria.

8.1.2 When preparing filtered samples for dissolved metals, an additional method blank must be prepared. The method blank must be filtered through the same filter media as the samples. See section 8.8 of current METSOP 100 for acceptance criteria.

8.2 Add 1.5 ml of concentrated nitric acid to all quality control and samples

8.3 Place the labeled digestion vessels into the heating apparatus. Heat the block (90 to 95$^{o}$C) until the samples are at a gentle reflux. Reduce the volume of each sample to approximately 5 ml. This should take approximately 1-2 hours. Cool.

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8.4 Add an additional 1.5-ml of concentrated nitric acid to all quality control and samples. Heat the samples at gentle reflux until the volume is again at approximately 5.0 ml. Cool.

8.4.1 If a client requires method 200.7 for the digestion, add 2.5ml of concentrated nitric acid instead of 1.5 ml in step 8.4. Continue heating the samples at a gentle reflux until the sample is completely digested. Signs of a complete digestion are if the digestate is light in color and/or if the appearance of the sample does not change with continued refluxing. More acid may be added as necessary to complete the digestion.

8.5 Add 2.5 ml of concentrated HCL to each sample and reflux for an additional 15 minutes. Cool. Rinse digestion vessel walls with de-ionized water and then filter (if necessary) the sample to remove insoluble material.

8.5.1 If a client requires method 200.7 for the digestion, add 7.5 ml of DI water along with the HCL.

8.6 Bring the samples to a final volume of 50.0 ml with de-ionized water. If the sample contains particulate, it should be filtered, along with the method blank and spike blank, through Whatman #41 filter paper or Filtermate apparatus before analysis. Filtering of samples should be documented in the prep logbook. The sample is now ready for analysis by ICP.

**8.7 Standard Method 3030C**

8.7.1 Thoroughly mix sample. Transfer 50 ml to a labeled digestion vessel, and add 2.5 ml of 1 + 1 HCL. Heat 15 minutes on 90-95$^{o}$C hotblock. Filter through a membrane filter and adjust filtrate volume to 50 ml with DI water. Sample is now ready for analysis. Please refer to Standard Methods 18$^{th}$ edition section 3030C for further instruction.

## 9.0 QC REQUIREMENTS

For each digestion batch of 20 samples, a matrix spike, a matrix spike duplicate, a duplicate, a spike blank (LCS), and a method blank should be prepared. High level spikes may also be prepared if higher levels of metals are expected in the samples. Re-digestion is suggested for QC that does not meet the Accutest QC limits. The appropriate lab supervisor or lab manager will notify the analyst of samples that need re-digestion.

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## 10.0 GLASSWARE CLEANING

All glassware should be washed with soap and tap water, rinsed with 5% nitric acid solution, and then rinsed at least 3 times with de-ionized water.

## 11.0 DOCUMENTATION REQUIREMENTS

All digestion information should be completed on the form attached to this SOP. The information required includes the sample identification (including the sample bottle number), the initial sample volume, and the final sample volume, the acids used (including lot number and manufacturer), the spikes used, the digestion vessel lot number, the temperature and thermometer ID, and the date of digestion. The analyst should write additional information such as unusual sample characteristics and samples that need to be filtered in the comment section. Refer to the standards SOP for additional information on documentation requirements to follow when making spiking solutions.

## 12.0 SAFETY

The analyst should follow safety procedures as outlined in the Accutest Laboratory Safety Manual which includes the use of safety glasses and lab coats. In addition, all acids are corrosive and should be handled with care. Flush spills with plenty of water. If acid contacts any part of the body, flush with water and contact the supervisor.

## 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

### 13.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids must be followed. All method users must be familiar with the waste management practices described in Section 13.2.

### 13.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

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## 14.0 DEFINITIONS

14.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

14.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

14.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

14.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

14.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

14.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

14.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

14.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

14.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through

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all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

14.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

14.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

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**Table 1: ICP Metals Spiking Levels**

| ELEMENT | INITIAL CONC (ppm) | VOLUME USED (ml) | FINAL CONC (mg/l) | FINAL VOL. (ml) |
|---|---|---|---|---|
| Ba | 200 | 1.0 | 4.0 | 50 |
| Be | 5 | 1.0 | .10 | 50 |
| Cd | 5 | 1.0 | .10 | 50 |
| Cr | 20 | 1.0 | .40 | 50 |
| Cu | 25 | 1.0 | .50 | 50 |
| Co | 50 | 1.0 | 1.0 | 50 |
| Mn | 50 | 1.0 | 1.0 | 50 |
| V | 50 | 1.0 | 1.0 | 50 |
| Zn | 50 | 1.0 | 1.0 | 50 |
| As | 200 | 1.0 | 4.0 | 50 |
| Se | 200 | 1.0 | 4.0 | 50 |
| Pb | 50 | 1.0 | 1.0 | 50 |
| Ti | 200 | 1.0 | 4.0 | 50 |
| Sb | 50 | 1.0 | 1.0 | 50 |
| Mo | 100 | 0.5 | 1.0 | 50 |
| Sn | 100 | 0.5 | 1.0 | 50 |
| Al | 200/5000 | 1.0/0.25 | 27 | 50 |
| Fe | 200/5000 | 1.0/0.25 | 29 | 50 |
| Mg | 5000 | 0.25 | 25 | 50 |
| Ca | 5000 | 0.25 | 25 | 50 |
| K | 5000 | 0.25 | 25 | 50 |
| Na | 5000 | 0.25 | 25 | 50 |
| Ag | 5 | 1.0 | .10 | 50 |
| Ni | 50 | 1.0 | 1.0 | 50 |

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**COLD VAPOR ANALYSIS OF MERCURY FOR SOILS**

**Effective 7 days after "Approved by" date**

Prepared by:_____Dave Metzgar_____Date:__11/11/05

Reviewed by:____Svetlana Izosimova_____Date:__11/14/05

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

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Issued to: _____ Date: _____

Issued to: _____ Date: _____

Effective 7 days after "*" date

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**TEST NAME: COLD VAPOR ANALYSIS OF MERCURY FOR SOILS**

**METHOD REFERENCE: SW-846 7471A**

**INSTRUMENT SERIAL #: 2022**

**DEPARTMENT: METALS**

**DETECTION LIMIT: 0.100 mg/kg for soils**

Amended sec 1, 6, 7, 8, 9, 10, 11, 12, 13, Added MDL sec, Definitions, Instrument serial number added, Amended sections 7.4, 7.7,13.2, 8.2, 7.8, 8.18, 4.3,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is outlined in this SOP is based on SW846 method 7471A for soils. The types of samples that can be analyzed include soils, sediments, bottom deposits and sludge type materials.

1.2 The mercury is reduced to the elemental state and aerated from the solution in a closed system. The mercury vapor passes through a cell in the light path of an atomic spectrophotometer, where the absorbance is measured as a function of mercury concentration.

## 2.0 PRESERVATION

All soils must be refrigerated between 1 - 4°C.

## 3.0 HOLDING TIME

All samples should be analyzed within 28 days of the date of collection.

## 4.0 REPORTING and METHOD DETECTION LIMIT

4.1 Reporting Limit. The reporting limit for this method has been established at 0.083mg/kg.

4.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria. Experimental MDLs must be determined annually for this method.

4.3 MDLs should be established for all appropriate methods, using a solution spiked at approximately 3 times the estimated detection limit annually. To determine the MDL values, take seven replicate aliquots of the spiked

sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level.

**Note: IDL<MDL<1/2 RDL**

## 5.0 INTERFERENCES

Possible interference from sulfide is eliminated by the addition of potassium permanganate. Concentrations of sulfide as sodium sulfide as high as 20 mg/l do not interfere with mercury recoveries when following this method. High copper concentrations (> 10 mg/l) may also interfere with mercury recoveries. Samples that are high in chloride such as seawater, brine and industrial effluent may require as much as 12.5 ml of additional permanganate.

**Note: When chloride concentrations are high, hydroxylamine sulfate and stannous sulfate should be used in place of corresponding chlorides. Finally, certain volatile organic materials will also absorb at this wavelength and can interfere. It can be determined if this type of interference is present by doing a preliminary run without reagents.**

## 6.0 APPARATUS

6.1 A Leeman HYDRA AA automated analyzer is used for all analysis. Refer to the instrument manual for further details on this instrumentation.

6.2 Environmental Express Hot Block, 100ml capacity, model SC150

6.3 Environmental Express digestion vessels, SC600

6.4 Class A volumetric pipettes and flasks

6.5 Thermometer

6.6 Fisherbrand wooden tongue depressors

6.7 Teflon boiling chips

## 7.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. De-ionized water should be used whenever water is required.

7.1 Sulfuric acid, concentrated

7.2 Hydrochloric acid, concentrated

7.3 Nitric acid concentrated. This acid must have low mercury content.

7.4 Stannous chloride. To 400 ml of DI water, add 14 ml of conc. sulfuric acid. Dilute to 500 ml and add 50 g of stannous chloride and dissolve. This compound does not dissolve well and should be stirred continuously when in use. Stannous sulfate may be used in place of stannous chloride. Stannous chloride is prepared daily. Lot number is recorded in Hg logbook.

7.5 Sodium chloride-hydroxylamine hydrochloride. Add 120 g of sodium chloride and 120 g of hydroxylamine hydrochloride to 1 liter of water. Mix well; hydroxylamine sulfate may be used in place of hydroxylamine hydrochloride.

7.6 Potassium permanganate. Add 50 g of potassium permanganate to 1 liter of water and mix well. **Caution: Potassium permanganate is a strong oxidizing agent. Handle with care.**

7.7 2% HCL Rinse Solution. Add 40mls concentrated HCL to a volumetric flask and dilute to 2 liters with DI water. 2% HCL is prepared daily. Lot number is recorded in Hg logbook.

7.8 Daily working standards are made fresh daily from the 100 ppb standard solution (7.8.2).

7.8.1 10 ppm Hg solution. Using a 10-ml volumetric pipette, add 10 ml of 1000-ppm stock (to be purchased from a vendor such as Fisher) to a 1.00-liter volumetric flask containing approximately 750 ml of water and 10 ml of concentrated nitric acid. Dilute to volume with water and mix well. This 10ppm standard must be prepared every six months.

7.8.2 100 ppb Hg solution. Using a 10-ml volumetric pipette, add 10 ml of 10 ppm Hg solution to a 1.00-liter volumetric flask containing approximately 750 ml of water and 10 ml of concentrated nitric acid. Dilute to volume with de-ionized water and mix well. This 100ppb standard must be prepared every month.

7.8.3 Daily working standards are prepared daily using 100ppb standard solution (7.8.2)

**Note:** All standards and prepared reagents must be prepared every 6 months or before stock standard expiration date, whichever comes first, except as noted elsewhere in this SOP.

## 8.0 SOIL DIGESTION AND ANALYSIS PROCEDURE

Below is a step-by-step procedure for the digestion and analysis of soil samples for mercury.

8.1 Make up the standard curve as shown below. Clearly label each digestion vessel with a standard ID. The standard ID's should be recorded on the data summary sheet.

| ml of 100 ppb Hg solution | ml of DI water | Total µg of Hg |
|---|---|---|
| 0.0 | 50 | 0.0 |
| 0.10 | 50 | 0.02 |
| 0.5 | 50 | 0.10 |
| 1.5 | 50 | 0.30 |
| 2.5 | 50 | 0.50 |
| 3.0 | 50 | 0.60 |

Add enough DI water to bring the volume up to 10ml in each digestion vessel.

8.2 Make up the quality control samples as shown below. Make sure to clearly label each digestion vessel.

| Sample ID | ml of 100 ppb Hg solution | ml of DI water | Total µg of Hg |
|---|---|---|---|
| Spike Blank | 1.5 | 50 | 0.30 |
| CCV | 1.5 | 50 | 0.30 |
| Low Check (CRI) | 0.10 | 50 | 0.020 |
| Method Blank | 0.0 | 50 | 0.0 |
| ICV | 1.5 | 50 | 0.30 |

**Note: ICV must be from a different source.**

| Sample ID | ml of 100 ppb Hg Solution | g of sample | Total µg of Hg |
|---|---|---|---|
| Matrix Spike | 1.5 | 0.6 | 0.30 +sample |
| Matrix Spike Dup | 1.5 | 0.6 | 0.30 +sample |
| Duplicate | | 0.6 | sample |

8.3 Using a tongue depressor, weigh out approximately 0.6 g of a homogeneous sample and place in the digestion vessel.

8.4 Preheat the Hot Block to 95 ± 1°C.

8.5 To all samples, QC and standards add the following reagents:

- 0.5 ml of concentrated nitric acid
- 1.5 ml of concentrated hydrochloric acid
- 2.5 ml of DI water

**NOTE:** the 2.5 ml of DI is not needed for the standards and QC samples already diluted to 10 ml

8.6 Swirl the samples well after each addition of reagent.

8.7 Place the vessels in the Hot Block and digest for 2 minutes at 95° C.

8.8 Cool the samples and then add 18ml of DI water and 7.5 ml of potassium permanganate. More potassium permanganate solution may be required for some samples. Enough should be added so that the purple color persists for at least 15 minutes.

8.9 Heat the samples for 30 minutes at 95 ± 1°C. Then remove and cool.

8.10 Add DI water to bring to a final volume of 50 ml.

8.11 While the samples are digesting, begin setting up the Leeman HYDRA AA mercury analyzer following the steps outlined below. Further details are available in the instrument manual.

8.12 Turn the Argon gas on. Make sure the vent line is connected to the exhaust hood.

8.13 Inspect all pump tubing and replace if necessary. Put the tubing on the cassettes and attach to the pump head, making sure the cassette adjusters are completely tightened. Place the fresh stannous chloride solution in the bottle. Fill the rinse bottle with 2% HCL solution.

8.14 Double click on the WINHG icon on the desktop. This will open the WinHg runner. Click on the control tab and click “turn on gas”, “turn on pump”, and “turn on lamp” options.

8.15 Go to file (pulldown menu) and choose new dataset. Save dataset as Hg-day-month-matrix-run no. (i.e., Hg0405S1).

8.16 Click on the **DB** ↓ button. This will open the WinHg Database window. Go to file and choose Hg7470 PROTOCOL. This will be the Protocol (method) used for water and soil analysis. Make sure “Dataset” match on WinHg Runner screen as well as the Database screen.

8.17 Click on the "STANDARD" tab in WinHgRunner window and click on **S1** through **S6.** Click on the "Rep1" button. Click on the "STAND AUTO" button and calibration will begin.

8.18 Calibration is performed by analyzing a series of 5 standards and a blank. While calibration is being performed, type the analysis sequence by clicking on the Rack Editor button. Enter the samples and the appropriate QC. ICV, ICB, CRI, CCV, CCB, 10 samples, CCV, and CCB, etc. Save the sequence as Hg-day-month-matrix-run no. (Hg0405S1). After calibration is performed and accepted (Correlation Coeff. Of >0.995 must be achieved), click on the Sample Tab in WinHgRunner and click on "START NEW BATCH" button. Type the auto-sampler sequence filename as above (i.e., Hg0405S1).

**Note:** One calibration point may be dropped for sw846-7471A. This point may be 6.0ppb. (ONLY ONE). If the 6.0ppb point is dropped then 5.0ppb becomes the upper range limit.

8.19 In Autosampler Run rack name drop down window, choose the filename you are analyzing. Assign the location of the start and finish cups and click on "RUN AUTO".

8.20 Add 3 ml of hydroxylamine hydrochloride solution to each standard and swirl until the solution has been completely decolorized before analyzing standards or samples.

## 9.0 QC REQUIREMENTS

All QC calculations should be done as outlined in the method. QC limits are compiled by Accutest quarterly and should be used to determine if a given analysis is valid.

9.1 Method Blank – An acceptable method blank or reagent blank must be analyzed with every batch of samples processed. The method blank must be less than one half the reporting limit. If the method blank is greater than on half of the reporting limit, the samples must be re-digested and reanalyzed with an acceptable method blank. Method blanks are processed with every 20 field samples or with every analysis batch.

9.2 Initial Calibration Verification – An initial calibration verification (ICV) sample must be analyzed after the initial calibration has been performed. This sample must be prepared at or near the midpoint of the initial calibration from a reference material independent from the initial calibration solution. The results of the ICV must agree within 10 percent of the true value for the analysis to be valid. If the ICV fails, a new ICV or

initial calibration must be performed and all samples must be re-digested and reanalyzed with an acceptable ICV.

9.3 Continuing Calibration Verification – If more than 10 samples are to be analyzed in a single day, a Continuing Calibration Verification sample prepared at or near the mid point of the initial calibration must be analyzed after every $10^{th}$ sample and at the end of the analytical run. The results of this analysis must be within 20 percent of the initial calibration for the CCV analyses to be considered valid. If the CCV fails, all samples analyzed after the first passing CCV must be re-digested and reanalyzed.

9.4 Low Level Check Standard (CRI) – A standard prepared at the low calibration concentration should be prepared and analyzed with each analytical run. The CRI should agree within 20 percent of the true value to be acceptable. If the CRI does not meet the acceptance criteria, the samples must be re-digested and reanalyzed.

9.5 Blank Spike – A blank spike (BSP) or Laboratory Control Spike (LCS) should be prepared using de-ionized water spiked at the midpoint of the calibration curve. The blank spike must be within 20 percent of the true value for the analysis to be considered valid. If the blank spike exceeds the acceptance criteria, the samples must be re-digested and reanalyzed. A blank spike is required for every 20 field samples or for each analysis batch. *Note: Samples with Hg non-detected may be reported with Blank Spike recovery biased high*.

9.6 Duplicate – A duplicate of a field sample should be processed and analyzed with each set of 20 field samples. The duplicate results should agree within 20 percent of one another for the analyses to be considered valid. If the duplicate fails the acceptance criteria, data must be footnoted in LIMS.

9.7 Matrix Spike/Matrix Spike Duplicate – At least on Matrix Spike/Matrix Spike Duplicate pair must be prepared and analyzed with every 20 field samples. The MS/MSD must agree within 25 percent of the true value of the MS/MSD (20 percent Relative Standard Deviation for the MSD) or within the laboratory recovery limits generated using historical data. If the results of the MS/MSD are outside the acceptance criteria, the data should be flagged as possible matrix effect. Alternatively, the use of the Method of Standard Additions (MSA) may be used to calculate the concentration in matrix effected samples.

## 10.0 DOCUMENTATION REQUIREMENTS

Record the start time, end time and temperature for all digestions on the analysis data sheet. All sample information should be clearly entered on these sheets. In addition, any unusual characteristics of the samples or the digestion procedure

should be noted in the comment section. All dilutions must be clearly documented.

## 11.0 SAFETY

The analyst should follow normal safety procedures as outline in the Accutest Laboratory Safety Manual. Particular care should be observed in handling the strong acids and oxidizing agents. Safety glasses and lab coats should be worn at all times. Gloves should be worn when handling samples and hazardous chemicals.

## 12.0 CALCULATIONS

Below are the calculations, which should be used for soil samples. The concentration of the sample in µg should be obtained from the calibration curve.

$$\text{Final concentration in mg/kg} = \frac{\text{Concentration of sample in µg}}{(\text{Sample wt in g})(\%\text{solids}/100)}$$

## 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

### 13.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards, reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids, or solids must be followed. All method users must be familiar with the waste management practices described in Section 13.2.

### 13.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples. Mercury waste must be analyzed prior to disposal. Result must be under TCLP MCL. If result is not under TCLP MCL waste must be considered hazardous and disposed of accordingly. After waste passes TCLP criteria it then can be neutralized and disposed of.

## 14.0 DEFINITIONS

14.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

14.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

14.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

14.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

14.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

14.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

14.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

14.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

14.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

14.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

14.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF DIESEL RANGE ORGANICS (DRO) FROM SOLID SAMPLES

Prepared by: Norm Farmer _____ Date: 12/06/03

Reviewed by: Mark Erstling _____ Date: 12/23/03

Annual Review

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF DIESEL RANGE ORGANICS (DRO) FROM SOLID SAMPLES

## 1.0 Summary, Scope and Application

1.1 Summary

Solid samples are serially extracted by pulse sonication, concentrated by TurboVap apparatus, and stored in glass vials with Teflon lined screw caps.

1.2 Scope and Application

This procedure is applicable to solid samples, including soils and sediments, submitted for DRO analysis by GC/FID method SW-846 8015B.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3550B. The method outlined in this SOP is designed for low concentration samples (concentration of the individual organic components is expected to be less than 20mg/kg).

The FID is a non-selective detector and will respond to most organic compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass, stainless steel, wood, or Teflon.

Animal oils, vegetable oils, and biogenic terpenes can be removed by treating the extract with silica gel.

## 3.0 Holding Times

All solid samples must be extracted within 14 days of collection. A sample is considered extracted after it has been sonicated three times and the solvent has been transferred to an Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Anhydrous sodium sulfate – precleaned to remove phthalates

5.4 Silica gel – Davidson grade 950 or equivalent – 60 to 200 mesh

5.5 DRO Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

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5.6 DRO Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

## 6.0 Glassware and Apparatus

6.1 400ml thick walled beaker

6.2 Glass funnels (large enough to support the filters)

6.3 500ml Erlenmeyer flask

6.4 Spatula – stainless steel, wood, or Teflon

6.5 0.5ml or 1.0ml syringes

6.6 1.0ml volumetric flask

6.7 200ml graduated TurboVap tube

6.8 Disposable transfer pipettes

6.9 glass wool – precleaned

6.10 Fisher P8 filters – or equivalent

6.11 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.12 Zymark TurboVap II or equivalent

6.13 Ultrasonic disrupter – minimum power of 300 watts with pulse capability

6.14 Disrupter horns – ¾" solid titanium tip

## 7.0 Sonic Disrupter

Follow the manufacturer's instructions for tuning and operating the sonic disrupter. Tuning should be verified at least weekly and should be documented in the "Instrument Repair and Maintenance" logbook. The sonic disrupter should be set in the pulse mode with a 50% duty cycle (energy on 50% of the time and off 50% of the time). Because the Fisher Scientific 550 Sonic Dismembrator has a maximum power output of 475 watts, the power control knob can be set at seven (70% output) instead of 10 (100% output).

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## 8.0 Procedure

8.1 The extraction of all samples must be documented on a "prep sheet". The prep sheet will include such items as: sample ID, bottle number, initial amount, final volume, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC analyst with the extracts.

8.2 Decant any free liquid from the solid sample. Remove any foreign objects such as twigs or rocks. Discard the top layer of soil and thoroughly mix the sample with a wooden spatula. Samples with obvious layers may need to be transferred to a larger container for proper mixing. Refer to SOP QA035 for more information on sample homogenization.

8.3 Transfer 30 grams of each sample to the appropriately labeled beakers. Use a clean spatula for each sample. Record the weight to the nearest 0.1gram on the prep sheet.

8.4 Add approximately 30 grams of sodium sulfate to each sample and mix until each sample has a free flowing sandy texture. Wetter soils will require more sodium sulfate.

8.5 Transfer 30 grams of each of the QC samples to the appropriately labeled beakers. This includes the method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 30 grams of sodium sulfate and/or clean sand for the MB and BS. Use additional 30 gram aliquots of a sample for the MS and MSD. If there is insufficient sample amount, a lesser amount may be used. Record the sample ID, bottle number, and weight on the prep sheet.

8.6 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

8.7 Using the dedicated spike syringe add 0.5ml of spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

8.8 Immediately add 100ml of methylene chloride (50:50 methylene chloride and acetone may also be used) to each of the beakers. This will minimize the loss of the more volatile analytes.

8.9 Label the Erlenmeyer flasks and place a glass filter funnel containing a Fisher P8 filter on the top of each flask.

8.10 Place the disrupter horn in the beaker such that the tip of the horn is approximately ½ inch into the solvent but not touching the beaker or the sample.

8.11 Sonicate the sample for 3 minutes.

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8.12 Remove the beaker and decant the solvent through the filter funnel into the flask.

8.13 Repeat steps 8.10 to 8.12 two more times with fresh 100ml solvent aliquots. All three solvent aliquots will be combined in the K-D flask.

8.14 After the final extraction, transfer the entire sample to the funnel, rinse thoroughly, and allow the solvent to drain through the sample.

**NOTE:** It is important to clean the disrupter horn between samples. This is done by rinsing the horn with the extraction solvent and wiping it dry with a Kim-wipe or paper towel.

8.15 Label the TurboVap tubes and place them in the metal support rack. Because the total extract volume exceeds the capacity of the TurboVap tube, transfer approximately 200ml each extract to the appropriately labeled tube. The remaining extract will be transferred later.

8.16 Set the water bath temperature for the TurboVap to 40 $^{o}$C. Place the tube in the TurboVap. **NOTE:** If the bath is too hot, the more volatile compounds may be lost during this step. Concentrate the extract to approximately 50ml.

8.17 Remove the TurboVap tube and transfer the remaining extract from the Erlenmeyer flask to the appropriate tube. Rinse each Erlenmeyer flask with methylene chloride and transfer it to the appropriate tube.

8.18 Return the tube to the TurboVap and concentrate the extract to 0.7ml.

8.19 Remove the TurboVap tube and place it in the metal support rack to allow it to cool.

8.20 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

8.21 Transfer the extract to a 1.0ml volumetric flask. Rinse the TurboVap tube with a few drops of methylene chloride and transfer it to the volumetric flask. Adjust the final volume to 1.0ml. **NOTE:** If the extract will not concentrate to 1.0ml, choose the next appropriate final volume. Be sure to record the final volume on the prep sheet.

8.22 Add 0.2 to 0.3 grams of silica gel to each extract. Use a transfer pipette to mix each extract.

8.23 Allow the silica gel to settle.

8.24 Transfer the extract to an appropriately labeled 2.0ml screw cap vial. Store the extracts in the “extract refrigerator” until they are needed for analysis.

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## 9.0 Quality Assurance and Quality Control

9.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

9.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

## 10.0 Safety and Waste Disposal

10.1 Safety

10.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

10.1.2 **Hearing protection** must be worn while operating the sonic disrupters. The high frequency could cause permanent hearing loss.

10.1.3 Avoid touching the disrupter horns while they are active. Contact may cause burns or tissue damage.

10.1.4 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

10.1.5 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

10.2 Waste Disposal

10.2.1 Waste methylene chloride is placed in the “chlorinated waste” container.

10.2.2 Waste acetone is placed in the “non-chlorinated waste” container.

10.2.3 Extracted soil samples are placed in a waste container after the solvent has drained or evaporated.

10.2.4 Waste soil from the homogenizing process should be place in the “soil waste” container. **Note:** Waste soil from foreign soils must follow “foreign soil” disposal requirements.

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## 11.0 References

11.1 SW-846 Method 3500B, Rev. 2, 12/96

11.2 SW-846 Method 3550B, Rev. 2, 12/96

11.3 SW-846 Method 8015B, Rev. 2, 12/96

11.4 Florida DEP Method FL-PRO, REV. 1, 11/95

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF DIESEL RANGE ORGANICS (DRO) FROM WATER SAMPLES

Prepared by: Norm Farmer _____ Date: 12/06/03

Reviewed by: Mark Erstling _____ Date: 12/23/03

Annual Review

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Document Control

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF DIESEL RANGE ORGANICS (DRO) FROM WATER SAMPLES

## 1.0 Summary, Scope and Application

1.1 Summary

Aqueous samples are serially extracted with methylene chloride, concentrated by TurboVap apparatus, and stored in glass vials with Teflon lined screw caps.

1.2 Scope and Application

This procedure is applicable to aqueous samples submitted for DRO analysis by GC/FID method SW-846 8015B.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3510C. The method utilizes "Separatory Funnel Liquid-Liquid Extraction"; it is not applicable to samples requiring "Continuous Liquid-Liquid Extraction".

The FID is a non-selective detector and will respond to most organic compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass or Teflon.

Animal oils, vegetable oils, and biogenic terpenes can be removed by treating the extract with silica gel.

## 3.0 Holding Times

All aqueous samples must be extracted within seven days of collection. A sample is considered extracted after the methylene chloride aliquots have been combined in the Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Anhydrous sodium sulfate – precleaned to remove phthalates

5.4 Reagent water – distilled or deionized - free of interferences

5.5 Silica gel – Davidson grade 950 or equivalent – 60 to 200 mesh

5.6 1:1 $H_2SO_4$

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5.7 DRO Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

5.8 DRO Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

## 6.0 Glassware and Apparatus

6.1 1000ml graduated cylinder

6.2 2 liter separatory funnel (glass or Teflon)

6.3 250ml separatory funnel

6.4 250ml Erlenmeyer flask

6.5 0.5ml or 1.0ml syringes

6.6 1.0ml volumetric flask

6.7 200ml graduated TurboVap tube

6.8 Disposable transfer pipettes

6.9 pH paper

6.10 glass wool – precleaned

6.11 Glass filter funnel

6.12 Fisher P8 filters, or equivalent

6.13 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.14 Zymark TurboVap II or equivalent

## 7.0 Procedure

7.1 The extraction of all samples must be documented on a “prep sheet”. The prep sheet will include such items as: sample ID, bottle number, initial volume, final volume, pHs, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC analyst with the extracts.

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7.2 Mark the level of the sample on the bottle. Transfer the entire sample directly into the appropriately labeled separatory funnel. Rinse the sample bottle with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. Fill the bottle to the sample mark with tap water. Transfer the water to a 1000ml graduated cylinder and record the sample volume. Discard the tap water.

**Alternative procedure:** Using a 1000ml graduated cylinder, transfer ~1000ml of sample to the appropriately labeled separatory funnels. The entire contents must be transferred. Record the actual sample volume. Rinse the sample bottle and graduated cylinder with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. The graduated cylinder must be rinsed with hot tap water, reagent water and methylene chloride between samples in order to prevent cross contamination.

7.3 Transfer 1000ml of each of the QC samples to the appropriately labeled separatory funnels. This includes the method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 1000ml of reagent water for the MB and BS. Use additional 1000ml aliquots of a sample for the MS and MSD. If there is insufficient sample volume, a lesser volume may be used. Record the sample ID, bottle number, and volume on the prep sheet.

7.4 Check the pH of each sample by dipping a clean glass-stirring rod into the sample and touching it to the pH paper. Record the pH on the prep sheet. Samples for DRO analysis may be preserved to a pH <2; however, this is not required. If a sample was not preserved, adjust the pH to <2 by adding 2ml aliquots of 1:1 $H_2SO_4$. Swirl the sample and recheck the pH after each aliquot is added.

7.5 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

7.6 Using the dedicated spike syringe add 0.5ml of spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

7.7 Add 75ml of methylene chloride to each of the separatory funnels. Cap and shake each separatory funnel for two minutes. **CAUTION:** The separatory funnels must be vented frequently to avoid an excessive buildup in pressure.

7.8 After shaking, allow the layers to separate for at least 10 minutes. Collect the solvent layer (bottom) in a labeled 250ml Erlenmeyer flask.

**NOTE:** Some samples may form emulsions. If emulsions are present, the technician must take steps to breakdown the emulsion. This may include filtering the emulsion through a smaller separatory funnel, centrifuging, or filtering through sodium sulfate.

7.9 Repeat steps 7.7 and 7.8 two additional times using 50 to 60ml of methylene chloride. Combine the extract in the Erlenmeyer flask.

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7.10 Label the TurboVap tubes and place them in the metal support rack.

7.11 This step is **optional**, but it must be performed if the extracts appear cloudy or contain water droplets. Place a glass filter funnel containing sodium sulfate supported on a Fisher P8 filter on the TurboVap tube. Pour the extracts through the sodium sulfate into the TurboVap tube and rinse with methylene chloride. Care must be taken not to overfill the TurboVap tube.

7.12 If the extract appears to be dry, simply transfer it to an appropriately labeled TurboVap tube. Rinse the Erlenmeyer flask with methylene chloride and transfer to the appropriate TurboVap tube. Care must be taken not to overfill the TurboVap tube.

7.13 Set the water bath temperature for the TurboVap to 40 $^{o}$C. Place the tube in the TurboVap. Concentrate the extract to 0.7ml.

7.14 Remove the TurboVap tube and place it in the metal support rack to allow it to cool.

7.15 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

7.16 Transfer the extract to a 1.0ml volumetric flask. Rinse the TurboVap tube with a few drops of methylene chloride and transfer it to the volumetric flask. Adjust the final volume to 1.0ml. **NOTE:** If the extract will not concentrate to 1.0ml, choose the next appropriate final volume. Be sure to record the final volume on the prep sheet.

7.17 Add 0.2 to 0.3 grams of silica gel to each extract. Use a transfer pipette to mix each extract.

7.18 Allow the silica gel to settle.

7.19 Transfer the extract to an appropriately labeled 2.0ml screw cap vial. Store the extracts in the “extract refrigerator” until they are needed for analysis.

## 8.0 Quality Assurance and Quality Control

8.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

8.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

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## 9.0 Safety and Waste Disposal

9.1 Safety

9.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

9.1.2 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

9.1.3 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

9.2 Waste Disposal

9.2.1 Waste methylene chloride is placed in the “chlorinated waste” container.

9.2.2 Waste acetone is placed in the “non-chlorinated waste” container.

9.2.3 Extracted water samples are poured through a container of activated charcoal and rinsed down the drain with large amounts of water.

9.2.4 Waste sodium sulfate is placed in a waste container after the solvent has drained or evaporated.

## 10.0 References

10.1 SW-846 Method 3500B, Rev. 2, 12/96

10.2 SW-846 Method 3510C, Rev. 3, 12/96

10.3 SW-846 Method 8015B, Rev. 2, 12/96

10.4 Florida DEP Method FL-PRO, REV. 1, 11/95

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF PESTICIDES AND/OR PCBs FROM SOLID SAMPLES

Prepared by: Norm Farmer Date: 12/06/03

Reviewed by: Mark Erstling Date: 12/23/03

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF PESTICIDES AND/OR PCBs FROM SOLID SAMPLES

## 1.0 Summary, Scope and Application

### 1.1 Summary

Solid samples are serially extracted by pulse sonication, solvent exchanged into hexane, concentrated by TurboVap, and stored in glass vials with Teflon lined screw caps.

### 1.2 Scope and Application

This procedure is applicable to solid samples submitted for Pesticide and/or PCB analysis by GC/ECD methods, including SW-846 8081A and SW-846 8082.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3550B. The method outlined in this SOP is designed for low concentration samples (concentration of the individual organic components is expected to be less than 20mg/kg).

The ECD is an extremely sensitive detector that will respond to many organic and some inorganic compounds that exhibit a strong electronegativity. This includes phthalates and sulfur compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass, stainless steel, wood, or Teflon.

## 3.0 Holding Times

All solid samples must be extracted within 14 days of collection. A sample is considered extracted after it has been sonicated three times and the solvent has been transferred to an Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Hexane – pesticide grade or equivalent

5.4 Isopropyl Alcohol – pesticide grade or equivalent

5.5 Anhydrous sodium sulfate – precleaned to remove phthalates

5.6 Tetrabutylammonium (TBA) sulfite reagent

5.7 Concentrated $H_2SO_4$

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5.8 Reagent water – distilled or deionized - free of interferences

5.9 Pesticide/PCB Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

5.10 **Pesticide** Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

5.11 **PCB** Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

## 6.0 Glassware and Apparatus

6.1 400ml thick walled beaker

6.2 Glass funnels (large enough to support the filters)

6.3 500ml Erlenmeyer flask

6.4 Spatula – stainless steel, wood, or Teflon

6.5 0.5 or 1.0ml syringes

6.6 200ml graduated TurboVap tubes

6.7 10ml graduated concentrator tube

6.8 Disposable transfer pipettes

6.9 glass wool – precleaned

6.10 Fisher P8 filters – or equivalent

6.11 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.12 8ml and 16ml glass screw cap vials – caps must have Teflon lined septa

6.13 Zymark TurboVap II or equivalent

6.14 Ultrasonic disrupter – minimum power of 300 watts with pulse capability

6.15 Disrupter horns – ¾” solid titanium tip

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## 7.0 Sonic Disrupter

Follow the manufacturer's instructions for tuning and operating the sonic disrupter. Tuning should be verified at least weekly and should be documented in the "Instrument Repair and Maintenance" logbook. The sonic disrupter should be set in the pulse mode with a 50% duty cycle (energy on 50% of the time and off 50% of the time). Because the Fisher Scientific 550 Sonic Dismembrator has a maximum power output of 475 watts, the power control knob can be set at seven (70% output) instead of 10 (100% output).

## 8.0 Procedure

8.1 The extraction of all samples must be documented on a "prep sheet". The prep sheet will include such items as: sample ID, bottle number, initial amount, final volume, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC analyst with the extracts.

8.2 Decant any free liquid from the solid sample. Remove any foreign objects such as twigs or rocks. Discard the top layer of soil and thoroughly mix the sample with a wooden spatula. Samples with obvious layers may need to be transferred to a larger container for proper mixing. Refer to SOP QA035 for more information on sample homogenization.

8.3 Transfer 30 grams of each sample to the appropriately labeled beakers. Use a clean spatula for each sample. Record the weight to the nearest 0.1gram on the prep sheet.

8.4 **Note:** A lesser amount, 3.0 to 10.0 grams of soil may be used for certain high level PCB projects, check with the department supervisor before reducing the sample amount.

8.5 Add approximately 30 grams of sodium sulfate to each sample and mix until each sample has a free flowing sandy texture. Wetter soils will require more sodium sulfate.

8.6 Transfer 30 grams of each of the QC samples to the appropriately labeled beakers. This includes the method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 30 grams of sodium sulfate and/or clean sand for the MB and BS. Use additional 30 gram aliquots of a sample for the MS and MSD. If there is insufficient sample amount, a lesser amount may be used. Record the sample ID, bottle number, and weight on the prep sheet.

8.7 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

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8.8 Two spiking solutions are used in this SOP. If the samples are to be analyzed for "pesticides" only, use the **Pesticide** spiking solution. If the samples are to be analyzed for "PCBs" only, use the **PCB** spiking solution. If the samples are to be analyzed for both "pesticides" and "PCBs" two separate sets of QC (BS, MS, and MSD) must be prepared, one using the **Pesticide** spiking solution and one using the **PCB** spiking solution**.**

8.9 Using the dedicated spike syringe add 0.5ml of the appropriate spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

8.10 Immediately add 100ml of methylene chloride (50:50 methylene chloride and acetone or 50:50 hexane and acetone may also be used) to each of the beakers. This will minimize the loss of the more volatile analytes.

8.11 Label the Erlenmeyer flasks and place a glass filter funnel containing a Fisher P8 filter on the top of each flask.

8.12 Place the disrupter horn in the beaker such that the tip of the horn is approximately ½ inch into the solvent but not touching the beaker or the sample.

8.13 Sonicate the sample for 3 minutes.

8.14 Remove the beaker and decant the solvent through the filter funnel into the K-D.

8.15 Repeat steps 8.12 to 8.14 two more times with fresh 100ml solvent aliquots. All three solvent aliquots will be combined in the flask.

8.16 After the final extraction, transfer the entire sample to the funnel, rinse thoroughly, and allow the solvent to drain through the sample.

**NOTE:** It is important to clean the disrupter horn between samples. This is done by rinsing the horn with the extraction solvent and wiping it dry with a Kim-wipe or paper towel.

8.17 Label the TurboVap tubes and place them in the metal support rack. Because the total extract volume exceeds the capacity of the TurboVap tube, transfer approximately 200ml each extract to the appropriately labeled tube. The remaining extract will be transferred later.

8.18 Set the water bath temperature for the TurboVap to 40 $^{o}$C. Place the tube in the TurboVap. **NOTE:** If the bath is too hot, the more volatile compounds may be lost during this step. Concentrate the extract to approximately 50ml.

8.19 Remove the TurboVap tube and transfer the remaining extract from the Erlenmeyer flask to the appropriate tube. Rinse each Erlenmeyer flask with methylene chloride and transfer it to the appropriate tube.

8.20 Return the tube to the TurboVap and concentrate the extract to between 1 and 5ml.

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8.21 Add approximately 50ml of hexane to the each of the TurboVap tubes. Increase the TurboVap water bath temperature to 55 $^{o}$C and concentrate the extract to less than 5ml.

8.22 Remove the TurboVap tube and place it in the metal support rack to allow it to cool.

8.23 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

8.24 Transfer the extract to a 10ml concentrator tube. Rinse the TurboVap tube with a few drops of hexane and transfer it to the concentrator tube. Adjust the final volume to 10.0ml. Use a transfer pipet to thoroughly mix the extract. Be sure to record the final volume on the prep sheet.

8.25 If the extract is to be analyzed for pesticides, transfer some of the extract to an appropriately labeled 2.0ml screw cap vial. This is kept as a backup.

8.26 Proceed to section 9.0 for acid cleaning procedure and section 10.0 for sulfur cleaning procedure. The PCB fraction undergoes both the acid and sulfur cleanup procedures. The pesticide fraction undergoes only the sulfur cleanup procedure.

## 9.0 Acid Cleaning Procedure (PCB only)

**NOTE: This cleaning procedure can be used on the PCB fraction only. It will destroy the pesticides.**

9.1 Label the 8ml screw cap vials for each sample and associated QC.

9.2 Add 2ml of concentrated $H_2SO_4$ to each of the vials.

9.3 Using a transfer pipet, transfer approximately 2ml of extract to the vial. Cap the vial and shake for one minute.

9.4 Allow the extracts to stand for 10 minutes. Transfer the hexane layer (top) to an appropriately labeled 2.0ml screw cap vial.

9.5 Store the extracts in the “extract refrigerator” until they are needed for analysis.

## 10.0 Sulfur Cleaning Procedure (Pesticide and PCB)

10.1 Label the 16ml screw cap vials for each sample and associated QC.

10.2 Add 1ml of TBA-sulfite reagent and 2ml of isopropyl alcohol to each of the vials.

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10.3 Using a transfer pipet, transfer approximately 2ml of extract to the vial. Cap the vial and shake for one minute.

10.4 Add 5ml of reagent water to each vial. Cap the vial and shake for one minute.

10.5 Allow the extracts to stand for 10 minutes. Transfer the hexane layer (top) to an appropriately labeled 2.0ml screw cap vial.

10.6 Store the extracts in the "extract refrigerator" until they are needed for analysis.

## 11.0 Quality Assurance and Quality Control

11.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

11.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

## 12.0 Safety and Waste Disposal

12.1 Safety

12.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

12.1.2 **Hearing protection** must be worn while operating the sonic disrupters. The high frequency could cause permanent hearing loss.

12.1.3 Avoid touching the disrupter horns while they are active. Contact may cause burns or tissue damage.

12.1.4 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

12.1.5 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

12.2 Waste Disposal

12.2.1 Waste methylene chloride is placed in the "chlorinated waste" container.

12.2.2 Waste acetone is placed in the "non-chlorinated waste" container.

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12.2.3 Extracted soil samples are placed in a waste container after the solvent has drained or evaporated.

12.2.4 Waste soil from the homogenizing process should be place in the “soil waste” container. **Note:** Waste soil from foreign soils must follow “foreign soil” disposal requirements.

## 13.0 References

13.1 SW-846 Method 3500B, Rev. 2, 12/96

13.2 SW-846 Method 3550B, Rev. 2, 12/96

13.3 SW-846 Method 8081A, Rev. 1, 12/96

13.4 SW-846 Method 8082, Rev. 0, 12/96

13.5 SW-846 Method 3660B, Rev. 2, 12/96

13.6 SW-846 Method 3665A, Rev. 1, 12/96

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF PESTICIDES AND/OR PCBs FROM WATER SAMPLES

Prepared by: Norm Farmer Date: 12/06/03

Reviewed by: Mark Erstling Date: 12/23/03

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF PESTICIDES AND/OR PCBs FROM WATER SAMPLES

## 1.0 Summary, Scope and Application

### 1.1 Summary

Aqueous samples are serially extracted with methylene chloride, solvent exchanged into hexane, concentrated by TurboVap, and stored in glass vials with Teflon lined screw caps.

### 1.2 Scope and Application

This procedure is applicable to aqueous samples submitted for Pesticide and/or PCB analysis by GC/ECD methods, including EPA 608, SW-846 8081A, and SW-846 8082.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3510C. The method utilizes “Separatory Funnel Liquid-Liquid Extraction”; it is not applicable to samples requiring “Continuous Liquid-Liquid Extraction”.

The ECD is an extremely sensitive detector that will respond to many organic and some inorganic compounds that exhibit a strong electronegativity. This includes phthalates and sulfur compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass or Teflon.

## 3.0 Holding Times

All aqueous samples must be extracted within seven days of collection. A sample is considered extracted after the methylene chloride aliquots have been combined in the Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Hexane – pesticide grade or equivalent

5.4 Isopropyl Alcohol – pesticide grade or equivalent

5.5 Anhydrous sodium sulfate – precleaned to remove phthalates

5.6 Tetrabutylammonium (TBA) sulfite reagent

5.7 Reagent water – distilled or deionized - free of interferences

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5.8 10 Normal NaOH

5.9 1:1 $H_2SO_4$

5.10 Concentrated $H_2SO_4$

5.11 Pesticide/PCB Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

5.12 **Pesticide** Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

5.13 **PCB** Spike Solution – prepared in acetone or methanol at a concentration specified by the GC analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

## 6.0 Glassware and Apparatus

6.1 1000ml graduated cylinder

6.2 2 liter separatory funnel (glass or Teflon)

6.3 250ml separatory funnel

6.4 250ml Erlenmeyer flask

6.5 0.5ml or 1.0ml syringes

6.6 200ml graduated TurboVap tube

6.7 10ml graduated concentrator tube

6.8 Disposable transfer pipettes

6.9 pH paper

6.10 glass wool – precleaned

6.11 Glass filter funnel

6.12 Fisher P8 filters, or equivalent

6.13 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.14 8ml and 16ml glass screw cap vials – caps must have Teflon lined septa

6.15 Zymark TurboVap II or equivalent

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## 7.0 Procedure

7.1 The extraction of all samples must be documented on a "prep sheet". The prep sheet will include such items as: sample ID, bottle number, initial volume, final volume, pHs, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC analyst with the extracts.

7.2 Mark the level of the sample on the bottle. Transfer the entire sample directly into the appropriately labeled separatory funnel. Rinse the sample bottle with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. Fill the bottle to the sample mark with tap water. Transfer the water to a 1000ml graduated cylinder and record the sample volume. Discard the tap water.

**Alternative procedure:** Using a 1000ml graduated cylinder, transfer ~1000ml of sample to the appropriately labeled separatory funnels. The entire contents must be transferred. Record the actual sample volume. Rinse the sample bottle and graduated cylinder with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. The graduated cylinder must be rinsed with hot tap water, reagent water and methylene chloride between samples in order to prevent cross contamination.

7.3 Transfer 1000ml of each of the QC samples to the appropriately labeled separatory funnels. This includes the reagent blank (MB), reagent blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 1000mls of reagent water for the MB and BS. Use additional 1000ml aliquots of a sample for the MS and MSD. If there is insufficient sample volume, a lesser volume may be used. Record the sample ID, bottle number, and volume on the prep sheet.

7.4 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

7.5 Two spiking solutions are used in this SOP. If the samples are to be analyzed for "pesticides" only, use the **Pesticide** spiking solution. If the samples are to be analyzed for "PCBs" only, use the **PCB** spiking solution. If the samples are to be analyzed for both "pesticides" and "PCBs" two separate sets of QC (BS, MS, and MSD) must be prepared, one using the **Pesticide** spiking solution and one using the **PCB** spiking solution**.**

7.6 Using the dedicated spike syringe add 0.5ml of the appropriate spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

7.7 Check the pH of each sample by dipping a clean glass-stirring rod into the sample and touching it to the pH paper. Record the pH on the prep sheet. If necessary, adjust the pH to between 5 and 9 by adding a few drops of 10 N NaOH or 1:1 $H_2SO_4$.

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7.8 Add 75ml of methylene chloride to each of the separatory funnels. Cap and shake each separatory funnel for two minutes. **CAUTION:** The separatory funnels must be vented frequently to avoid an excessive buildup in pressure.

7.9 After shaking, allow the layers to separate for at least 10 minutes. Collect the solvent layer (bottom) in a labeled 250ml Erlenmeyer flask.

**NOTE:** Some samples may form emulsions. If emulsions are present, the technician must take steps to breakdown the emulsion. This may include filtering the emulsion through a smaller separatory funnel, centrifuging, or filtering through sodium sulfate.

7.10 Repeat steps 7.8 and 7.9 two additional times using 50 to 60ml of methylene chloride. Combine the extract in the Erlenmeyer flask.

7.11 Label the TurboVap tubes and place them in the metal support rack.

7.12 This step is **optional**, but it must be performed if the extracts appear cloudy or contain water droplets. Place a glass filter funnel containing sodium sulfate supported on a Fisher P8 filter on the TurboVap tube. Pour the extracts through the sodium sulfate into the TurboVap tube and rinse with methylene chloride. Care must be taken not to overfill the TurboVap tube.

7.13 If the extract appears to be dry, simply transfer it to an appropriately labeled TurboVap tube. Rinse the Erlenmeyer flask with methylene chloride and transfer to the appropriate TurboVap tube. Care must be taken not to overfill the TurboVap tube.

7.14 Set the water bath temperature for the TurboVap to 40 $^{o}$C. Place the tube in the TurboVap. Concentrate the extract to less than 5ml.

7.15 Add approximately 50ml of hexane to the each of the TurboVap tubes. Increase the TurboVap water bath temperature to 55 $^{o}$C and concentrate the extract to less than 5ml.

7.16 Remove the TurboVap tube and place it in the metal support rack to allow it to cool.

7.17 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

7.18 Transfer the extract to a 10ml concentrator tube. Rinse the TurboVap tube with a few drops of hexane and transfer it to the concentrator tube. Adjust the final volume to 10.0ml. Use a transfer pipet to thoroughly mix the extract. Be sure to record the final volume on the prep sheet.

7.19 If the extract is to be analyzed for pesticides, transfer some of the extract to an appropriately labeled 2.0ml screw cap vial. This is kept as a backup.

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7.20 Proceed to section 8.0 for acid cleaning procedure and section 9.0 for sulfur cleaning procedure. The PCB fraction undergoes both the acid and sulfur cleanup procedures. The pesticide fraction undergoes only the sulfur cleanup procedure.

## 8.0 Acid Cleaning Procedure (PCB only)

**NOTE: This cleaning procedure can be used on the PCB fraction only. It will destroy the pesticides.**

8.1 Label the 8ml screw cap vials for each sample and associated QC.

8.2 Add 2ml of concentrated $H_2SO_4$ to each of the vials.

8.3 Using a transfer pipet, transfer approximately 2ml of extract to the vial. Cap the vial and shake for one minute.

8.4 Allow the extracts to stand for 10 minutes. Transfer the hexane layer (top) to an appropriately labeled 2.0ml screw cap vial.

8.5 Store the extracts in the “extract refrigerator” until they are needed for analysis.

## 9.0 Sulfur Cleaning Procedure (Pesticide and PCB)

9.1 Label the 16ml screw cap vials for each sample and associated QC.

9.2 Add 1ml of TBA-sulfite reagent and 2ml of isopropyl alcohol to each of the vials.

9.3 Using a transfer pipet, transfer approximately 2ml of extract to the vial. Cap the vial and shake for one minute.

9.4 Add 5ml of reagent water to each vial. Cap the vial and shake for one minute.

9.5 Allow the extracts to stand for 10 minutes. Transfer the hexane layer (top) to an appropriately labeled 2.0ml screw cap vial.

9.6 Store the extracts in the “extract refrigerator” until they are needed for analysis.

## 10.0 Quality Assurance and Quality Control

10.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

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10.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

## 11.0 Safety and Waste Disposal

11.1 Safety

11.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

11.1.2 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

11.1.3 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

11.2 Waste Disposal

11.2.1 Waste methylene chloride is placed in the “chlorinated waste” container.

11.2.2 Waste acetone is placed in the “non-chlorinated waste” container.

11.2.3 Extracted water samples are poured through a container of activated charcoal and rinsed down the drain with large amounts of water.

11.2.4 Waste sodium sulfate is placed in a waste container after the solvent has drained or evaporated.

## 12.0 References

12.1 SW-846 Method 3500B, Rev. 2, 12/9

12.2 SW-846 Method 3510C, Rev. 3, 12/96

12.3 SW-846 Method 8081A, Rev. 1, 12/96

12.4 SW-846 Method 8082, Rev. 0, 12/96

12.5 SW-846 Method 3660B, Rev. 2, 12/96

12.6 SW-846 Method 3665A, Rev. 1, 12/96

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF BASE-NEUTRAL AND ACID (BNAs) EXTRACTABLES FROM SOLID SAMPLES

Prepared by: Norm Farmer Date: 12/06/03

Reviewed by: Mark Erstling Date: 12/23/03

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF BASE-NEUTRAL AND ACID (BNAs) EXTRACTABLES FROM SOLID SAMPLES

## 1.0 Summary, Scope and Application

1.1 Summary

Solid samples are serially extracted by pulse sonication, concentrated by Kuderna-Danish apparatus, and stored in glass vials with Teflon lined screw caps.

1.2 Scope and Application

This procedure is applicable to solid samples, including soils and sediments, submitted for BNA analysis by GC/MS method SW-846 8270C.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3550B. The method outlined in this SOP is designed for low concentration samples (concentration of the individual organic components is expected to be less than 20mg/kg).

Although the mass spectrometer identifies compounds by specific ions, it will respond to most organic compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass, stainless steel, wood, or Teflon. Plastic items must be avoided because they can lead to phthalate contamination.

## 3.0 Holding Times

All solid samples must be extracted within 14 days of collection. A sample is considered extracted after it has been sonicated three times and the solvent has been transferred to an Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Anhydrous sodium sulfate – precleaned to remove phthalates

5.4 BNA Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC/MS analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

5.5 BNA Spike Solution – prepared in acetone or methanol at a concentration specified by the GC/MS analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

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## 6.0 Glassware and Apparatus

6.1 400ml thick walled beaker

6.2 Glass funnels (large enough to support the filters)

6.3 500ml Erlenmeyer flask

6.4 Spatula – stainless steel, wood, or Teflon

6.5 0.5ml or 1.0ml syringes

6.6 1.0ml volumetric flask

6.7 500ml Kuderna-Danish (K-D) flask

6.8 10ml graduated concentrator tube

6.9 3-ball macro Snyder column

6.10 Disposable transfer pipettes

6.11 Teflon boiling chips

6.12 glass wool – precleaned

6.13 Fisher P8 filters – or equivalent

6.14 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.15 Water bath – adjustable temperature control

6.16 Nitrogen evaporator

6.17 Ultrasonic disrupter – minimum power of 300 watts with pulse capability

6.18 Disrupter horns – ¾" solid titanium tip

## 7.0 Sonic Disrupter

Follow the manufacturer's instructions for tuning and operating the sonic disrupter. Tuning should be verified at least weekly and should be documented in the "Instrument Repair and Maintenance" logbook. The sonic disrupter should be set in the pulse mode with a 50% duty cycle (energy on 50% of the time and off 50% of the time). Because the Fisher Scientific 550 Sonic Dismembrator has a maximum power output of 475 watts, the power control knob can be set at seven (70% output) instead of 10 (100% output).

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## 8.0 Procedure

8.1 The extraction of all samples must be documented on a "prep sheet". The prep sheet will include such items as: sample ID, bottle number, initial amount, final volume, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC/MS analyst with the extracts.

8.2 Decant any free liquid from the solid sample. Remove any foreign objects such as twigs or rocks. Discard the top layer or soil and thoroughly mix the sample with a wooden spatula. Samples with obvious layers may need to be transferred to a larger container for proper mixing. Refer to SOP QA035 for more information on sample homogenization.

8.3 Transfer 30 grams of each sample to the appropriately labeled beakers. Use a clean spatula for each sample. Record the weight to the nearest 0.1gram on the prep sheet.

8.4 Add approximately 30 grams of sodium sulfate to each sample and mix until each sample has a free flowing sandy texture. Wetter soils will require more sodium sulfate.

8.5 Transfer 30 grams of each of the QC samples to the appropriately labeled beakers. This includes the method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 30 grams of sodium sulfate and/or clean sand for the MB and BS. Use additional 30 gram aliquots of a sample for the MS and MSD. If there is insufficient sample amount, a lesser amount may be used. Record the sample ID, bottle number and weight on the prep sheet.

8.6 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

8.7 Using the dedicated spike syringe add 0.5ml of spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

8.8 Immediately add 100ml of 50:50 methylene chloride and acetone to each of the beakers. This will minimize the loss of the more volatile analytes.

8.9 Assemble and label the K-D flasks and concentrator tubes. Using forceps, place a Teflon boiling chip in each concentrator tube and set each K-D flask in a support stand. Use an Erlenmeyer flask (with cover) for storage, if the extracts will not be concentrated the same day.

8.10 Place a glass filter funnel containing a Fisher P8 filter on the top of each K-D.

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8.11 Place the disrupter horn in the beaker such that the tip of the horn is approximately ½ inch into to solvent but not touching the beaker or the sample.

8.12 Sonicate the sample for 3 minutes.

8.13 Remove the beaker and decant the solvent through the filter funnel into the K-D.

8.14 Repeat steps 8.11 to 8.13 two more times with fresh 100ml solvent aliquots. All three solvent aliquots will be combined in the K-D flask.

8.15 After the final extraction, transfer the entire sample to the funnel, rinse thoroughly, and allow the solvent to drain through the sample.

**NOTE:** It is important to clean the disrupter horn between samples. This is done by rinsing the horn with the extraction solvent and wiping it dry with a Kim-wipe or paper towel.

8.16 Remove the filter funnel and attach a Snyder column to the K-D flask.

8.17 Pre-wet the Snyder column with a few drops of methylene chloride and place the K-D assembly in a hot (75 to 85 $^{o}$C) water bath. **NOTE:** If the bath is too hot, the more volatile compounds may be lost during this step. Concentrate the extract to approximately 5ml.

8.18 Remove the K-D assembly from the bath and allow it to cool. Remove the Snyder columns and rinse them with methylene chloride and then with acetone before placing them back in their storage rack.

8.19 Wipe the water from the joint area between the K-D flask and the concentrator tube. Be sure that the sample ID is still on the concentrator tube. Remove the concentrator tube from the K-D flask, rinse the joint with solvent, and place the concentrator tube in the rack for the nitrogen evaporator.

8.20 Use a steady stream of nitrogen to concentrate the extract to 0.5ml.

8.21 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

8.22 Transfer the extract to a 1.0ml volumetric flask. Rinse the concentrator tube with a few drops of methylene chloride and transfer it to the volumetric flask. Adjust the final volume to 1.0ml. **NOTE:** If the extract will not concentrate to 1.0ml, choose the next appropriate final volume. Be sure to record the final volume on the prep sheet.

8.23 Transfer the extract to an appropriately labeled 2.0ml screw cap vial. Store the extracts in the “extract freezer” until they are needed for analysis.

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## 9.0 Quality Assurance and Quality Control

9.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

9.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

## 10.0 Safety and Waste Disposal

10.1 Safety

10.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

10.1.2 **Hearing protection** must be worn while operating the sonic disrupters. The high frequency could cause permanent hearing loss.

10.1.3 Avoid touching the disrupter horns while they are active. Contact may cause burns or tissue damage.

10.1.4 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

10.1.5 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

10.2 Waste Disposal

10.2.1 Waste methylene chloride is placed in the “chlorinated waste” container.

10.2.2 Waste acetone is placed in the “non-chlorinated waste” container.

10.2.3 Extracted soil samples are placed in a waste container after the solvent has drained or evaporated.

10.2.4 Waste soil from the homogenizing process should be place in the “soil waste” container. **Note:** Waste soil from foreign soils must follow “foreign soil” disposal requirements.

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## 11.0 References

11.1 SW-846 Method 3500B, Rev. 2, 12/96

11.2 SW-846 Method 3550B, Rev. 2, 12/96

11.3 SW-846 Method 8270C, Rev. 3, 12/96

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF BASE-NEUTRAL AND ACID (BNAs) EXTRACTABLES FROM WATER SAMPLES

Prepared by: Norm Farmer Date: 12/06/03

Reviewed by: Mark Erstling Date: 12/23/03

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# STANDARD OPERATING PROCEDURE FOR THE EXTRACTION OF BASE-NEUTRAL AND ACID (BNAs) EXTRACTABLES FROM WATER SAMPLES

## 1.0 Summary, Scope and Application

1.1 Summary

Aqueous samples are serially extracted with methylene chloride, concentrated by Kuderna-Danish apparatus, and stored in glass vials with Teflon lined screw caps.

1.2 Scope and Application

This procedure is applicable to aqueous samples submitted for semivolatile analysis by GC/MS methods, including EPA 625 and SW-846 8270C.

## 2.0 Discussion and Comments

This procedure is adapted from SW-846 methods 3500B and 3510C. The method utilizes “Separatory Funnel Liquid-Liquid Extraction”; it is not applicable to samples requiring “Continuous Liquid-Liquid Extraction”.

Although the mass spectrometer identifies compounds by specific ions, it will respond to most organic compounds. It is important to minimize extraneous contaminants by scrupulously cleaning all glassware and by using only high purity reagents. Additionally, all extraction items that come in contact with the sample must be made from glass or Teflon. Plastic items must be avoided because they can lead to phthalate contamination.

## 3.0 Holding Times

All aqueous samples must be extracted within seven days of collection. A sample is considered extracted after the methylene chloride aliquots have been combined in the Erlenmeyer flask.

## 4.0 Definitions

4.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 12 hours which ever comes first.

4.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document

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laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

4.3 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

4.4 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

4.5 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

4.6 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

4.7 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

4.8 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

4.9 Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior, but which is not normally found in environmental samples. Surrogates are used to measure the extraction efficiency.

## 5.0 Reagents

5.1 Acetone – pesticide grade or equivalent

5.2 Methylene chloride – pesticide grade or equivalent

5.3 Anhydrous sodium sulfate – precleaned to remove phthalates

5.4 Reagent water – distilled or deionized - free of interferences

5.5 10 Normal NaOH

5.6 1:1 $H_2SO_4$

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5.7 BNA Surrogate Solution – prepared in acetone or methanol at a concentration specified by the GC/MS analyst. All surrogate solutions must be logged in the Spike and Surrogate Logbook.

5.8 BNA Spike Solution – prepared in acetone or methanol at a concentration specified by the GC/MS analyst. All spike solutions must be logged in the Spike and Surrogate Logbook.

## 6.0 Glassware and Apparatus

6.1 1000ml graduated cylinder

6.2 2 liter separatory funnel (glass or Teflon)

6.3 250ml separatory funnel

6.4 250ml or 500ml Erlenmeyer flask

6.5 0.5ml or 1.0ml syringes

6.6 1.0ml volumetric flask

6.7 500ml Kuderna-Danish (K-D) flask

6.8 10ml graduated concentrator tube

6.9 3-ball macro Snyder column

6.10 Disposable transfer pipettes

6.11 pH paper

6.12 Teflon boiling chips

6.13 glass wool – precleaned

6.14 Glass filter funnel

6.15 Fisher P8 filters, or equivalent

6.16 2.0ml glass screw cap vials – caps must have Teflon lined septa

6.17 Water bath – adjustable temperature control

6.18 Nitrogen evaporator

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## 7.0 Procedure

7.1 The extraction of all samples must be documented on a "prep sheet". The prep sheet will include such items as: sample ID, bottle number, initial volume, final volume, pHs, solvent lot numbers, spike and surrogate lot numbers, batch numbers, and dates. The extraction technician is responsible for filling out all the required information on the prep sheet. A copy of the prep sheet will be submitted to the GC/MS analyst with the extracts.

7.2 Mark the level of the sample on the bottle. Transfer the entire sample directly into the appropriately labeled separatory funnel. Rinse the sample bottle with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. Fill the bottle to the sample mark with tap water. Transfer the water to a 1000ml graduated cylinder and record the sample volume. Discard the tap water.

**Alternative procedure:** Using a 1000ml graduated cylinder, transfer ~1000ml of sample to the appropriately labeled separatory funnels. The entire contents must be transferred. Record the actual sample volume. Rinse the sample bottle and graduated cylinder with an aliquot of methylene chloride and transfer it to the appropriate separatory funnel. The graduated cylinder must be rinsed with hot tap water, reagent water and methylene chloride between samples in order to prevent cross contamination.

7.3 Transfer 1000ml of each of the QC samples to the appropriately labeled separatory funnels. This includes the method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD). Use 1000ml of reagent water for the MB and BS. Use additional 1000ml aliquots of a sample for the MS and MSD. If there is insufficient sample volume, a lesser volume may be used. Record both the sample ID and volume on the prep sheet.

7.4 Check the pH of each sample by dipping a clean glass-stirring rod into the sample and touching it to the pH paper. Record the pH on the prep sheet.

7.5 Using the dedicated surrogate syringe add 0.5ml of surrogate solution to each of the samples including the QC samples. Record the surrogate lot number on the prep sheet.

7.6 Using the dedicated spike syringe add 0.5ml of spike solution to the BS, MS, and MSD. Record the spike lot number on the prep sheet.

**NOTE: If samples are being analyzed for Base-Neutral extractable compounds only, sections 7.7 to 7.10 may be omitted.**

7.7 Adjust the pH of each sample to <2 by adding 1ml aliquots of 1:1 $H_2SO_4$. Swirl the sample and recheck the pH after each aliquot is added.

7.8 Add 75ml of methylene chloride to each of the separatory funnels. Cap and shake each separatory funnel for two minutes. **CAUTION:** The separatory funnels must be vented frequently to avoid an excessive buildup in pressure.

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7.9 After shaking, allow the layers to separate for at least 10 minutes. Collect the solvent layer (bottom) in a labeled 250ml (if BN and Acids fractions are kept separate) or 500ml (if fractions are to be combined) Erlenmeyer flask.

**NOTE:** Some samples may form emulsions. If emulsions are present, the technician must take steps to breakdown the emulsion. This may include filtering the emulsion through a smaller separatory funnel, centrifuging, or filtering through sodium sulfate.

7.10 Repeat steps 7.8 and 7.9 two additional times using 50 to 60ml of methylene chloride. Combine the extract in the Erlenmeyer flask.

**NOTE: If samples are being analyzed for Acid extractable compounds only, sections 7.11 to 7.14 may be omitted.**

7.11 Adjust the pH of each sample to >11 by adding 2ml aliquots of 10 N NaOH. Swirl the sample and recheck the pH after each aliquot is added.

7.12 Add 75ml of methylene chloride to each of the separatory funnels. Cap and shake each separatory funnel for two minutes. **CAUTION:** The separatory funnels must be vented frequently to avoid an excessive buildup in pressure.

7.13 After shaking, allow the layers to separate for at least 10 minutes. Collect the solvent layer (bottom) in a labeled 250ml (if BN and Acids fractions are kept separate) or 500ml (if fractions are to be combined) Erlenmeyer flask.

**NOTE:** Some samples may form emulsions. If emulsions are present, the technician must take steps to breakdown the emulsion. This may include filtering the emulsion through a smaller separatory funnel, centrifuging, or filtering through sodium sulfate.

7.14 Repeat steps 7.12 and 7.13 two additional times using 50 to 60ml of methylene chloride. Combine the extract in the Erlenmeyer flask.

7.15 Assemble and label the K-D flasks and concentrator tubes. Using forceps, place a Teflon boiling chip in each concentrator tube.

7.16 This step is **mandatory** for this extraction because any acid residue remaining in the extract will cause some of the unstable analytes to decompose. Place a glass filter funnel containing sodium sulfate supported on a Fisher P8 filter on the K-D flask. Pour the extracts through the sodium sulfate into the K-D flasks and rinse with methylene chloride. Remove the funnels and attach the Snyder columns.

7.17 Pre-wet the Snyder column with a few drops of methylene chloride and place the K-D assembly in a hot (65 to 75 $^{o}$C) water bath. **NOTE:** If the bath is too hot, the more volatile compounds may be lost during this step. Concentrate the extract to approximately 5ml.

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7.18 Remove the K-D assembly from the bath and allow it to cool. Remove the Snyder columns and rinse them with methylene chloride and then with acetone before placing them back in their storage rack.

7.19 Wipe the water from the joint area between the K-D flask and the concentrator tube. Transfer the sample ID to the concentrator tube. Remove the concentrator tube from the K-D flask, rinse the joint with solvent, and place the concentrator tube in the rack for the nitrogen evaporator.

7.20 Use a steady stream of nitrogen to concentrate the extract to 0.5ml.

7.21 If the extract is cloudy or contains water droplets, run the extract through a micro column of glass wool and sodium sulfate.

7.22 Transfer the extract to a 1.0ml volumetric flask. Rinse the concentrator tube with a few drops of methylene chloride and transfer it to the volumetric flask. Adjust the final volume to 1.0ml. **NOTE:** If the extract will not concentrate to 1.0ml, choose the next appropriate final volume. Be sure to record the final volume on the prep sheet.

7.23 Transfer the extract to an appropriately labeled 2.0ml screw cap vial. Store the extracts in the "extract freezer" until they are needed for analysis.

## 8.0 Quality Assurance and Quality Control

8.1 An extraction batch is defined as samples of a similar matrix that are prepared for a particular parameter. The batch size is limited to 20 samples. A batch may be held open for up to 12 hours; however, samples should not be added after the QC set has been completed. **NOTE:** Some project plans may require different batch definitions.

8.2 A method blank (MB), blank spike (BS), matrix spike (MS), and matrix spike duplicate (MSD) must be extracted with each new batch of samples.

## 9.0 Safety and Waste Disposal

9.1 Safety

9.1.1 Safety glasses, gloves and lab coats should be worn when handling samples, standards or solvents.

9.1.2 Material Safety Data Sheets (MSDS) are available for all reagents and solvents used in the lab. Technicians should review the MSDS prior to using any new reagents or solvents.

9.1.3 Methylene chloride is an inhalation hazard and a suspected carcinogen. Fume hoods must be used to minimize exposure to vapors.

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9.2 Waste Disposal

9.2.1 Waste methylene chloride is placed in the “chlorinated waste” container.

9.2.2 Waste acetone is placed in the “non-chlorinated waste” container.

9.2.3 Extracted water samples are poured through a container of activated charcoal and rinsed down the drain with large amounts of water.

9.2.4 Waste sodium sulfate is placed in a waste container after the solvent has drained or evaporated.

## 10.0 References

10.1 SW-846 Method 3500B, Rev. 2, 12/96

10.2 SW-846 Method 3510C, Rev. 3, 12/96

10.3 SW-846 Method 8270C, Rev. 3, 12/96

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**TEST NAME: IGNITABILITY**

**REFERENCES: SW846 1010, SW846 Chapter 7**

**DEPARTMENT: GN**

**DETECTION LIMIT: Not Applicable**

Added Document Control pg,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is used to determine the flash point of various solid and liquid samples.

1.2 The sample is loaded in the cup of the tester. While the sample is being stirred and slowly heated at a constant rate, a flame is directed into the cup. The flash point is defined as the lowest temperature at which the vapor, generated by the sample, will ignite.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation: The preservation for this analysis is not specified.

2.2 Holding Time: The holding time for this analysis is not specified.

## 3.0 REPORTING and METHOD DETECTION LIMIT

Not Applicable

## 4.0 INTERFERENCES

Ambient pressure, sample homogeneity, drafts, and operator bias can affect flash point values.

## 5.0 APPARATUS

5.1 Pensky-Martens Closed Flash Tester

5.2 Thermometer, minimum range of 60 to 212°F.

## 6.0 REAGENTS

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6.1 p-Xylene reference solution.

## 7.0 PROCEDURE

7.1 Thoroughly clean and dry all parts of the cup and its accessories before starting the test.

7.2 Fill the cup with the sample to be tested to the level indicated by the fill mark.

7.3 Place the lid on the cup and set the latter in the stove. Be sure to properly engage the locking device.

7.4 Insert the thermometer.

7.5 Light the test flame and adjust it to a diameter of 4 mm. Most samples should be heated at a rate of approximately 9 to 11°F per minute.

7.6 For liquid samples, turn on the stirrer. The stirrer should turn at approximately 90–120 rpm for most liquid samples. For more viscous samples, a higher stirrer speed may be required.

7.7 Apply the test flame and test for ignitability as described below.

**NOTE: All samples that show a flash point under 212°F must have the results verified by a second analyst. Both the original analyst and the verifying analyst must sign the data. Both results must be recorded on the data sheet.**

7.7.1 Apply the test flame at each temperature that is a multiple of 2°F up to a temperature of 212°F.

7.7.2 Apply the test flame by operating the mechanism on the cover which controls the shutter and test flame burner so that the flame is lowered into the vapor space of the cup in 0.5 sec, left in its lowered position for 1 sec., and quickly raised to its high position.

**NOTE: Do not stir the sample while applying the test flame.**

7.8 Record the starting temperature for each sample.

7.9 Record as the flash point, the temperature at the time the test flame application causes a distinct flash in the interior of the cup. If the flash point is greater than 212°F, then record the results as greater than the final temperature tested (212°F).

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**NOTE: Do not confuse the true flash point with the bluish halo that sometimes surrounds the test flame. The actual flash will have occurred when a large flame propagates itself over the surface of the sample.**

## 8.0 CALCULATIONS

8.1 Record the temperature read in degrees Fahrenheit in the ignitability logbook. The calculation of degrees C to degrees F is as follows:

9/5 (C) + 32 = F

8.2 Correct for barometric pressure using the following equation:

Corrected Results = F + (0.06*(760-(P*760mmHg/1013mbarHg)))

Where: F = observed temperature
P = barometric pressure in mb Hg

8.3 When pressure is in mmHg, the equation simplifies to:

Corrected Results = F + (0.06*(760-P))

## 9.0 QC REQUIREMENTS

9.1 Thermometer calibration. The thermometers used for this test must be calibrated against an NBS certified thermometer in the temperature range of use at least once per year. The calibration must be documented and any correction factor applied when used. If a correction factor is used, the raw data must show the uncorrected and the corrected temperatures, the correction factor, and the date the thermometer was calibrated.

9.2 p-xylene check standard. An aliquot of p-xylene must be analyzed daily or with each batch of samples. The flash point of p-xylene is 77 ± 4.3°F

9.3 Duplicate. A duplicate must be analyzed for every batch of 10 samples, or on each analysis day, whichever is more frequent. The results obtained must be within 5 percent of the original result.

9.4 All samples with an ignitability of less than or equal to 212°F must have results verified by a second analyst. Both the original and the verification result must be recorded and both analysts should sign the worksheet. In addition, a blank must be analyzed between the original result and the second result to confirm that there was no carryover from an earlier sample or check.

## 10.0 SAFETY

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The analyst should follow normal safety procedures as outlined in the Laboratory Safety Manual. All work should be done in a hood and the analyst should wear a lab coat and safety glasses for all analytical work. Gloves should be worn when handling samples.

## 11.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

11.0 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in Section 11.2.

11.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

## 12.0 DEFINITIONS

12.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

12.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

12.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

12.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

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12.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

12.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

12.7 Continuing Calibration Verification 2 (CCV2): A check standard used to verify instrument calibration. CCV2 is analyzed at the time of instrument calibration and is usually the same concentration as the lowest standard or the reporting limit.

12.8 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

12.9 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

12.10 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

12.11 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

12.12 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

Table 1 QC Criteria

| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration:<br>$r^2$ = coefficient of determination, or:<br>r = coefficient of correlation | $\geq$0.990<br>$\geq$0.995 | Rerun calibration standards, and/or prepare new calibration standards and recalibrate the instrument, or document why the data are acceptable. |

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| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration Verification standard (ICV) | ± 10% of the standard's true value | Rerun standard, and/or prepare new standard, and/or recalibrate instrument, or document why the data are acceptable. |
| Continuing Calibration Verification standard (CCV), and Low-Level Standard (where applicable) | ± 10% of the standard's true value<br>± 10% of the standard's true value | Rerun standard, and/or recalibrate instrument and reanalyze all samples run since the last acceptable CCV, or document why the data are acceptable. |
| Method blank (MB) | < 1/2RL | Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable. |
| Blank Spike (BS or LSC) | ± 10 to 20%, or as per method | Determine and correct the problem, reanalyze samples, if necessary, or document why data are acceptable. |
| MS/MSD | ± 15 to 25%, or as per method. | Determine and correct the problem, reanalyze samples and MS/MSD, or document why data are acceptable |
| Sample Duplicate | ± 15 to 20%, or as per method. | Determine and correct cause of the poor reproducibility |

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# CORROSIVITY (SOIL pH BY ELECTRODE)

Prepared by: _____Ellen Pampel_____ Date: _03/05/04_

Reviewed by: _____Steve Lee_____ Date: _07/25/04_

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

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Issued to: _____QA Department_____ Date: _07/25/04_

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Effective 7 days after "*" date

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**TEST NAME: CORROSIVITY (SOIL pH BY ELECTRODE)**

**METHOD REFERENCE: SW846 9045C, Chap 7.2.1 M**

**DEPARTMENT: GN**

**DETECTION LIMIT: NOT APPLICABLE**

Added Doc Control page, MDL sec, Definitions, revised sec 1, 6, 7,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 Per SW846, corrosivity has two properties; pH and corrosivity toward steel.

1.2 This method measures the pH of soil by mixing equal amounts of the soil and DI water and then measuring the pH while the sample is being continuously stirred. This method is based on a modification of SW846 method 9045C.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

The sample containers should be filled completely and sealed tightly and stored at 4°C.

2.2 Holding Time

Samples should be analyzed as soon as possible, preferably in the field or as soon as they are received by the laboratory.

## 3.0 REPORTING and METHOD DETECTION LIMITS

Not applicable

## 4.0 INTERFERENCES

4.1 Samples with very low or very high pH may give incorrect readings on the meter. For samples with a true pH of greater than 10, the measured pH may be incorrectly low. For samples with a true pH of less than 1, the measured pH may be incorrectly high.

4.2 In addition, temperature fluctuations and dirty electrodes can cause measurement errors. (See electrode-cleaning procedure below.)

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## 5.0 APPARATUS

The following items are needed for the analysis of pH:

5.1 pH meter with means for temperature compensation

5.2 pH electrode

5.3 Graduated plastic beakers

5.4 Stir plate

5.5 Magnetic stir bars

5.6 Thermometer or temperature sensor for automatic compensation.

## 6.0 REAGENTS

All reagents listed below must be made from reagent grade chemicals.

6.1 De-ionized water. This water must be monitored daily before use.

6.2 Buffer solution at pH 4, pH 7 and pH 10. Commercially available solutions that have been validated by comparison to NIST standards are recommended for routine use. All buffers must be labeled on receipt and after opening. Fresh buffer must be poured each time a new analysis is started.

6.3 Buffers with pH < 4 and > 10 may be used, to insure accuracy at very low or very high pH's.

## 7.0 PROCEDURE

Below is detailed description of the procedure that must be followed for the determination of pH. Make sure to properly document each step of the analysis.

7.1 Make sure that the pH electrode is clean. If the electrode is coated with oil or grease, then it must be washed with detergent and then rinse it well with DI water. Place the electrode in a beaker containing 1:10 HCL so that the lower third of the electrode is submerged and let the electrode soak for approximately 10 to 30 minutes. Then thoroughly rinse the electrode with DI water and place in a pH 7 buffer to store.

7.2 Weigh out approximately 20 g or each sample to be analyzed into a clearly labeled graduated plastic beaker. Add 20 ml of DI water to each sample.

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Record the weights and the volumes used in the pH logbook. Stir the suspension for 15 minutes.

Note: If the waste is hygroscopic and absorbs all the reagent water, begin the experiment again using 20 g of waste and 40 ml of reagent water

Note: If the supernatant is multiphase, decant the oily phase and measure the pH of the aqueous phase. The electrode may need to be cleaned if it becomes coated with oily material.

7.3 Connect the pH electrode to the pH meter. Enter the proper temperature and then calibrate the meter using two points, either pH 4 and pH 7 or pH 7 and pH 10 depending on where the pH of the samples are expected to be.

Note: For specific calibration procedure, see the instruction manual for the meter being used.

7.4 After the calibration is complete, analyze the 3 buffer solutions to ensure that an accurate calibration was obtained. Record the results on the pH worksheet. Record the temperature of the sample.

7.5 Place the sample in a clean glass beaker using sufficient volume to cover the sensing elements of the electrodes and to give adequate clearance for the magnetic stirring bar.

7.6 Place the sample on the stir plate and stir. Lower the pH electrode into the solution and record the pH.

7.7 After every 10 samples have been analyzed, reanalyze the buffer solutions and record the results on the pH worksheet.

## 8.0 QUALITY CONTROL

Below is the quality control requirement that should be followed for pH analyses on soil samples. Refer to the Accutest quality control manual for additional information on quality control calculations and requirements.

8.1 A new calibration must be performed and documented each day that analysis are done. A pH 4, pH 7 and pH 10 solution should be analyzed immediately after the calibration is completed. The buffer checks must be within 0.05 pH units of the true values.

8.2 A calibration check standard should be analyzed after every 10 samples and after the last sample analyzed in the batch. The check standard should be within 0.05 pH units of the true value of the check standard solution.

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8.3 A duplicate analytical sample should be analyzed for every 20 samples. The RPD for the sample and the duplicate should not exceed 10 percent.

## 9.0 DOCUMENTATION REQUIREMENTS

All data must be recorded in the appropriate logbooks, which show the results for all quality control and samples. In addition, the pH meter that was used and the buffer solutions used should be documented. All work must be dated and signed by the analyst. Any changes should be crossed out with a single line and should be initialed and dated.

## 10.0 SAFETY

The analyst should follow normal safety procedures as outlined in the Laboratory Safety Manual. A lab coat and safety glasses should be worn for all lab work.

## 11.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

11.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in Section 11.2.

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the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

12.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

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12.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

12.7 Continuing Calibration Verification 2 (CCV2): A check standard used to verify instrument calibration. CCV2 is analyzed at the time of instrument calibration and is usually the same concentration as the lowest standard or the reporting limit.

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12.12 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

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Table 1 QC Criteria

| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration:<br>$r^2$ = coefficient of determination, or:<br>r = coefficient of correlation | ≥0.990<br>≥0.995 | Rerun calibration standards, and/or prepare new calibration standards and recalibrate the instrument, or document why the data are acceptable. |
| Initial Calibration Verification standard (ICV) | ± 10% of the standard's true value | Rerun standard, and/or prepare new standard, and/or recalibrate instrument, or document why the data are acceptable. |
| Continuing Calibration Verification standard (CCV), and Low-Level Standard (where applicable) | ± 10% of the standard's true value<br>± 10% of the standard's true value | Rerun standard, and/or recalibrate instrument and reanalyze all samples run since the last acceptable CCV, or document why the data are acceptable. |
| Method blank (MB) | < 1/2RL | Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable. |
| Blank Spike (BS or LSC) | ± 10 to 20%, or as per method | Determine and correct the problem, reanalyze samples, if necessary, or document why data are acceptable. |
| MS/MSD | ± 15 to 25%, or as per method. | Determine and correct the problem, reanalyze samples and MS/MSD, or document why data are acceptable |
| Sample Duplicate | ± 15 to 20%, or as per method. | Determine and correct cause of the poor reproducibility |

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# CYANIDE DISTILLATION of AQUEOUS AND SOLID SAMPLES

Prepared by: _____Ellen Pampel_____ Date: __03/03/04_

Reviewed by: _____Steve Lee_____ Date: _04/15/04_

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

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Effective 7 days after "*" date

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**TEST NAME: CYANIDE DISTILLATION of AQUEOUS AND SOLID SAMPLES**

**REFERENCE: EPA 335.2 / SW846 9010 M**

**DEPARTMENT: GN**

**DETECTION LIMIT: 0.010 mg/l waters, 2.0 mg/Kg soils**

Added Doc Control page, MDL sec, Definitions, edited sec 1, 5, 6, 7, 12, 13,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This distillation procedure is used in the determination of cyanide in water and soil matrices. It is used as a preparatory procedure for the analysis by the manual method.

1.2 The cyanide is released from the sample by a reflux-distillation under acidic conditions and is absorbed in a NaOH solution in a scrubber.

## 2.0 PRESERVATIVE AND HOLDING TIME

2.1 Preservative

Samples should be preserved with 10N NaOH to pH ≥ 12 and cooled to 4ºC. Test a portion of the sample with pH paper and make note of pH on spreadsheet. If pH is under 12 bring pH of remaining sample to ≥ 12 using 10N NaOH. See laboratory supervisor and project manager.

2.2 Holding Time

The sample should be distilled and analyzed within 14 days from the time of sampling.

## 3.0 REPORTING and METHOD DETECTION LIMITS

3.1 Reporting Limit. The reporting limit for this method has been established at 0.010mg/l for waters and 2.0 mg/kg for solids

3.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria. Experimental MDLs must be determined annually for this method.

3.3 MDLs should be established for all appropriate methods, using a solution spiked at approximately 3 times the estimated detection limit. To determine

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the MDL values, take seven replicate aliquots of the spiked sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level.

## 4.0 INTERFERENCES

Most interferences are eliminated by the distillation procedure. Sulfides interfere because they will distill over. Oxidizing agents such as chlorine decompose most of the cyanides. Test for sulfide and chlorine with the following procedure on every sample.

## 5.0 TEST FOR SULFIDES

5.1 Put a drop of sample on a piece of Lead Acetate paper. For soils, slurry approximately 5 grams of sample in 25 ml of DI water and place a drop of the slurry on a piece of Lead Acetate paper.

5.2 Check to see if there is darkening of the paper. The darkening indicates that sulfide is present.

5.3 If sulfide is present add 5 mg of Lead Carbonate powder to the absorber solution used during the distillation. This will precipitate sulfide.

5.4 Filter the absorber solution before proceeding to the colorimetric method.

5.5 Document Sulfide results, positive or negative on the spreadsheet.

## 6.0 TEST FOR CHLORINE

6.1 Put a drop of sample on potassium iodide-starch test paper. For soils: slurry approximately 5 grams of sample in 25 ml of DI water and place a drop of the slurry on a piece of potassium iodide-starch paper.

6.2 If the paper turns blue, then treat the sample with ascorbic acid. Add a few crystals of ascorbic acid at a time until a drop of sample produces no color on the indicator paper. Then add an additional 0.06g of ascorbic acid for each liter of the sample volume.

## 7.0 REAGENTS

As in all preparation of reagents, record the amounts used, the lot numbers of the reagents, the date made, the expiration date, etc. in the reagent log book. Reagents are ACS grade or better.

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7.1 NaOH, 0.5 N: Dissolve 20 g of NaOH in 1 liter of DI water.

7.2 NaOH, 10 N: Dissolve 400 g of NaOH in 1 liter of DI water. This solution is to be used by Shipping and Receiving personnel for sampling container preservation.

7.3 Magnesium Chloride: Dissolve 510 g of $MgCl_2 \bullet 6H_20$ in DI water and dilute to 1 liter.
Or
Use 119 g of $MgCl_2$ (anhydrous) to 500 ml of DI $H_2O$

**CAUTION!!!** $MgCl_2$ reacts violently with water and produces a great amount of heat. Add $MgCl_2$ slowly under a hood!

7.4 Sulfamic acid.

7.5 Sulfuric acid, conc.

7.6 1000 ppm CN stock: Dissolve 2.51 g of KCN and 2 g of KOH in 900 ml if DI water. Standardize with 0.0192 N $AgNO_3$. Dilute to the appropriate final volume so that 1 ml = 1 mg CN (1000 ppm). This standard is available commercially.

7.7 10 ppm CN spiking solution. Add 1 ml of 1000 ppm stock solution to a 100 ml volumetric flask. Dilute to volume with DI water.

7.8 Lead Carbonate powder

7.9 Ascorbic acid

## 8.0 APPARATUS

8.1 Midi Vap 2000 distillation apparatus, complete

8.2 Volumetric Pipets.

8.3 Volumetric flasks.

8.4 100 ml graduated cylinder.

8.5 Lead Acetate paper.

8.6 Potassium-iodide starch test paper.

8.7 Graduated plastic cups with lids

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## 9.0 CYANIDE DISTILLATION PROCEDURE

9.1 For Water Samples: Add 50 ml of sample to a digestion tube.

For Soil Samples: Weigh 0.5 grams of sample and place in a digestion tube.

Spike the matrix spikes and the spike blank with the levels shown for both water and soil samples below.

| Spike concentration | Amount of 10 ppm Added to flask | Total vol. |
|---|---|---|
| Blank spike 0.10 mg/l | 0.5 ml | 50 ml DI |
| Matrix spike 0.10 mg/l | 0.5 ml | 50 ml sample |

Document sample number and initial volume on the digestion log. Add 0.2 g of sulfamic acid to each digestion tube

9.2 Add 50 ml of 0.50 N NaOH to the collection tube. If the sample contains sulfides (see Section 5.0) add 5 mg of Lead Carbonate powder. If the sample contains chlorine, it should be treated with ascorbic acid as outlined in Section 6.

9.3 Turn on vacuum pump and slowly start air bubbling through the boiling flask. Adjust the vacuum so that approximately 2 bubbles of air per second enters the boiling flask.

**CAUTION!!!** It will be necessary to readjust the pump once the sample is boiling and reagents are added. Watch that sample doesn't back up out of the air tube.

9.4 Slowly add 2.5 ml of concentrated sulfuric acid through the air tube. Rinse the tube with DI water. Allow the airflow to mix the flask contents for 3 minutes.

9.5 Slowly add 2.0 ml of magnesium chloride in through the air inlet tube and then rinse the tube with DI water.

9.6 After the sample starts to boil, reflux for 60 minutes. Make sure the contents do not back up into the air inlet tube.

9.7 Turn off the heat and continue to keep the air bubbling through the solution for at least 15 min.

9.8 When the vessel is cool, disconnect the collection tube and turn off the vacuum pump.

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9.9 Drain the collection tube into a 100-ml volumetric flask and wash collection tube with DI water.

9.10 Bring flask up to volume with DI water and mix by inverting flask 10 times.

9.11 Document in the distillation log. Initial and date each sample.

9.12 Transfer the sample distillate into a sample cup and tightly cap. Label cup with sample #, date, matrix, and analyte. If the samples can not be analyzed immediately, place distillates in the refrigerator.

## 10.0 QC REQUIREMENTS

Prepare a method blank, a blank spike, a sample duplicate, a matrix spike and a matrix spike duplicate each day that the CN distillations are done or for every 20 samples. See Table 1

## 11.0 GLASSWARE CLEANING

Wash distillation glassware with hot soapy water. Rinse well with tap water and then rinse well with DI water.

## 12.0 DOCUMENTATION REQUIREMENTS

All sample information should be recorded in distillation logsheets for the Cyanide soil and water samples. Any unusual characteristics of the samples should be noted in the comments section. In addition, all reagent information such as lot numbers, etc should also be recorded in the reagent logbook.

## 13.0 SAFETY

The analyst should follow normal safety procedures as outlined in the Accutest Laboratory Manual. HCN is very toxic, and the analyst should make sure that the distillation flask is properly assembled and the absorber solution is filled with NaOH solution before starting the distillation. Lab coats and safety glasses should be worn at all times. Gloves should be worn when handling samples or strong chemicals.

## 14.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

14.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the

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environment. The amounts of standards reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in Section 14.2.

14.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

## 15.0 DEFINITIONS

15.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

15.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

15.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

15.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

15.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

15.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

15.7 Continuing Calibration Verification 2 (CCV2): A check standard used to verify instrument calibration. CCV2 is analyzed at the time of instrument calibration

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and is usually the same concentration as the lowest standard or the reporting limit.

15.8 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

15.9 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

15.10 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

15.11 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

15.12 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

Table 1 QC Criteria

| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration:<br>$r^2$ = coefficient of determination, or:<br>r = coefficient of correlation | ≥0.990<br>≥0.995 | Rerun calibration standards, and/or prepare new calibration standards and recalibrate the instrument, or document why the data are acceptable. |
| Initial Calibration Verification standard (ICV) | ± 10% of the standard's true value | Rerun standard, and/or prepare new standard, and/or recalibrate instrument, or document why the data are acceptable. |
| Continuing Calibration Verification standard (CCV), and Low-Level Standard (where applicable) | ± 10% of the standard's true value<br>± 10% of the standard's true value | Rerun standard, and/or recalibrate instrument and reanalyze all samples run since the last acceptable CCV, or document why the data are acceptable. |

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| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Method blank (MB) | < 1/2RL | Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable. |
| Blank Spike (BS or LSC) | ± 10 to 20%, or as per method | Determine and correct the problem, reanalyze samples, if necessary, or document why data are acceptable. |
| MS/MSD | ± 15 to 25%, or as per method. | Determine and correct the problem, reanalyze samples and MS/MSD, or document why data are acceptable |
| Sample Duplicate | ± 15 to 20%, or as per method. | Determine and correct cause of the poor reproducibility |

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**CYANIDE, TOTAL (MANUAL ANALYSIS)**
**Effective at the date of last signature**

Prepared by: _____Ellen Pampel_____ Date: _09/10/03__

Reviewed by: _____Steve Lee_____ Date: _02/29/04__

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Document Control

Issued to: _____QA Department_____ Date: _03/01/04_

Issued to: _____Inorganics Department_____ Date: _03/01/04_*

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Effective 7 days after "*" date

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**TEST NAME: CYANIDE, TOTAL (MANUAL ANALYSIS)**

**METHOD REFERENCE: EPA 335.2 for waters, SW846 9014 for soils**

**DEPARTMENT: GN**

**DETECTION LIMIT: 0.010 mg/l for waters, and 0.50 mg/kg for soils**

Added sec 3-MDL, Definitions, expanded sec 1, 2, 4, 6, 7,

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is used as a measure of cyanide in waters, wastewaters, soils, and sludges. It should be used on samples that have been distilled following the method outlined in the CN distillation SOP. The method is based on EPA method 335.2 and SW846 9014 and is applicable to all waters, wastewaters, soils, and sludges.

1.2 The cyanide in the distillate is converted to CNCl, by the chloramine-T at a pH < 8. Color is formed on the addition of pyridine-barbituric acid reagent and the absorbance is read at 578nm. It is essential that the samples and the standards have the same salt content.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation. Refer to the CN distillation SOP for information on sample collection and preservation. All samples should be stored under refrigeration at 4°C after distillation and before analysis.

2.2 Holding Time. All samples should be analyzed within 14 days of the date of collection.

## 3.0 REPORTING and METHOD DETECTION LIMIT

3.1 Reporting Limit. The reporting limit for this method is established at the lowest concentration standard in the calibration curve. Detected concentrations below this concentration cannot be reported without qualification. RL is established at 0.01mg/l for waters and 0.5mg/kg for soils.

3.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria. Experimental MDLs must be determined annually for this method.

3.3 MDLs should be established for all appropriate methods, using a solution spiked at approximately 3 times the estimated detection limit. To determine

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the MDL values, take seven replicate aliquots of the spiked sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level. MDLs should be determined approximately once per year for frequently analyzed parameters.

## 4.0 INTERFERENCES

4.1 Interference can be reduced or eliminated using the distillation procedure described in the CN distillation SOP. Sulfides adversely affect the colorimetric procedures. If a drop of distillate on lead acetate test paper indicates the presence of sulfides, treat the sample with powered lead carbonate. Yellow lead sulfide precipitates if the sample contains sulfide. Repeat this operation until a drop of the treated sample solution does not darken the lead acetate test paper. Filter the solution through a dry filter paper into a beaker, and from the filtrate, measure the amount of sample to be used for analysis.

4.2 Other possible interference includes substances that might contribute color or turbidity. In most cases, distillation will remove these.

## 5.0 APPARATUS

The following items are needed for the colorimetric analysis of samples for cyanide following the method outlined below. All volumetric glassware should be class A.

5.1 Spectrophotometer for use at 578 nm.

5.2 Graduated polyethylene beakers (Sludge cups).

5.3 Volumetric pipettes and pipette bulbs appropriate for making standards

5.4 Volumetric flasks for preparing standards.

5.5 Microburet, 5 or 10 ml.

## 6.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. De-ionized water should be used whenever water is required.

6.1 Chloramine T solution. Dissolve 1.0 g of the white, water-soluble Chloramine T in 100 ml of water. Prepare daily.

6.2 Stock cyanide solution (1000 ppm): Dissolve approximately 2.0 g of KOH and exactly 2.51 g of KCN in 1 liter of water. Store in the refrigerator.

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**NOTE: This solution should be standardized weekly. See procedure for this standardization under section 7.1**

**CAUTION: KCN is highly toxic. Avoid contact or inhalation.**

6.3 Pyridine-barbituric acid solution. Place 15 g of barbituric acid in a 250 ml volumetric flask and add just enough DI water to wash the sides of the flask and wet the barbituric acid. Add 75 ml of pyridine and mix. Add 15 ml of concentrated HCL and mix and cool to room temperature. Dilute to the mark with water and mix. This reagent is stable for up to 6 months if stored in a cool dark place.

6.4 Sodium dihydrogen phosphate buffer, (Sodium Phosphate, monobasic) 3 N: Dissolve 138 g of $NaH_2PO_4*H_2O$ in 1 liter of distilled water. Refrigerate. The pH of this buffer should be approximately 4.0. **NOTE: If $NaH_2PO_4*2H_2O$ is being used, use 156 g of this chemical in 1 liter of DI water.**

6.5 Standard silver nitrate solution, 0.0192 N: Crush approximately 5 g of silver nitrate crystals and dry to a constant weight at 40$^o$ C. Store in a desiccator. Weigh out 3.2647 g of dried silver nitrate into a 1 liter volumetric flask. Dissolve the silver nitrate in DI water and dilute to a final volume of 1000 ml. One ml of this solution will titrate 1 mg of CN.

6.6 Rhodanine indicator: Dissolve 20 mg of p-dimethyl-amino-benzalrhodanine in 100 ml of acetone.

6.7 0.25 N Sodium Hydroxide solution: Dissolve 5.0 g of sodium hydroxide in approximately 400 ml of DI water. Mix well. Dilute to a final volume of 500 ml with DI water.

## 7.0 ANALYSIS PROCEDURE

Below is a step-by-step procedure for the analysis of samples for the determination of CN.

7.1 If the cyanide stock solution has not been standardized within a week, then the stock must be standardized before proceeding further with the analysis. The standardization can be done following the procedure outline below.

7.1.1 Volumetrically measure out 5.0 ml of the 1000 mg/l cyanide stock solution into a graduated plastic beaker and dilute to 25 ml. Other volumes of stock may be used, depending on preference and experience of the analyst. Add 10 to 12 drops of benzalrhodanine indicator to the solution. Place a stir bar in the beaker.

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7.1.2 Fill a microburet with 0.0192 n silver nitrate solution. Titrate the sample with continuous stirring until the color changes from yellow to a brownish-pink. Approximately 5 ml of silver nitrate solution should be needed to reach this endpoint. Also analyze a method blank following this procedure.

7.1.3 Calculate the concentration of the stock cyanide solution using the equation shown below:

$$CN, mg/l = \frac{(A - B) * 1000}{25 \text{ ml}}$$

Where A = the volume of $AgNO_3$ used to titrate the sample.
B = the volume of $AgNO_3$ used to titrate the blank.

Adjust the amount of stock solution used to prepared the standards below based on the true concentration of the stock.

7.2 Prepare standards as shown below. A blank of 0.25 N sodium hydroxide should also be prepared.

7.2.1 10 ppm Intermediate standard. Dilute 1 ml of 1000 ppm stock to 100 ml with 0.25 N sodium hydroxide.

7.2.2 1 ppm Intermediate standard. Dilute 10 ml of the 10 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.3 0.50 ppm standard. Dilute 5 ml of the 10 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.4 0.30 ppm standard. Dilute 3 ml of the 10 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.5 0.20 ppm standard. Dilute 2 ml of the 10 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.6 0.10 ppm standard. Dilute 10 ml of the 1.0 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.7 0.050 ppm standard. Dilute 5.0 ml of the 1.0 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.8 0.010 ppm standard. Dilute 1.0 ml of 1.0 ppm standard to 100 ml with 0.25 N sodium hydroxide.

7.2.9 Calibration Check Standard, 0.25 ppm. Dilute 2.5 ml if 10 ppm standard to 100 ml with 0.25 N sodium hydroxide. Once per month,

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run CCVs with concentrations from the low end of the curve and from the high end.

7.3 Measure out 50 ml of each distilled sample into a plastic graduated beaker. Also measure out 50 ml of each standard, and 50 ml of 0.25 N sodium hydroxide for the calibration blank. Additional QC (duplicates, matrix spikes, blank spikes, and method blanks) are prepared at the distillation step and should be analyzed with each batch as appropriate. A method blank and blank spike must be analyzed for each sample distillation date being analyzed.

7.4 Temperature of reagents and spiking solutions can affect the response of the colorimetric method. Refrigerated reagents should be warmed to ambient temperature before use. Samples should not be put into a warm instrument to develop color, but poured into the cuvette just prior to reading the absorbance.

7.5 To each standard, add 15 ml of the phosphate buffer and mix well. Then add 2 ml of Chloramine T and mix. Some distillates may contain compounds that have a chlorine demand. Test for excess chlorine using KI-starch paper, about 1 minute after Chloramine T addition. If the result is negative, add 0.5 ml of Chloramine T and re-test after 1 minute. Continue adding Chloramine T and re-checking until an excess of chlorine is maintained. After 1 to 2 minutes, add 5 ml of pyridine-barbituric acid to each sample and mix again. Dilute to 100 ml with DI water, mix and allow the color to develop for 8 minutes.

7.6 Read the absorbance at 578 nm in the spectrophotometer **within 15 minutes** from the time the pyridine-barbituric acid is added. **There are only 7 minutes from full color development in which to take the readings.** The spectrophotometer must be properly zeroed before starting to take readings and the cuvette must be clean.

7.7 Record all standard absorbances in the CN absorbance sheet. Any samples that are higher than the highest point on the curve should be diluted and reanalyzed. Dilutions should be made to bring the sample into the mid-range of the curve.

7.8 Calculate the curve using linear regression and make sure that the proper QC criteria are met. That is, the correlation coefficient must be greater than 0.995.

7.9 Repeat steps 7.4 and 7.5 for all of the distilled samples and the distilled QC. Since the timing of this reaction is critical, it is important not to prepare more samples than can be analyzed in the 7 minute time window allowed. Normally, a skilled analyst can analyze only 5 to 8 samples plus QC within the time window. Do not analyze more than 10 samples plus a mid-level check standard at a time. Run a QC check standard every 10 samples.

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7.10 Record all absorbances and sample information in a CN absorbance sheet. Note any problems with the samples in the comment section. Calculate sample values using linear regression from the standard curve. Calculate QC recoveries as outlined in the Accutest QC manual.

## 8.0 CALCULATIONS:

8.1 For water samples, the following calculations should be used.

Original sample conc. of CN as mg CN/liter =

$$\frac{\text{(Sample conc. from curve in mg/l)} * \text{(final vol. in ml)}}{\text{(initial sample volume distilled in ml)}}$$

The initial and final sample volumes can be obtained from the cyanide distillation log. Spike amounts are also recorded in the distillation log.

8.2 For soil samples, the following calculations should be used.

Original sample conc. of CN as mg CN/kg =

$$\frac{\text{(sample conc. from curve in mg/l)} * \text{(final vol. in l)}}{\text{(initial sample weight distilled in kg)} * \text{(\%solids/100)}}$$

The initial weights and the final volumes can be obtained from the cyanide distillation log. Spike amounts are also recorded in the distillation log.

## 9.0 QUALITY CONTROL

9.1 A method blank, blank spike, sample duplicate, matrix spike and matrix spike duplicate should be prepared for each 20 samples or each day, during the distillation step. Additional QC such as a mid-level calibration check standard should be analyzed with each run.

9.2 Calibration check samples should be at the mid-point of the curve and should be analyzed at a frequency of 10%. All QC calculations should be done as outlined in the Accutest QC manual. See Table 1 for additional QC criteria.

## 10.0 GLASSWARE CLEANING

All glassware should be washed with soap and tap water and then rinse well with de-ionized water.

## 11.0 DOCUMENTATION REQUIREMENTS

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All sample information is in recorded in the CN spreadsheets. In addition, all reagent information such as lot numbers should also be recorded in the reagent logbook. Any unusual characteristics of the samples should be noted in the comment section. All sample ID's and dilutions should be clearly labeled on the data. If both soil and water samples were analyzed, the data for these separate matrices should be recorded on separate sheets with the appropriate matrix and detection limit indicated at the top of the sheet.

## 12.0 SAFETY

12.1 The analyst should follow normal safety procedures as outlined in the Accutest Laboratory Safety Manual. Safety glasses and lab coats should be worn at all times in the lab. Gloves should be worn when handling samples.

12.2 As noted above, KCN is highly toxic and contact and inhalation should be avoided.

12.3 Pyridine has a strong odor, which can be offensive in the lab. All samples should be capped when working outside of a hood after the pyridine is added.

## 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

13.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in Section 13.2.

13.2 Waste Management

Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

## 14.0 DEFINITIONS

14.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A

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sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

14.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

14.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

14.4 Holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

14.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

14.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

14.7 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

14.8 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

14.9 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

14.10 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

14.11 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

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Table 1 QC Criteria

| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration:<br>$r^2$ = coefficient of determination<br>or:<br>r = coefficient of correlation | ≥0.990<br>≥0.995 | Rerun calibration standards, and/or prepare new calibration standards and recalibrate the instrument, or document why the data are acceptable. |
| Initial Calibration Verification standard (ICV) | ± 10% of the standard's true value | Rerun standard, and/or prepare new standard, and/or recalibrate instrument, or document why the data are acceptable. |
| Continuing Calibration Verification standard (CCV), and Low-Level Standard (where applicable) | ± 10% of the standard's true value<br>± 10% of the standard's true value | Rerun standard, and/or recalibrate instrument and reanalyze all samples run since the last acceptable CCV, or document why the data are acceptable. |
| Method blank (MB) | < 1/2RL | Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable. |
| Blank Spike<br>(BS or LSC) | As per method | Determine and correct the problem, reanalyze samples, if necessary, or document why data are acceptable. |
| MS/MSD | ±15 to 20%, or as per method. | Determine and correct the problem, reanalyze samples and MS/MSD, or document why data are acceptable |
| Sample Duplicate | ±15 to 20%, or as per method. | Determine and correct cause of the poor reproducibility |

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# SULFIDE

Prepared by: _____Ellen Pampel_____ Date: _03/16/04_

Reviewed by: _____Svetlana Izosimova_____ Date: _04/05/04_

Annual Review

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

Reviewed by: _____ Date: _____

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Issued to: _____Inorganics Department_____ Date: _04/05/04_*

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Issued to: _____ Date: _____

**Effective 7 days after "*" date**

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**TEST NAME: SULFIDE**

**METHOD REFERENCE: EPA 376.1/ SW846 9030**

**DEPARTMENT: GN**

**DETECTION LIMIT: 1.0 mg/l for waters and 20 mg/kg for soils.**

Added Doc Control page, revised sec 2, 3, 12, 14

## 1.0 SCOPE AND APPLICATION, SUMMARY

1.1 This method is used as a measure of sulfides and is applicable to all water and wastewater. A modification of this method is used to determine water-soluble sulfides in soil samples. The iodometric titration is based on EPA Method 376.1.

1.2 Excess iodine is added to the sample, which may have been preserved with zinc acetate and sodium hydroxide to produce zinc sulfide. The iodine oxidizes the sulfide to sulfur when the sample is acidified with HCl. The excess iodine is back titrated with sodium thiosulfate.

## 2.0 PRESERVATION AND HOLDING TIME

2.1 Preservation

Water samples should be preserved with zinc acetate and sodium hydroxide to pH ≥ 9 and collected in three 250-ml bottles. Water and soil samples should be kept under refrigeration at 4°C until they are analyzed.

2.2 Holding Time

All samples should be analyzed as soon as possible, but definitely within 7 days of the date of collection.

## 3.0 REPORTING LIMITS AND METHOD DETECTION LIMITS

3.1 The reporting limit for sulfide in water has been established at 1.0 mg/l and 20 mg/kg for soils

3.2 Method Detection Limit. Experimentally determine MDLs using the procedure specified in 40 CFR, Part 136, Appendix B. This value represents the lowest reportable concentration of an individual compound that meets the method qualitative identification criteria. Experimental MDLs must be determined annually for this method.

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3.3 MDLs should be established for all appropriate methods, using a solution spiked at approximately 3 times the estimated detection limit. To determine the MDL values, take seven replicate aliquots of the spiked sample and process through the entire analytical method. The MDL is calculated by multiplying the standard deviation of the replicate analyses by 3.14, which is the student's t value for a 99% confidence level.

## 4.0 INTERFERENCES

Reduced sulfur compounds, which decompose in acid, such as sulfite and thiosulfate, may yield erratic results. Volatile iodine consuming substances will give high results. Samples should be taken with a minimum of aeration as oxidation may affect results.

## 5.0 APPPARATUS

The following items are needed for the analysis of samples following the method outlined below:

5.1 25 ml buret

5.2 Graduated beakers or flasks

5.3 Stir bars

5.4 Stir plates

5.5 Volumetric pipets

5.6 Filtering apparatus with 934 AH Whatman glass fiber filters or equivalent

## 6.0 REAGENTS

All chemicals listed below are reagent grade unless otherwise specified. De-ionized water should be used whenever water is required.

6.1 Hydrochloric acid, HCl, 6N. Add 50 ml of concentrated HCl to 50 ml of DI water and mix.

6.2 Standard iodine solution, 0.0250 N: Dissolve 20 to 25 g of KI in a little water in a 1 liter volumetric and add 3.2 g of iodine. Allow it to dissolve. Dilute to 1 liter and standardize against 0.025 N sodium thiosulfate.

6.3 Sodium Thiosulfate solution, 0.025 N: This solution is commercially available.

6.4 Starch indicator solution: This solution is commercially available.

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6.5 Zinc acetate solution: Dissolve 220 g of zinc acetate in 870 ml of DI water.

6.6 Sodium hydroxide, 6N: Weigh out 24 g of sodium hydroxide and dilute to a final volume of 100 ml with DI water.

6.7 Sodium hydroxide, 1N: Dissolve 40 g of NaOH in 500 ml of DI water. Dilute to 1 liter with DI.

6.8 Sulfide Stock Solution, 537 mg/l: Dissolve 4.02 g of $Na_2S \bullet 9H_2O$ in approximately 980 ml DI water. Adjust the pH to between 9 and 11 with 1N NaOH (6.7). Dilute to 1 liter with DI in a volumetric flask. **NOTE:** Sodium sulfite nonahydrate is extremely hydroscopic. This solution must be made weekly.

## 7.0 TITRATION PROCEDURE

7.1 Before starting on the samples, standardize the iodine solution using the following procedure.

7.1.1 Volumetrically pipette 5.0 ml of the iodine solution into the beaker. Then measure out 200 ml of DI water into the beaker. Place a stir bar in the solution and place the beaker on a stir plate. Add several drops of HCl, to bring the pH to less than 2 and then add several drops starch solution.
**Note:** The amount of HCl solution needed may vary with the strength of the solution. If you do not get a blue color with several drops of starch, first verify that the pH is less than 2. If the pH is correct, then add addition starch solution until a blue color is obtained.

7.1.2 Fill a 25-ml buret with 0.025 N sodium thiosulfate solution. Titrate the iodine solution with the sodium thiosulfate until the last blue color disappears. Record the volume of sodium thiosulfate used. At a minimum, perform this titration in duplicate.

7.1.3 Calculate the normality of the iodine as shown below. The iodine normality used should be the average of the normality for the two titrations of the DI blanks.

$$\text{N of iodine solution} = \frac{(\text{ml of Na thiosulfate}) * (0.025\ \text{N})}{(5.00\ \text{ml of iodine})}$$

7.2 For soil samples, weigh out 25.0 g and dilute to 250 ml with DI water. Mix well. Let settle and filter through Whatman 934 AH filters until clear. Measure out 200 ml to use for analysis. Prepare a duplicate sample, a matrix spike, a spike blank, and a method blank. For the method blank, use 200 ml of DI

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water. **NOTE:** The soil sample should be prepared immediately before titration.

7.3 For water samples that are **not preserved** with Zn acetate/ NaOH, mix the sample well and measure out 200 ml to use for analysis. Continue with step 7.5

7.4 For water samples that are **preserved** with Zn acetate/ NaOH, mark the side of the sample bottle at the level of the sample meniscus.

7.5 Volumetrically pipette 3.0 ml of the iodine solution (6.2) into a flask and add 2 ml of 6N HCl and swirl to mix. Gently transfer the contents of the sample bottle to the flask (or the 200 ml from step 7.3) with a minimum of aeration under the surface of the iodine. Rinse the preserved sample bottle with sufficient DI to ensure a quantitative transfer to the flask. Add a stir bar and stir slowly. The solution should be yellow. If not, add additional iodine. Add a small amount of starch solution and the solution should turn blue.
**Note:** The amount of HCl solution needed may vary with the strength of the solution. If you do not get a blue color with several drops of starch, first verify that the pH is less than 2. If the pH is correct, then add addition starch solution until a blue color is obtained.

7.6 Titrate the sample slowly with the 0.025N sodium thiosulfate solution until the last bluish tint disappears. The solution is normally clear at the end point. Note: The sample should be gently, but continuously stirred during the titration.

7.7 Each batch of samples, set up quality control samples, consisting of a method blank, a spike blank, a matrix spike and a duplicate. The spike blank and the matrix spike are spiked with 5.0 ml of sulfide Stock solution (6.8) when the sample is transferred to the flask. **NOTE:** For MS and SB, use 10.0 ml of iodine, instead of 3.0.

7.8 For water samples that are preserved with Zn acetate/ NaOH, measure the volume used by filling the original bottle with water to the line marked on the side of the bottle then pour the water into a graduated cylinder. Record the volume.

7.9 If interference is suspected, the samples may be taken through a pre-treatment step as described below.

7.9.1 If the sample was not preserved, measure out 200 ml of sample. Add 0.30 ml of zinc acetate solution and 4 to 5 drops of 6N NaOH solution to bring the pH above 9. Mix gently. Let the precipitate settle for approximately 30 minutes. Continue with step 7.9.3

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7.9.2 If the sample was preserved, verify the pH > 9 and mark the level of the meniscus on the side of the bottle. Additional Zn acetate may be added to ensure complete precipitation. Continue with step 7.9.3.

7.9.3 Filter the sample through glass fiber filter paper and then place the filter paper in a beaker with approximately 200-ml of DI water. Proceed with the titration starting at step 7.5.

## 8.0 CALCULATIONS

The calculations for both soils and waters are outlined below.

For water samples, the following calculations should be used.

$$\text{Sulfide in mg/l} = \frac{((V_iN_i) - (V_tN_t)) \times 16000}{\text{sample volume in ml}}$$

Where:
$V_i$ = volume of iodine solution in ml
$N_i$ = normality of iodine solution in ml
$V_t$ = volume of sodium thiosulfate solution in ml
$N_t$ = normality of sodium thiosulfate solution

For soil sample, the following calculation should be used.

$$\text{Sulfide in mg/kg} = \frac{((V_iN_i) - (V_tN_t)) \times 16000 \times V_f}{V_s \times (\%\text{solids}/100) \times W_i}$$

Where:
$V_i$ = volume of iodine solution in ml
$N_i$ = normality of iodine solution in ml
$V_t$ = volume of sodium thiosulfate solution in ml
$N_t$ = normality of sodium thiosulfate solution
$V_s$ = volume of sample titrated
$V_f$ = final volume of sample after preparation
$W_i$ = initial weight of sample prepared

## 9.0 QUALITY CONTROL

9.1 A method blank is required at a minimum of one per batch of 20 samples or one for each analysis day. The concentration of sulfide in the MB must be less than ½ the reporting limit.

9.2 A spike blank is required at a minimum of one per batch of 20 samples or one for each analysis day. Until in-house limits can be generated, use 80 to 120% recovery as the limits. See Table 1.

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9.3 A matrix spike is analyzed for every batch of 20 samples or one for each analytical day. In-house recovery limits should be used to assess the data. Use 75 to 125% recovery until the limits can be generated. If there is insufficient sample for a matrix spike, a second spike blank must be analyzed.

9.4 A duplicate is analyzed for every batch of 20 samples or one for each analytical day. Until in-house limits can be generated, 20% RPD should be used as the limit. A spike blank duplicate may be used, if there is insufficient sample available for the duplicate. If the RPD is greater than 20 and the sample and the duplicate are less than 5 times the RL, then the duplicate is considered in control and appropriately footnoted.

## 10.0 GLASSWARE CLEANING

All glassware should be washed with soap and tap water and then well rinsed with de-ionized water.

## 11.0 DOCUMENTATION REQUIREMENTS

All data should be recorded in a sulfide analysis log. Any unusual characteristics of the samples should be noted in the comment section. In addition, all reagent information such as lot numbers, vendors, date made, etc. should be recorded in the reagent logbook. All sample ID's and dilutions should be clearly labeled on the data.

## 12.0 SAFETY

The analyst should follow normal safety procedures as outlined in the Accutest Laboratory Safety Manual. Safety glasses and lab coats should be worn at all times in the lab. Gloves should be worn when handling samples.

## 13.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

13.1 Pollution Prevention

Users of this method must perform all procedural steps in a manner that controls the creation and/or escape of wastes or hazardous materials to the environment. The amounts of standards reagents and solvents must be limited to the amounts specified in this SOP. All safety practices designed to limit the escape of vapors, liquids or solids to the environment must be followed. All method users must be familiar with the waste management practices described in Section 13.2.

13.2 Waste Management

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Individuals performing this method must follow established waste management procedures as described in the Sample and Laboratory Waste Disposal SOP. This document describes the proper disposal of all waste materials generated during the testing of samples.

## 14.0 DEFINITIONS

14.1 Batch: A group of samples which are similar with respect to matrix and the testing procedures being employed and which are processed as a unit. A sample batch is limited to a maximum of 20 samples or 24 hours which ever comes first.

14.2 Blank Spike (BS): An analyte-free matrix spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. Blank Spike Recoveries are used to document laboratory performance for a given method. This may also be called a Laboratory Control Sample (LCS).

14.3 Continuing Calibration Verification (CCV): A check standard used to verify instrument calibration throughout an analytical run. For all GC and HPLC methods, a CCV must be analyzed at the beginning of the analytical run, after every 10 samples, and at the end of the run. For all MS methods, a CCV must be analyzed at the beginning of each analytical run.

14.4 holding Time: The maximum times that samples may be held prior to preparation and/or analysis and still be considered valid.

14.5 Initial Calibration (ICAL): A series of standards used to establish the working range of a particular instrument and detector. The low point should be at a level equal to or below the reporting level.

14.6 Initial Calibration Verification (ICV): A standard from a source different than that used for the initial calibration. A different vendor should be used whenever possible. The ICV is used to verify the validity of an Initial Calibration. This may also be called a QC check standard.

14.7 Continuing Calibration Verification 2 (CCV2): A check standard used to verify instrument calibration. CCV2 is analyzed at the time of instrument calibration and is usually the same concentration as the lowest standard or the reporting limit.

14.8 Matrix Spike (MS): A sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the bias of a method in a given sample matrix.

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14.9 Matrix Spike Duplicate (MSD): A replicate sample aliquot spiked with a known amount of analyte(s), processed simultaneously with the samples through all the steps of the analytical procedure. The matrix spike recoveries are used to document the precision and bias of a method in a given sample matrix.

14.10 Method Blank (MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank is processed simultaneously with the samples through all the steps of the analytical procedure. The method blank is used to document contamination resulting from the analytical process.

14.11 Sample Duplicate (DUP): A replicate sample which is used to document the precision of a method in a given sample matrix.

14.12 Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical integrity of the sample.

Table 1 QC Criteria

| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| Initial Calibration:<br>$r^2$ = coefficient of determination, or:<br>r = coefficient of correlation | ≥0.990<br>≥0.995 | Rerun calibration standards, and/or prepare new calibration standards and recalibrate the instrument, or document why the data are acceptable. |
| Initial Calibration Verification standard (ICV) | ± 10% of the standard's true value | Rerun standard, and/or prepare new standard, and/or recalibrate instrument, or document why the data are acceptable. |
| Continuing Calibration Verification standard (CCV), and Low-Level Standard (where applicable) | ± 10% of the standard's true value<br>± 10% of the standard's true value | Rerun standard, and/or recalibrate instrument and reanalyze all samples run since the last acceptable CCV, or document why the data are acceptable. |
| Method blank (MB) | < 1/2RL | Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable. |
| Blank Spike (BS or LSC) | ± 10 to 20%, or as per method | Determine and correct the problem, reanalyze samples, if necessary, or document why data are acceptable. |

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| Quality Control | Acceptance Criteria | Corrective Action |
|---|---|---|
| MS/MSD | ± 15 to 25%, or as per method. | Determine and correct the problem, reanalyze samples and MS/MSD, or document why data are acceptable |
| Sample Duplicate | ± 15 to 20%, or as per method. | Determine and correct cause of the poor reproducibility |

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***Attachment 4***

***Accutest Laboratory Quality Systems Manual***

# Quality Systems Manual

## Volume VI, Revision II: March 2005

Effective Date: March 31, 2005

## Document Control Number: _____

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The Accutest Laboratories Southeast, Inc. (Accutest SE) Quality Assurance Program, detailed in this plan, has been designed to meet the quality program requirements of the National Environmental Laboratories Accreditation Conference (NELAC) and ISO Guide 25. The plan establishes the framework for documenting the requirements of the quality processes regularly practiced by the Laboratory. The Quality Assurance Officer is responsible for changes to the Quality Assurance Program, which are appended to the LQSM as they occur. The plan is reviewed annually for compliance purposes by the Laboratory Director and Technical Director and edited if necessary. Changes that are incorporated into the plan are summarized in the plan introduction. Changes to the plan are communicated to the general staff in a meeting conducted by the Quality Assurance Officer following the plan's approval.

The Accutest SE plan is supported by standard operating procedures (SOPs), which provide specific operational instructions on the execution of each quality element and assure that compliance with the requirements of the plan are achieved. Accutest SE employees are responsible for knowing the requirements of the SOPs and applying them in the daily execution of their duties. These documents are updated as changes occur and the staff is trained to apply the changes.

At Accutest, we believe that satisfying client requirements and providing a product that meets or exceeds the standards of the industry is the key to a good business relationship. However, client satisfaction cannot be guaranteed unless there is a system that assures the product consistently meets its design requirements and is adequately documented to assure that all procedural steps are executed and are traceable.

This plan has been designed to assure that this goal is consistently achieved and the Accutest product withstands the rigors of scrutiny that are routinely applied to analytical data and the processes that support its generation.

**Summary of Changes**
**Accutest SE Quality System Manual – February and March 2005**

| Section | Description |
|---|---|
| Cover | Redesigned to new corporate standard, added proprietary statement |
| Intro. | Changes criteria modified |
| 1 | Policy addition reflecting work environment being free from production pressure |
| 1 | Expiration date removed |
| 1 | Responsibilities for knowledge of QSM content added to policy |
| 2 | Modified Accutest Laboratories organizational chart |
| 4 | Manager, Field Services removed |
| 3 | Data Integrity Policy added, replacing Technical ethics policy |
| 6 | SOP Distribution changes and Report Archival changes |
| 6 | Repot Generation and Archiving revised |
| 6 | CBI added |
| 7 | Reference Standard traceability modification for thermometers and weights |
| 8 | NIST thermometer – triennial – pursuant to ELPASO QAPP |
| 8 | Amended Capabilities Table Petroleum Methods |
| 8 | Amended Capabilities Table RSK, Alcohols, O&G 1664 |
| 9 | Sample custody paragraphs rearranged, sample retrieval, Recycling procedure – labels destroyed |
| 10 | Added instrumentation |
| 13 | Corr. Action Database – Access application, Monitoring |
| 13 | Client notification added |
| 16 | Control of Non-conforming product |
| 17 | Record Transfer Procedure |
| 18 | QS Audits added, Preventive Action added |

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# 1.0 QUALITY POLICY

## 1.1 *Accutest Mission*:

***Accutest Laboratories provides analytical services to commercial and government clients in support of environmental monitoring and remedial activities as requested. The Laboratory's mission is dedicated to providing reliable data that satisfies clients requirements as explained in the following: "Provide easy access, high quality, analytical support to commercial and government clients which meet or exceeds data quality objectives and provides them with the data needed to satisfy regulatory requirements and/or make confident decisions on the effectiveness of remedial activities."***

These services are provided impartially and are not influenced by undue commercial or financial pressures, which might impact the staff's technical judgment. Coincidentally, Accutest does not engage in activities that endanger the trust in our independent judgment and integrity in relation to the testing activities performed.

## 1.2 *Policy Statement*:

*The management and staff of Accutest Laboratories share the responsibility for product quality. Accordingly, Accutest's quality assurance program is designed to assure that all processes and procedures, which are components of environmental data production, meet established industry requirements, are adequately documented from a procedural and data traceability perspective, and are consistently executed by the staff. It also assures that analytical data of known quality, meeting the quality objectives of the analytical method in use and the data user's requirements, is consistently produced in the laboratory. This assurance enables the data user to make rational, confident, cost-effective decisions on the assessment and resolution of environmental issues.*

*The laboratory QA program also provides the management staff with data quality and operational feedback information. This enables them to determine if the laboratory is achieving the established quality and operational standards, which are dictated by the client or established by regulation. The information provided to management, through the QA program, is used to assess operational performance from a quality perspective and to perform corrective action as necessary.*

*All employees of Accutest Laboratories participating in environmental testing receive quality system training and are responsible for knowing and complying with the system requirements. The entire staff shares Accutest's commitment to good professional practice.*

| | | |
|---|---|---|
| Harry Behzadi, Ph.D.<br>Laboratory Director | Norman Farmer<br>Technical Director | Svetlana Izosimova, Ph.D.<br>Quality Assurance Officer |

**2.1** ***Organizational Entity***. Accutest Laboratories is a privately held, independent testing laboratory founded in 1956 and registered as a New Jersey Corporation. The laboratory is located in Dayton, New Jersey where it has conducted business since 1987. Satellite laboratories are maintained in Marlborough, Massachusetts; Orlando, Florida and Houston, Texas.

**2.2** ***Management Responsibilities***

***Requirement***: Each laboratory facility will have an established chain of command. The duties and responsibilities of the management staff are linked to the President/CEO of Accutest Laboratories who establishes the agenda for all company activities.

**President/CEO***.* Primarily responsible for all operations and business activities. Delegates authority to laboratory directors, general managers, and quality assurance director to conduct day-to-day operations and execute quality assurance duties. Each of the three operational entities (New Jersey, Florida and Massachusetts) reports to the President/CEO.

**Corporate Quality Assurance Director***.* Responsible for design, oversight, and facilitation of all quality assurance activities established by the Quality Program. Directly reports to the President/CEO.

**Vice President Operations/Laboratory Director***.* There is Laboratory Director assigned to each of the operational entities: New Jersey, Massachusetts and Florida. Executes day-to-day responsibility for laboratory operations including technical aspects of production activities and associated logistical procedures. Directly reports to the President/CEO.

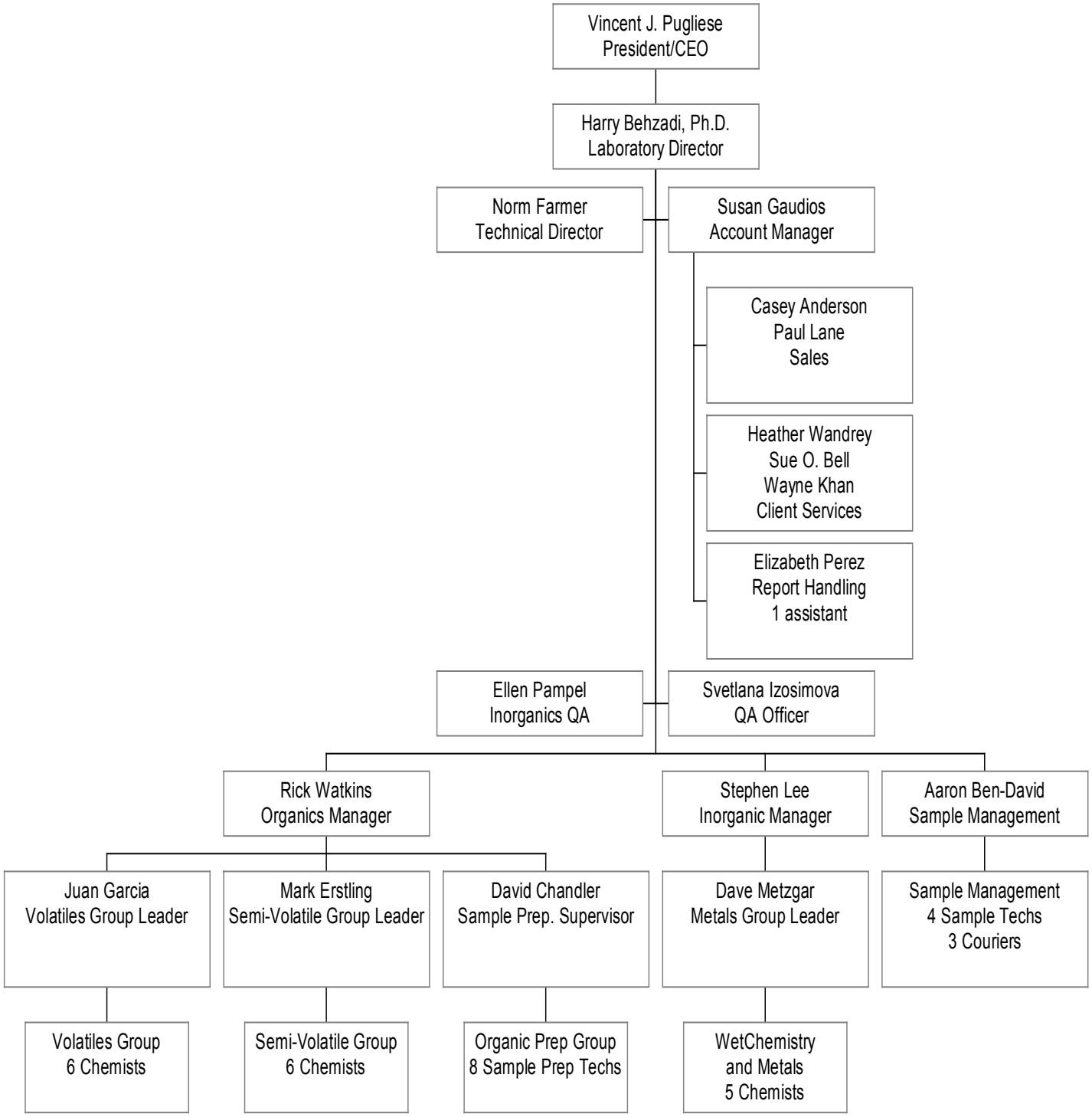
**Quality Assurance Officer** *(on location).* Responsible for oversight, implementation and facilitation of all quality assurance activities established by the Quality Program. Directly reports to the Laboratory Director.

**Technical Director**. Responsible for oversight and implementation of technical aspects of production activities in the environmental testing laboratory. In the event of prolonged absence Quality Assurance Officer is designated a deputy Technical Director, and Technical Director is designated a deputy Quality Assurance Officer.

**Department Managers***.* Executes day-to-day responsibility for specific laboratory areas including technical aspects of production activities and associated logistical procedures. Directly report to the Laboratory Director.

**Section Supervisors***.* Executes day-to-day responsibility for specific laboratory units including technical aspects of production activities and associated logistical procedures. Directly report to the Department Manager.

## Accutest Laboratories Southeast Organizational Chart



## 3.0 QUALITY RESPONSIBILITIES OF THE MANAGEMENT TEAM

**3.1** ***Requirement*:** Each member of the management team has a defined responsibility for the Quality Program. Program implementation and operation is designated as an operational management responsibility. Program design and implementation is designated as a Quality Assurance Responsibility.

**President/CEO***:* Primary responsibility for all quality activities. Delegates program responsibility to the Quality Assurance Director. Serves as the primary alternate in the absence of the Quality Assurance Director. Has the ultimate responsibility for implementation of the Quality Program.

**Vice President Operations/Laboratory Director***.* Responsible for implementing and operating the Quality Program in all laboratory areas. Responsible for the design and implementation of corrective action for defective processes. Has the authority to delegate Quality Program implementation responsibilities.

**Corporate Quality Assurance Director***.* Responsible for design, implementation support, training, and monitoring of the quality system. Identifies product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Empowered with the authority to halt production if warranted by quality problems. Monitors implemented corrective actions for compliance.

**Quality Assurance Officer** *(on location).* Responsible for implementation, support, and monitoring of the quality system. Training personnel in various aspects of quality system. Identifies product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Empowered with the authority to halt production if warranted by quality problems. Monitors implemented corrective actions for compliance.

**Technical Director.** Responsible for oversight and implementation of technical aspects of Quality System.

**Department Managers***.* Responsible for applying the requirements of the Quality Program in their section and assuring subordinate supervisors and staff apply all program requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

**Section Supervisors***.* Responsible for applying the requirements of the Quality Program to their operation and assuring the staff applies all program requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

**Bench Analysts**. Responsible for applying the requirements of the Quality Program to the analyses they perform, evaluating QC data and initiating corrective action for

quality control deficiencies within their control. Implements global corrective action as directed by superiors.

**3.2** ***Program Authority***:

Authority for program implementation originates with the President/CEO who bears ultimate responsibility for program design, implementation, and enforcement of requirements. This authority and responsibility is delegated to the Director of Quality Assurance who performs quality functions independently without the encumbrances or biases created by operational or production responsibilities to ensure an honest, independent assessment of quality issues.

**3.3** ***Data Integrity Policy***:

The Accutest Data Integrity Policy reflects a comprehensive, systematic approach for assuring that data produced by the laboratory accurately reflects the outcome of the tests performed on field samples and has been produced in a bias free environment by ethical professionals. The policy includes a commitment to technical ethics, staff training in ethics and data integrity, an individual attestation to data integrity and procedures for evaluating data integrity. Senior management assumes the responsibility for assuring compliance with all technical ethics elements and operation of all data integrity procedures. The staff is responsible for compliance with the ethical code of conduct and for practicing data integrity procedures.

The Accutest Data Integrity Policy is as follows:

***"Accutest Laboratories is committed to producing data that meets the data integrity requirements of the environmental regulatory community. This commitment is demonstrated through the application of a comprehensive data integrity program that includes ethics and data integrity training, data integrity evaluation procedures, staff participation and management oversight. Adherence to the specifications of the program assures that data provided to our clients is of the highest possible integrity and can be used for decision making processes with high confidence."***

**Data Integrity Responsibilities**

***Management.*** Senior management retains oversight responsibility for the data integrity program and retains ultimate responsibility for execution of the data integrity program elements. Senior management is responsible for providing the resources required to conduct ethics training and operate data integrity evaluation procedures. They also include responsibility for creating an environment of trust among the staff and being the lead advocate for promoting the data integrity policy and the importance of technical ethics.

***Staff*.** The staff is responsible for adhering to the company ethics policy as they perform their duties and responsibilities associated with sample analysis and reporting. By executing this responsibility, data produced by Accutest Laboratories retains its high integrity characteristics and withstands the rigors of all data integrity checks.

The staff is also responsible for adhering to all laboratory requirements pertaining to manual data edits, data transcription and data traceability. These include the application of approved manual peak integration and documentation procedures. It also includes establishing traceability for all manual results calculations and data edits.

**Ethics Statement.** The Accutest ethics statement reflects the standards that are expected for businesses that provide environmental services to regulated entities and regulatory agencies on a commercial basis. The Ethics Policy is comprised of key elements that are essential to organizations that perform chemical analysis for a fee. As such, it focuses on elements related to personal, technical and business activities.

Accutest Laboratories provides analytical chemistry services on environmental matters to the regulated community. The data the company produces provides the foundation for determining the risk presented by a chemical pollutant to human health and the environment. The environmental industry is dependent upon the accurate portrayal of environmental chemistry data. This process is reliant upon a high level of scientific and personal ethics.

It is essential to the Company that each employee understands the ethical and quality standards required to work in this industry. Accordingly, Accutest has adopted a code of ethics, which each employee is expected to adhere to as follows:

- Perform chemical and microbiological analysis using accepted scientific practices and principles.
- Perform tasks in an honest, principled and incorruptible manner inspiring peers & subordinates.
- Maintain professional integrity as an individual.
- Provide services in a confidential, honest, and forthright manner.
- Produce results that are accurate and defensible.
- Report data without any considerations of self-interest.
- Comply with all pertinent laws and regulations associated with assigned tasks and responsibilities.

**Data Integrity Procedures.**

Four key elements comprise the Accutest data integrity system. Procedures have been implemented for conducting data integrity training and for documenting that employees conform to the Accutest Data Integrity and Ethics policy.

The data integrity program consists of routine data integrity evaluation and documentation procedures to periodically monitor and document data integrity. These procedures are documented as SOPs. SOPs are approved and reviewed annually following the procedures employed for all Accutest SOPs. Documentation associated with data integrity evaluations is maintained on file and is available for review.

**Data Integrity Training**, .Accutest employees receive technical ethics training during new employee orientation. Employees are also required to attend annual ethics refreshment training and sign an ethical conduct agreement annually, which verifies their understanding of Accutest's ethics policy and their ethical responsibilities. The agreement is refreshed annually and appended to each individual's training file.

The training focuses on the reasons for technical ethic training, explains the impact of data fraud on human health and the environment, and illustrates the consequences of criminal fraud on businesses and individual careers. Accutest's ethics policy and code of ethics are reviewed and explained for each new employee.

Training on data integrity procedures are conducted by individual departments for groups involved in data operations. These include procedures for manual chromatographic peak integration, traceability for manual calculations and data transcription.

**Data Integrity Training Documentation**. Records of all data integrity training are maintained in individual training folders. Attendance at all training sessions is documented and maintained in the training archive.

**Accutest Data Integrity and Ethical Conduct Agreement.** All employees are required to sign a Data Integrity and Ethical Conduct Agreement annually. This document is archived in individual training files, which are retained for duration of employment.

The Data Integrity and Ethical Conduct Agreement is as follows**:**

I. *I understand the high ethical standards required of me with regard to the duties I perform and the data I report in connection with my employment at Accutest Laboratories.*

II. *I have received formal instruction on the code of ethics that has been adapted by Accutest Laboratories and agree to comply with these requirements.*

*III. I have received formal instruction on the elements of Accutest Laboratories' Data Integrity Policy and have been informed of the following specific procedures:*

*a. Routine data integrity monitoring is conducted on sample data, which may include an evaluation of the data I produce,*

*b. Formal procedures for the confidential reporting of data integrity issues are available, which can be used by any employee,*

*c. A data integrity investigation is conducted when data issues are identified that may negatively impact data integrity.*

*IV. I am aware that data fraud is a punishable crime that may include fines and/or imprisonment upon conviction.*

*V. I also agree to the following:*

*a. I shall not intentionally report data values, which are not the actual values observed or measured.*

*b. I shall not intentionally modify data values unless the modification can be technically justified through a measurable analytical process.*

*c. I shall not intentionally report dates and times of data analysis that are not the true and actual times the data analysis was conducted.*

*d. I shall not condone any accidental or intentional reporting of inauthentic data by other employees and immediately report it's occurrence to my superiors.*

*e. I shall immediately report any accidental reporting of inauthentic data by myself to my superiors.*

**Data Integrity Monitoring.** Several documented procedures are employed for performing data integrity monitoring. These include regular data review procedures by supervisory and management staff (Section 12.7), supervisory review and approval of manual integrations and periodic reviews of GALP audit trails from the LIMS and all computer controlled analysis.

*Data Review*. All data produced by the laboratory undergoes several levels of review, which includes two levels of management review. Detected data anomalies that appear to be related to data integrity issues are isolated for further investigation. The investigation is conducted following the procedures described in this section.

*Manual Peak Integration Review and Approval*. Routine data review procedures for all chromatographic processes includes a review of all manual chromatographic peak integrations. This review is performed by the management staff and consists of a

review of the machine integration compared to the manual integration. Manual integrations, which have been performed in accordance with Accutest's manual peak integration procedures are approved for further processing and release. Manual integrations which are not performed to Accutest's specifications are set aside for corrective action, which may include analyst retraining or further investigation as necessary.

*GALP Audit Trail Review.* Good Automated Laboratory Practice (GALP) audits are comprehensive data package audits that include a review of raw data, process logbooks, processed data reports and GALP audit trails from individual instruments and LIMS. GALP audit trails, which record all electronic data activities, are available for the majority of computerized methodology and the laboratory information management system (LIMS). These audit trails are periodically reviewed to determine if interventions performed by technical staff constitute an appropriate action. The review is performed on a recently completed job and includes interviews with the staff who performed the analysis. Findings indicative of inappropriate interventions or data integrity issues are investigated to determine the cause and the extent of the anomaly.

**Confidential Reporting Of Data Integrity Issues.** Data integrity concerns may be raised by any individual to their supervisor. Employees with data integrity concerns should always discuss those concerns with their immediate supervisors as a first step unless the employee is concerned with the confidentiality of disclosing data integrity issues or is uncomfortable discussing the issue with their immediate supervisors. The supervisor makes an initial assessment of the situation to determine if the concern is related to a data integrity violation. Those issues that appear to be violations are documented by the supervisor and referred to the Director of Quality Assurance for investigation.

Documented procedures for the confidential reporting of data integrity issues in the laboratory are part of the data integrity policy. These procedures assure that laboratory staff can privately discuss ethical issues or report items of ethical concern without fears of repercussions with senior staff.

Employees with data integrity concerns that they consider to be confidential are directed to the Corporate Human Resources Manager in Dayton, New Jersey. The HR Manager acts as a conduit to arrange a private discussion between the employee and the Corporate QA Director or a local QA Officer.

During the employee - QA discussion, the QA representative evaluates the situation presented by the employee to determine if the issue is a data integrity concern or a legitimate practice. If the practice is legitimate, the QA representative clarifies the process for the employee to assure understanding. If the situation appears to be a data integrity concern, the QA representative initiates a Data Integrity Investigation following the procedures specified in SOP EQA059.

**Data Integrity Investigations**. Follow-up investigations are conducted for all reported instances of ethical concern related to data integrity. Investigations are performed in a confidential manner by senior management according to a documented procedure. The outcome of the investigation is documented and reported to the company president who has the ultimate responsibility for determining the final course of action in the matter. Investigation documentation includes corrective action records, client notification information and disciplinary action outcomes, which is archived for a period of five years.

The investigations are conducted by the senior staff and supervisory personnel from the affected area. The investigation team includes the Laboratory Director and the Quality Assurance Director. Investigations are conducted in a confidential manner until it is completed and resolved.

The investigation includes a review of the primary information in question by the investigations team. The team performs a review of associated data and similar historical data to determine if patterns exist. Interviews are conducted with key staff to determine the reasons for the observed practices.

Following data compilation, the investigations team reviews all information to formulate a consensus conclusion. The investigation results are documented along with the recommended course of action.

**Corrective Action, Client Notification & Discipline.** Investigations that reveal systematic data integrity issues will go through corrective action for resolution and disposition (Section 13). If the investigation indicates that an impact to data has occurred and the defective data has been released to clients, client notification procedures will be initiated following the steps in Section 17.6.

In all cases of data integrity violations, some level of disciplinary action will be conducted on the responsible individual. The level of discipline will be consistent with the violation and may range from retraining and/or verbal reprimand to termination.

## 4.0 JOB DESCRIPTIONS OF KEY STAFF

**4.1** ***Requirement***: Descriptions of key positions within the organization must defined to ensure that clients and staff understand duties and the responsibilities of the management staff and the reporting relationships between positions.

**President/Chief Executive Officer**. Responsible for all laboratory operations and business activities. Establishes the company mission and objectives in response to business needs. Direct supervision of the Vice President of Operations, each laboratory director, client services, management information systems, and quality assurance.

**Vice President, Operations/Laboratory Director**. Reports to the company president. Establishes laboratory operations strategy. Direct supervision of organic chemistry, inorganic chemistry, field services, and sample management. Operational responsibility for Orlando, Florida and Marlborough, Massachusetts laboratories.

**Director, Quality Assurance**. Reports to the company president. Establishes the company quality agenda, develops quality procedures, provides assistance to operations on quality procedure implementation, coordinates all quality control activities monitors the quality system and provides quality system feedback to management to be used for process improvement.

**Director, Management Information Systems (MIS)**. Reports to the company president. Develops the MIS software and hardware agenda. Provides system strategies to compliment company objectives. Maintains all software and hardware used for data handling.

**Manager Client Services**. Reports to the company president. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

**Quality Assurance Officer** *(on location)*. Reports to the Laboratory Director. Develops quality procedures, provides assistance to operations on quality procedure implementation, coordinates all quality control activities, monitors the quality system, and provides quality system feedback to management to be used for process improvement. In the event of prolonged absence QAO also designated a Deputy Technical Director, unless otherwise specified by internal memo from Laboratory Director.

**Manager Client Services** *(on location)*. Reports to the Laboratory Director. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

**Manager, Organics**. Reports to the laboratory director. Directs the operations of the organics group, consisting of organics preparation and instrumental analysis. Establishes daily work schedule. Supervises method implementation, application, and data production. Responsible for following Quality Program requirements. Maintains laboratory instrumentation in an operable condition.

**Manager, Inorganics**. Reports to the laboratory director. Directs the operations of the inorganics group, consisting of wet chemistry and the metals laboratories. Establishes daily work schedule. Supervises method implementation, application, and data production. Responsible for following Quality Program requirements. Maintains laboratory instrumentation in an operable condition.

**Manager, Sample Management**. Reports to the laboratory director. Develops, maintains and executes all procedures required for receipt of samples, verification of preservation, and chain of custody documentation. Responsible for maintaining and documenting secure storage, delivery of samples to laboratory units on request, and disposal following completion of all analytical procedures. *Manager of Sample Management and Manager of Field Services are combined in Accutest-SE location.*

**Supervisor, Wet Chemistry**. Reports to the inorganics manager. Executes daily analysis schedule. Supervises the analysis of samples for wet chemistry parameters using valid, documented methodology. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. *Not applicable to Accutest-SE location (see Manager, Inorganics)*

**Supervisor, Metals**. Reports to the inorganics manager. Executes daily analysis schedule. Supervises the analysis of samples for metallic elements using valid, documented methodology. Documents all procedures and data production activities. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. *Not applicable to Accutest-SE location (see Manager, Inorganics)*

**Supervisor, Organic Preparation**. Reports to the organics manager. Executes the daily sample preparation schedule. Performs the extract of multi-media samples for organic constituents using valid, documented methodology. Prepares documentation for extracted samples. Assumes custody until transfer for analysis.

**Technical Support Supervisor, Organics**. Reports to the organic manager. Oversees all instrument maintenance and new equipment installation. Conducts method development and implementation tasks.

**Assistant Manager, Organics**. Reports to the organics manager. Expedites the analysis of samples and sample extracts. Executes daily analysis schedule. Supervises the analysis of samples for organic parameters using valid, documented methodology. Documents all data and data production activities. Maintains

instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements.

*In Accutest-SE location the positions of Assistant Manager, Organics and Technical Support Supervisor, Organics are substituted for Volatile Analysis Team Leader and Semivolatile Analysis Team Leader.*

**4.2** ***Employee Screening, Orientation, and Training***.

All potential laboratory employees are screened and interviewed by human resources and technical staff prior to their hire. The pre-screen process includes a review of their qualifications including education, training and work experience to verify that they have adequate skills to perform the tasks of the job.

Newly hired employees receive orientation training beginning the first day of employment by the Company. Orientation training consists of initial health and safety training and a detailed review of the chemical hygiene plan, technical ethics training and quality assurance program training (including Company's goals, objectives, mission, and vision).

All technical staff receives training to develop and demonstrate proficiency for the methods they perform. New analysts work under supervision until the supervisory staff is satisfied that a thorough understanding of the method is apparent. Organics/Inorganics analysts are required to demonstrate method proficiency through a precision and accuracy study. Data from the study is compared to method acceptance limits. If the data is unacceptable, additional training is required. The analyst must also demonstrate the ability to produce acceptable data through the analysis of an independently prepared proficiency sample.

Proficiency is demonstrated annually. Data from initial and continuing proficiency demonstration is archived in the individual's training folder. In the instance where analyte can not be spiked in the clean matrix, such as TSS or pH, the results of an external Performance Evaluation (PE) sample may be used to document analyst's proficiency.

Minimum training required for administrative staff consists of laboratory safety and ethical conduct.

**4.3** ***Training Documentation***. The QA Officer prepares a training file for every new employee. All information related to qualifications, experience, external training courses, and education are placed into the file. Verification documentation for orientation, health & safety, quality assurance, and ethics training is also included in the file.

Additional training documentation is added to the file as it occurs. This includes data for initial and continuing demonstrations of proficiency, performance evaluation study data and notes and attendance lists from group training sessions.

## 5.0 SIGNATORY APPROVALS

***Requirement***: Procedures are required for establishing the traceability of data and documents. The procedure consists of a signature hierarchy, indicating levels of authorization for signature approvals of data and information within the organization. Signature authority is granted for approval of specific actions based on positional hierarchy within the organization and knowledge of the operation that requires signature approval. A log of signatures and initials of all employees is maintained for cross-referencing purposes.

### 5.1 *Signature Hierarchy*.

**President/Chief Executive Officer**. Authorization for contracts and binding agreements with outside parties. Approval of final reports, quality assurance policy, SOPs, project specific QAPs, data review and approval in lieu of technical managers.

**Vice President, Operations/Laboratory Director**. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Technical policy.

**Technical Director** (on location): Approval of final reports and quality assurance policy in the absence of the Laboratory Director. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Technical policy review. In the event of prolonged absence Technical Director also designated a Deputy QAO, unless otherwise specified by internal memo from Laboratory Director.

**Director, Quality Assurance**. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers.

**Quality Assurance Officer** (on location). Approval of final reports and quality assurance policy in the absence of the Laboratory Director. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. In the event of prolonged absence QAO also designated a Deputy Technical Director, unless otherwise specified by internal memo from Laboratory Director.

**Director, Management Information Systems (MIS)**. Department specific supplies purchase. MIS policy.

**Manager, Sample Management**. Initiation of laboratory sample custody and acceptance of all samples. Approval of department policies and procedures. Department specific supplies purchase. Waste manifesting and disposal.

**Manager Client Services**. QAP and sampling and analysis plan approval. Project specific contracts, pricing, and price modification agreements. Approval and acceptance of incoming work, Client services policy.

**Managers, Technical Departments**. Methodology and department specific QAPs. Data review and approval, department specific supplies purchase. Technical approval of SOPs.

**Assistant Managers: Technical Departments**. Data review approval, purchasing of expendable supplies.

**Supervisors, Technical Departments**. Data review approval, purchasing of expendable supplies.

**5.2** ***Signature Requirements***. All laboratory activities related to sample custody and generation or release of data must be approved using either initials or signatures. The individual, who applies his signature or initial to an activity or document, is authorized to do so within the limits assigned to them by their supervisor. All signatures and initials must be applied in a readable format that can be cross-referenced to the signatures and initials log if necessary.

**5.3** ***Signature and Initials Log***. The QA Officer maintains a signature and initials log. New Employee signatures and initials are appended to the log on the first day of employment. Signature of individuals no longer employed by the company are retained

## 6.0 DOCUMENTATION

***Requirement***: Policies and procedures for the control, protection, and storage of any information related to the production of analytical data to assure its integrity and traceability must be established and practiced

**6.1 Administrative Records**. Administrative (non-analytical) records are managed by the quality assurance department. These records consist of electronic documents which are retained in a limited access electronic directory or paper documents, which are released to the technical staff upon specific request.

***Form Generation & Control***. The quality assurance group approves all forms used as either stand-alone documents or in logbooks to ensure their traceability. The approved forms are maintained in a master book. Forms that are generated as computer files only are maintained in a limited access master directory. Approved forms must display the date of current revision and initials of person who revised the form.

New forms must include the name Accutest Laboratories and appropriate spaces for signatures of approvals and dates. Further design specifications are the responsibility of the originating department.

Technical staff is required to complete all forms to the maximum extent possible. If information for a specific item is unavailable, the analyst is required to "Z" the information block. The staff is also required to "Z" the uncompleted portions of a logbook or logbook form if the day's analysis does not fill the entire page of the form.

***Logbook Control***. All laboratory logbooks are controlled documents that are comprised of approved forms used to document specific processes. Logbook control is maintained by quality assurance.

New logs are numbered and issued to a specific individual who is assigned responsibility for the log. Supervisor performs periodical review of the logbooks. Old logs are returned to QA for entry into the document archive system where they are retained for five (5) years. Laboratory staff may hold a maximum of two consecutively dated logbooks of the same type in the laboratory including the most recently issued book to simplify review of recently completed analysis.

***Controlled Documents.*** Key laboratory documents are designated for controlled document status to assure that identities of individuals receiving copies and the number of copies that have been distributed are known. Controlled status simplifies document updates and retrieval of outdated documents. Control is maintained through a document numbering procedure and document control logbook designating the individual receiving the controlled document. Document control is also maintained by pre-designating the numbers of official copies of documents that are placed into circulation within the laboratory.

**Quality Systems Manual (QSM).** All QSMs are assigned a number prior to distribution. The number, date of distribution, and identity of the individual receiving the document are recorded in the document control logbook. The numbering system is restarted with each new revision of the QSM.

**Standard Operating Procedures (SOPs).** SOPs are maintained by pre-designating the numbers of official copies of documents that are placed into circulation within the laboratory. Official documents are printed and placed into the appropriate laboratory section as follows:

Sample Management: One copy for the sample management file.
Organics Laboratories: One for the affected laboratory area.
Inorganics Laboratories: One for the affected laboratory area.

The original, signed copy of the SOP is maintained in the master SOP binder by the QA staff.

Documents are controlled using an "Official Copy" stamp in red ink. Additional copies could be issued to individuals for training purposes. Distribution is documented on SOP cover page. Superceded copies collection is conducted accordingly to distribution list.

**6.2** ***Technical Records***. All records related to the analysis of samples and the production of an analytical result are archived in secure document storage or on electronic media and contain sufficient detail to produce an audit trail which re-creates the analytical result. These records include information related to the original client request, bottle order, sample login and custody, storage, sample preparation, analysis, data review and data reporting.

Each department involved in this process maintains controlled documents which enable them to maintain records of critical information relevant to their department's process.

**6.3** ***Quality Assurance Directory.*** All Quality Assurance documentation and quality control limit data is stored in a restricted QA directory on the network server. The directory has been designated as read only. The QA staff, technical director and the laboratory director have write capability in this directory. Information on this directory is backed-up daily.

This directory contains all current and archived quality system manuals, SOPs, control limits, MDL studies, precision and accuracy data, official forms, and metrics calibration information.

**6.4** ***Analytical Records***. All data related to the analysis of field samples are retained as either paper or electronic records that can be retrieved to compile a traceable audit trail for any reported result. All information is linked to the client job and sample number, which serves as a reference for all sample related information tracking.

Critical times in the life of the sample from collection through analysis to disposal are documented. This includes date and time of collection, receipt by the laboratory, preparation times and dates, analysis times and dates and data reporting information. Analysis times are calculated in hours for methods where holding time is specified in hours (≤72 hours).

Sample preparation information is recorded in a separate controlled logbook. It includes sample identification numbers, types of analysis, preparation and cleanup methods, sample weights and volumes, reagent lot numbers and volumes and any other information pertinent to the preparation procedure.

Information related to the identification of the instrument used for analysis is permanently attached to the electronic record. The record includes an electronic data file that indicates all instrument conditions employed for the analysis, including the type of analysis conducted. The analyst's identification is electronically attached to the record. The instrument tuning and calibration data is electronically linked to the sample or linked though paper logs which were used in the documentation of the analysis. Quality control and performance criteria are permanently linked to the paper archive or electronic file.

Paper records for the identity, receipt, preparation and evaluation of all standards and reagents used in the analysis are documented in prepared records and maintained in controlled documents or files. Lot number information linking these materials to the analysis performed is recorded in the logbooks associated with the samples in which they were used.

Manual calculations or peak integrations that were performed during the data review are retained as paper or scanned documents and included as part of the electronic archive. Signatures for data review are retained on paper or as scanned versions of the paper record for the permanent electronic file.

**6.5** ***Confidential Business Information (CBI).*** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between Accutest and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat .PDF format only.

**6.6** ***Software Change Documentation & Control.*** Changes to software are documented as text within the code of the program undergoing change. Documentation includes a description of the change, reason for change and the date the change was placed into effect. Documentation indicating the adequacy of the change is prepared following the evaluation by the user who requested the change.

**6.7** ***Report and Data Archiving***. Accutest Laboratories maintains electronic image file copies of original reports in archive for a period of five (5) years. After five years, the files are automatically discarded unless contractual arrangements exist which dictate different requirements. Client specific data retention practices are employed for government organizations such as the Department of Defense Agencies that require a retention period of ten (10) years.

Accutest archives the original report (organized by job number) and the organic and inorganic support data. Organic support data is archived according to instrument batch numbers. Wet chemistry support data is archived by test organized monthly. Metals support data is archived by batch number. Metals digestion data is archived by month.

The reports generation group electronically scans completed reports and stores them by job number on the document server. The document server is backed up daily to a digital tape, and is automatically cloned to a second tape. The “clone” tapes are transferred to an onsite fireproof safe for secure storage. Copies of these files remain active on the document server for easy review access. The digital tapes remain in secure storage for the remainder of the archive period.

**6.8** ***Training***. The company maintains a training record for all employees that documents that they have received instruction on administrative and technical tasks that are required for the job they perform. Training records for individuals employed by the company are retained for a period of five years following their termination of employment.

***Training File Origination***. The Quality Assurance Officer (QAO) initiates training files. Quality Assurance officer retains the responsibility for the maintenance and tracking of all training related documentation in the file. The file is begun on the first day of employment. Information required for the file includes a copy of the individual’s most current resume, detailing work experience and a copy of any college diplomas or transcript(s). Information added on the first day includes documentation of health and safety training and a signed Ethics and Data Integrity agreement. These two constitute minimal necessary training for Project Management and Administrative staff.

**6.9** ***Technical Training***. The supervisor of each new employee must submit a training plan outline to QAO detailing the areas of training the new employee will receive. The supervisor updates the outline, adding signatures and dates as training elements are completed. Supporting documentation, such as precision and accuracy studies, which

demonstrate analyst capability for a specific test, are added as completed. When analyte can not be spiked, such as pH or TSS, external PE sample is purchased and analyzed. Where no external PE sample is available, sample duplicates must be successfully analyzed. Method review records are retained where analysis of duplicates is not possible. Certificates or diplomas for any off-site training are added to the file.

**7.0**

## REFERENCE STANDARD TRACEABILITY

*Requirement*: Documented procedures, which establish traceability between any measured value and a national reference standard, must be in place in the laboratory. All metric measurements must be traceable to NIST reference weights or thermometers that are calibrated on a regular schedule. All chemicals used for calibration of a quantitative process must be traceable to an NIST reference that is documented by the vendor using a certificate of traceability. The laboratory maintains a documentation system that establishes the traceability links. The procedures for verifying and documenting traceability must be documented in standard operating procedures.

**7.1** ***Traceability of Metric Measurements - Thermometers***. Accutest uses NIST thermometers to calibrate commercially purchased thermometers prior to their use in the laboratory. If necessary, thermometers are assigned correction factors that are determined during their calibration using an NIST thermometer as the standard. The correction factor is documented in a thermometer log and on a tag attached to the thermometer. The correction factor is applied to temperature measurements before recording the measurement in the temperature log. The NIST thermometer is verified by outside vendor on triennial basis. Certificate(s) of calibration are maintained on file with QAO.

**7.2** ***Traceability of Metric Measurements – Calibration Weights***. Accutest uses calibrated weights, which are traceable to NIST standard weights to calibrate all balances used in the laboratory. Balances must be calibrated to specific tolerances within the intended use range of the balance. Calibration checks are required on each day of use. If the tolerance criteria are not achieved, corrective action specified in the balance calibration SOP must be applied before the balance can be used for laboratory measurements. All weights are recalibrated by outside vendor every five years. Certificate(s) of calibration are maintained on file with QAO. Balances are inspected and maintained by professional service technicians. Certificate(s) of inspection are maintained with QAO.

**7.3** ***Traceability of Chemical Standards***. All chemicals, with the exception of bulk dry chemicals and acids, purchased as reference standards for use in method calibration must establish traceability to NIST referenced material through a traceability certificate. Process links are established that enable a calibration standard solution to be traced to its NIST reference certificate.

**7.4** ***Assignment Of Reagent and Standard Expiration Dates.*** Expiration date information for all purchased standards and reagents is provided to Accutest with all prepared standard solutions and unstable reagents as a condition of purchase. Neat materials and inorganic reagents are not required to be purchased with expiration dates. Prepared solutions are labeled with the expiration date provided by the manufacturer. In-house prepared solutions are assigned expiration dates that are consistent with the method that employs their use unless documented experience

indicates that an alternate date can be applied. If alternate expiration dates are employed, their use is documented in the method SOP. Expiration dates for prepared inorganic reagents, which have not exhibited instability are established at two years form the date of preparation for tracking purposes. All containers shall be labeled with the date of preparation and expiration date clearly indicated.

The earliest expiration date is always the limiting date for assigning expiration dates to prepared solutions. Expiration dates that are later than the expiration date of any derivative solution or material are prohibited.

**7.5** ***Documentation of Traceability***. Traceability information is documented in individual logbooks designated for the measurement process in use. The quality assurance group maintains calibration documentation for metric references in separate logbooks.

Balance calibration verification is documented in logbooks that are assigned to each balance. The individual conducting the calibration is required to initial and date all calibration activities. Any defects that occur during calibration are also documented along with the corrective action applied and a demonstration of return to control.

Temperature control is documented in logbooks assigned to the equipment being monitored. A calibrated thermometer is assigned to each individual item. Measurements are recorded along with date and initials of the individual conducting the measurement on a daily or as used basis. Corrective action, if required, is also documented including the demonstration of return to control.

Initial traceability of chemical standards is documented via a vendor-supplied certificate (not available for bulk dry chemicals and acids) that includes lot number and expiration date information. Solutions prepared using the vendor supplied chemical standard are documented in logbooks assigned to specific analytical processes. The documentation includes links to the vendors lot number, an internal lot number, dates of preparation, and the preparer's initials.

## 8.0 TEST PROCEDURES, METHOD REFERENCES, AND REGULATORY PROGRAMS

***Requirements***: The laboratory must use client specified or regulatory agency approved methods for the analysis of environmental samples. The laboratory maintains a list of active methods, which specifies the type of analysis performed, and cross-references the methods to applicable environmental regulation. Routine procedures used by the laboratory for the execution of a method must be documented in a standard operating procedure. Method performance and sensitivity must be demonstrated annually where required. Defined procedures for the use of method sensitivity for data reporting purposes must be established by the Director of Quality Assurance and used consistently for all data reporting purposes.

**8.1** ***Standard Operating Procedures***. Standard operating procedures (SOP) are prepared for routine methods executed by the laboratory and processes related to sample or data handling. The procedures describe the process steps in sufficient detail to enable an individual, who is unfamiliar with the procedure to execute it successfully. SOPs are reviewed annually and edited if necessary. SOPs can be edited on a more frequent basis if systematic errors dictate a need for process change or the originating regulatory agency promulgates a new version of the method. Procedural modifications are indicated using a revision number. SOPs are available for client review at the Accutest facility upon request.

8.1.1 ***Exception Policy*** With respect to the quality system, incoming non-conforming product refers to received samples that do not meet requirements of custody documentation, are improperly packaged or stored or are contaminated. An internal non-conformance refers to a problem, caused internally due to improper handling of samples, improper sampling methods, and equipment malfunction or data management errors. The individual who identifies the incoming non-conformance is responsible for notifying the project manager. The project manager resolves the issue with the client. The individual who recognizes an internal non-conformance is responsible for initiating corrective action (see also Section 14.2).

Departures from standard practices, policies and specifications are reviewed and approved by Technical Director, QA Officer and by Project Manager of the project affected.

8.1.2. ***Corrective & Preventative Action***

Once a quality problem has been identified, the analytical or review process stops, until the reason is identified. Primary responsibility for identifying the cause of the problem rests with the instrument operator. Other staff may be called on to assist in reaching the root cause. The problem prevention tracking system, using Corrective Action Tracking Records, provides a method to track

systemic problems until resolved/removed. The QA Officer is responsible for the record management with respect to the disposition of problems.

Deviations that do not limit themselves to a single department and/or client are cited on Corrective Action Record. This may include but not limited to: sample arrival outside of EPA specified holding time, analysis completion outside of EPA specified holding time (with explanation of the reason), inconsistencies between chain of custody and cooler contents, including labeling errors, improper preservation, etc.

Deviations from analytical methods' SOP's are reported by the Analyst to the Section Leader. Single occurrences warrant completion of Corrective Action Tracking Record, repetitive occurrences may indicate that either an additional training session is in order, or the SOP does not reflect proper laboratory practice. Training session is conducted by the Technical Director or by QA Officer. In case where SOP does not reflect current laboratory practice, SOP review and correction process may be initiated.

**8.2** ***Method Detection Limit Determination***. Annual method detection limit (MDL) studies are performed as appropriate for routine methods used in the laboratory. The procedure used for determining MDLs is described in 40 CFR, Part 136, Appendix B. Studies are performed for each method on water and soil matrices for every instrument that is used to perform the method. MDL determination studies are conducted at the RL level for both the Organic and Inorganic methods. MDLs are established at the instrument level. The highest MDL of the pooled instrument data is used to establish a laboratory MDL. The quality assurance staff manages the annual MDL determination process and is responsible for retaining MDL data on file. Valid MDL must be greater than 1/10 and less than spiking value. For majority of compounds for each method/matrix type. Accutest Laboratories Southeast employs a concept of verified MDL: the analyte undergoes entire preparation and analytical process at ½ to 1/5 of Reporting limit, and must be recovered at +/- 50% of the true value. Methods performed infrequently, such as, but not limited to, Acidity, may not have an MDL study conducted annually, but as need for the analysis is indicated by the client.

**8.3** ***Method Reporting Limit.*** The method reporting limit is established at the lowest concentration calibration standard in the calibration curve. The low calibration standard is selected by department managers as the lowest concentration standard that can be used while continuing to meet the calibration linearity criteria of the method being used. By definition, detected analytes at concentrations below the low calibration standard cannot be accurately quantitated and must be qualified accordingly.

**8.4** ***Reporting of Quantitative Data.*** Analytical data for all methods is reported without qualification to the reporting limit established for each method. Data may be reported to MDL depending upon the client's requirements provided that all qualitative identification criteria for the parameter have been satisfied. All parameters reported at

concentrations between the reporting limit and MDL are qualified as an estimated concentration.

**8.5** ***Precision and Accuracy Studies***. Annual precision and accuracy (P&A) studies, which demonstrate the laboratories ability to generate acceptable date, are performed for all routine methods used in the laboratory. The procedure used for generating organic P&A data is referenced in the majority of the regulatory methodology in use. The procedure requires quadruplicate analysis of a sample spiked with target analytes at a concentration in the working range of the method. This data may be compiled from a series of existing blank spikes or laboratory control samples. Accuracy (percent recovery) of the replicate analysis is averaged and compared to established method performance limits. Values within method limits indicate an acceptable performance demonstration.

**8.6** ***Method Selection.*** The Quality Assurance Staff maintains a list of active methods used for the analysis of samples. This list includes valid method references such as EPA, American Society of Testing and Materials (ASTM) or Standard Methods designations and the current version and version date.

Updated versions of approved reference methodology are placed into use as changes occur. The Quality Assurance Director informs operations management of changes in method versions as they occur. The operations management staff selects an implementation date. The operations staff is responsible for completing all method use requirements prior to the implementation date. This includes modification to SOPs, completion of MDL and precision and accuracy studies and staff training. Documentation of these activities is provided to the QA staff who retains this information on file. The updated method is placed into service on the implementation date and the old version is de-activated.

Multiple versions of selected methods may remain in use to satisfy client specific needs. In these situations, the default method version becomes the most recent version. Client specific needs are communicated to the laboratory staff using method specific analytical codes method, which clearly depict the version to be used. The old method version is maintained as an active method until the specified client no longer requires the use of the older version.

Accutest will not use methodology that represents significant departures from the reference method unless specifically directed by the client. In cases where clients direct the laboratory to use a method modification that represents a significant departure from the reference method, the request will be documented in the project file.

**8.7** ***Analytical Capabilities***. Table 8.1 provides a detailed listing of the methodology employed for the analysis of test samples.

Table 8.1 – Analytical Capabilities and Method References

| Method Type | Method Number | Regulatory Program |
|---|---|---|
| Organics – GC/MS: | | |
| Volatile Organics | EPA 624 | Clean Water Act |
| Semi-Volatile Organics | EPA 625 | Clean Water Act |
| Volatile Organics | SW846 – 8260B | RCRA |
| Semi-Volatile Organics | SW846 – 8270C | RCRA |
| Petroleum Hydrocarbons | Iowa OA-1 | RCRA |
| | | |
| Organics – GC: | | |
| | | |
| EDB and DBCP – DW | EPA 504.1 | Safe Drinking Water Act |
| Purgeable Halocarbons | EPA 601 | Clean Water Act |
| Purgeable Aromatics | EPA 602 | Clean Water Act |
| Chlorinated Pesticides & PCBs | EPA 608 | Clean Water Act |
| Poly-Aromatic Hydrocarbons | EPA 610 | Clean Water Act |
| Gasoline Range Organics | SW-846 – 8015B | RCRA |
| Diesel Range Organics | SW-846 – 8015B | RCRA |
| Alcohols | SW-846 – 8015B | RCRA |
| Dissolved Gases | RSK SOP 147-175 | RCRA |
| Volatile Aromatic/Halocarbons | SW-846 – 8021B | RCRA |
| Organochlorine Pesticides | SW-846 – 8081A | RCRA |
| Polychlorinated Biphenyls | SW-846 – 8082 | RCRA |
| Nitroaromatics | SW-846 – 8091 | RCRA |
| Polynuclear-Aromatic Hydrocarbons | SW-846 – 8100 | RCRA |
| Total Petroleum Hydrocarbons | FLPRO | RCRA |
| Tennessee EPH | TN-EPH | RCRA |
| Tennessee GRO | TN-GRO | RCRA |
| Wisconsin DRO | WI-DRO | RCRA |
| Petroleum Hydrocarbons | Iowa OA-1 | RCRA |
| Petroleum Hydrocarbons | Iowa OA-2 | RCRA |
| Volatile Petro. Hydrocarbons | Massachusetts VPH | MCP |
| Extractable Petro. Hydrocarbons | Massachusetts EPH | MCP |
| Polynuclear-Aromatic Hydrocarbons | SW-846 – 8310 | RCRA |
| Explosives | SW-846 – 8330 and 8332 | RCRA |
| Explosives | CAD 4.2 and CAD 8.2 | CHPPM |
| Thiodiglycol | Accutest in-house method (HPLC) | RCRA |
| | | |
| **Prep Methods:** | | |
| | | |
| Liquid/Liquid Extraction, Water | SW846 – 3510C | RCRA |

| | | |
|---|---|---|
| Solids Extraction by Sonication | SW846 – 3550B | RCRA |
| Acid/Base Partitioning | SW846 – 3650B | RCRA |
| Sulfur Cleanup of Extracts | SW846 – 3660B | RCRA |
| Sulfuric Acid Cleanup | SW846 – 3665A | RCRA |
| Purge & Trap - Aqueous | SW846 – 5030B | RCRA |
| Purge & Trap – Solids | SW846 – 5035 | RCRA |
| | | |
| Metals: | | |
| | | |
| Total Recov. Metals Digestion | EPA 200.7 | Clean Water Act |
| Non-Pot. Water Digest: ICP | SW846 3010A, | RCRA |
| Digestion of Soils for ICP | SW846 3050B | RCRA |
| ICP: General – EPA WW | EPA 200.7, 1983 | Clean Water Act |
| ICP (General – SW846 update) | SW846 6010B | RCRA |
| Cold Vapor Mercury – EPA WW | EPA 245.1, 1983 | Clean Water Act |
| Cold Vapor Mercury – EPA DW | EPA 245.1, 1994 | Safe Drinking Water Act |
| Cold Vapor Mercury – AQ | SW846 7470A | RCRA |
| Cold Vapor Mercury – Soils | SW846 7471A | RCRA |
| | | |
| General Chemistry: | | |
| | | |
| Organic Matter – Loss on Ignition | AASHTO T267-86M | AASHTO Method |
| Oxidation-Reduction Potential | ASTM D1498-76, mod. for solids | ASTM Standard |
| Percent Ash (dry basis) | ASTM D2974-87, D482-91 | ASTM Standard |
| Grain Size (hydrometer) | | ASTM Standard |
| Sieve Testing | ASTM D422-63 | ASTM Standard |
| Specific Gravity | ASTM D1298-85 | ASTM Standard |
| Tetraethyl Lead in Soils & Waters | ASTM D3341-87, mod. for solids | ASTM Standard |
| Acidity | EPA 305.1 | Clean Water Act |
| Alkalinity | EPA 310.1/SM18 2320B | Clean Water Act |
| CBOD | | Clean Water Act |
| COD | | Clean Water Act |
| BOD | EPA 405.1 | Clean Water Act |
| Chloride – titrimetric | EPA 325.3/SW846 9252A | Clean Water Act |
| Color, Apparent | EPA 110.2 | Clean Water Act |
| Dissolved Oxygen | EPA 360.1 | Clean Water Act |
| Fluoride | EPA 340.2 | Clean Water Act |
| Hardness | EPA 130.2 | Clean Water Act |
| Ion Chromatography (Bromide, Fluoride, Chloride, Sulfate, Nitrite, Nitrate,) – Aqueous | EPA 300.0 | Clean Water Act |
| Mineral Suspended Solids | EPA 160.2/160.4 | Clean Water Act |
| Total Kjeldahl Nitrogen | EPA 351.3 | Clean Water Act |
| Ammonia | EPA 350.2 | Clean Water Act |
| Nitrogen, Nitrite | EPA 354.1/SM18 4500NO2B | Clean Water Act |

| | | |
|---|---|---|
| Odor | EPA 140.1 | Clean Water Act |
| Oil & Grease, Gravimetric – AQ | EPA 9070 | RCRA |
| Oil & Grease, Gravimetric – AQ | EPA 413.1 | Clean Water Act |
| Oil & Grease, Gravimetric – AQ | EPA 1664 | Clean Water Act |
| Orthophosphate | EPA 365.2/SM18 4500PE | Clean Water Act |
| Organophosphonic Acids | Accutest in-house method (IC) | RCRA |
| Percent Solids | EPA 160.3 | Clean Water Act |
| Petroleum Hydrocarbons – AQ | EPA 418.1 | Clean Water Act |
| pH by electrode (Waters) | EPA 150.1 | Clean Water Act |
| Phenols – chloroform extraction | EPA 420.1 | Clean Water Act |
| Settleable Solids | EPA 160.5 | Clean Water Act |
| Specific Conductance | EPA 120.1 | Clean Water Act |
| Sulfate (Turbidimetric) | EPA 375.4 | Clean Water Act |
| Sulfide | EPA 376.1 | Clean Water Act |
| Sulfite | EPA 377.1 | Clean Water Act |
| Total Dissolved Solids | EPA 160.1/SM18 2540C | Clean Water Act |
| Total Mineral Solids | EPA 160.4 | Clean Water Act |
| Total Organic Carbon | EPA 415.1 | Clean Water Act |
| Total Residual Chlorine | EPA 330.5/SM18 4500CLF | Clean Water Act |
| Total Solids | EPA 160.3 | Clean Water Act |
| Total Suspended Solids | EPA 160.2 | Clean Water Act |
| Total Volatile Solids | EPA 160.4 | Clean Water Act |
| Turbidity | EPA 180.1 | Clean Water Act |
| Volatile Suspended Solids | EPA 160.2/160.4 | Clean Water Act |
| Total CN | EPA 335.1/2, SW846 9020 | CWA or RCRA |
| CN Amenable to Chlorination | EPA 335.1/2, SW846 9020 | CWA or RCRA |
| Perchlorate | EPA 314 | DWA, CWA |
| Waste Ignitability | SW846 1010 | CWA or RCRA |
| Bicarbonate, Carbonate, CO2 | SM18 4500 CO2D | None – Standard Method |
| Calcium Hardness by Calculation | SM18 2340B | None – Standard Method |
| Ferrous Iron | SM18 3500 FE-D | None – Standard Method |
| Hardness, Total by Calculation | SM18 2340B | None – Standard Method |
| MBAS (Anionic Surfactants as) | SM18 5540C | None – Standard Method |
| Salinity | SM18 2520B | None – Standard Method |
| Total Nitrogen by calculation (TKN + NO32) | SM18 4500N | None – Standard Method |
| Total Organic Nitrogen by calculation (TKN – AMN) | SM18 4500N | None – Standard Method |
| Hexavalent Chromium/soils | SW846 3060/7196A (NJDEP) | None-NJDEP Modification |
| Ion Chromatography (Bromide, Fluoride, Chloride, Sulfate, Nitrite, Nitrate, Sulfate) – Solids | SW846 9056 | RCRA |
| Corrosivity & pH – aqueous | SW846 9040B | RCRA |
| Corrosivity & pH – solid | SW846 9045B | RCRA |
| Waste Corrosivity | SW846 1110 | CWA or RCRA |

| | | |
|---|---|---|
| Hexavalent Chromium - soil | SW846 3060A/7196A | RCRA |
| Hexavalent Chromium - water | SW846 7196A | RCRA |
| Ignitability | SW846 Chp 7, SW1010, ASTM D93-90 | RCRA |
| Oil & Grease, Gravimetric (Soils) | SW846 9071A M-Solids | RCRA |
| Paint Filter Test | SW846 9095 | RCRA |
| Phenols with distillation | SW846 9066 | RCRA |
| Synthetic Precipitation Leaching Procedure (SPLP) | SW846 1312 | RCRA |
| Sulfide/Cyanide Reactivity | SW846 Chapter 7 | RCRA |
| Toxicity Characteristics Leaching Procedure (TCLP) | SW846 1311 | RCRA |

## 9.0 SAMPLE MANAGEMENT, LOGIN, CUSTODY, STORAGE AND DISPOSAL

***Requirement***: A system to ensure that client supplied product is adequately evaluated, acknowledged, and secured upon delivery to the laboratory must be practiced by the laboratory. The system must assure that chain of custody is maintained and that sample receipt conditions and preservation status are documented and communicated to the client and internal staff. The login procedure must assign, document, and map the specifications for the analysis of each unique sample to assure that the requested analysis is performed on the correct sample and enables the sample to be tracked throughout the laboratory analytical cycle. The system must include procedures for reconciling defects in sample condition or client provided data, which occur at sample arrival. The system must specify the procedures for proper sample storage, transfer to the laboratory, and disposal after analysis. The system must be documented in a standard operating procedure.

**9.1** ***Order Receipt and Entry***. New orders are initiated and processed by the client services group (See Chapter 14, Procedures for Executing Client Specifications). The new order procedure includes mechanisms for providing bottles to clients, which meet the size, cleanliness, and preservation specifications for the analysis to be performed.

For new orders, the project manager prepares a bottle request form, which is submitted to sample management. This form provides critical project details to the sample management staff, which are used to prepare and assemble the sample bottles for shipment to the client prior to sampling.

The bottle order is assembled using bottles that meet USEPA specifications for contaminant free sample containers. Accutest-SE uses a combination of pre-cleaned bottles, which are purchased from commercial suppliers and bottles that are checked for cleanliness. Precleaned bottle certificates are reviewed by both the analyst and sample management technician. Results of bottle analyses are retained for 5 years.

All preservative solution are prepared in the laboratory and are checked to assure that they are free of contamination from the compounds being analyzed before being released for use. Sample management department retains a copy of the documentation of in-house contamination checks.

Reagent water for trip and field blanks is poured into appropriately labeled containers. All bottles are packed into ice chests with blank chain of custody forms and the original bottle order from. Completed bottle orders are delivered to clients using Accutest couriers or commercial carriers for use in field sample collection.

**9.2** ***Sample Receipt and Custody***. Samples are delivered to the laboratory using a variety of mechanisms including Accutest couriers, commercial shippers, and client self-delivery. Documented procedures are followed for arriving samples to assure that custody and integrity are maintained and that handling and preservation requirements are documented and continued.

Sample custody documentation is initiated when the individual collecting the sample collects field samples. Custody documentation includes all information necessary to provide an unambiguous record of sample collection, sample identification, and sample collection chronology. Initial custody documentation employs either Accutest or client generated custody forms.

Accutest generates a chain of custody in situations where the individuals who collected the sample did not generate custody documentation in the field.

Accutest defines sample custody as follows:

- The sample is in the actual custody or possession of the assigned responsible person,

- The sample is in a secure area.

The Accutest facility is defined as a secure facility. Perimeter security has been established, which limits access to authorized individuals only. Visitors enter the facility through the building lobby and must register with the receptionist prior to entering controlled areas. While in the facility, visitors are required to wear a badge and must be accompanied by their hosts at all times. After hours, building access is controlled using a computerized pass-key reader system. This system limits building access to individuals with a pre-assigned authorization status. After hours visitors are not authorized to be in the building. Clients delivering samples after hours must make advanced arrangements through client services and sample management to assure that staff is available to take delivery and maintain custody.

Upon arrival at Accutest, the sample custodian reviews the chain of custody for the samples received to verify that the information on the form corresponds with the samples delivered. This includes verification that all listed samples are present and properly labeled, checks to verify that samples were transported and received at the required temperature, verification that the sample was received in proper containers, verification that sufficient volume is available to conduct the requested analysis, and a check of individual sample containers to verify test specific preservation requirements including the absence of headspace for volatile compound analysis.

Sample conditions and other observations are documented on the chain of custody by the sample custodian prior to completing acceptance of custody. The sample custodian accepts sample custody upon verification that the custody document is correct. Discrepancies or non-compliant situations are documented and communicated to the Accutest project manager, who contacts the client for resolution. The resolution is documented and communicated to sample management for execution.

**9.3** ***Sample Acceptance Policy***. Incoming samples must satisfy Accutest's sample acceptance criteria before being logged into the system. Sample acceptance is based on the premise that clients have exercised proper protocols for sample collection. This

includes sufficient volume, proper chemical preservation, temperature preservation, sample container sealing and labeling, and appropriate shipping container packing.

The sample management staff will make every attempt to preserve improperly preserved samples upon arrival. However, if preservation is not possible, the samples may be refused unless the client authorizes analysis. No samples will be accepted if holding times have been exceeded or will be exceeded before analysis can take place unless the client authorizes analysis.

Sample acceptance criteria include proper custody and sample labeling documentation. Proper custody documentation includes an entry for all physical samples delivered to the laboratory with an identification code that matches the sample bottle and a date and signature of the individual who collected the sample and delivered them to the laboratory.
Accutest reserves the right to refuse any sample which in its sole and absolute discretion and judgement is hazardous, toxic and poses or may pose a health, safety or environmental risk during handling or processing.

**9.4** ***Assignment of Unique Sample Identification Codes***. Unique identification codes must be assigned to each sample bottle to assure traceability and unambiguously identify the tests to be performed in the laboratory.

The sample identification coding process begins with the assignment of a unique alphanumeric job number. A job is defined as a group of samples received on the same day, from a specific client pertaining to a specific project. A job may consist of groups of samples received over multi-day period. The first character of the job number is an alpha-character that identifies the laboratory facility. The next characters are numeric and sequence by one number with each new job.

Unique sample numbers are assigned to each bottle collected as a discrete entity from a designated sample point. This number begins with the job number and incorporates a second series of numbers beginning at one and continuing chronologically for each point of collection. The test to be performed is clearly identified on the bottle label.

Alpha suffixes may be added to the sample number to identify special designations such as subcontracted tests, in-house QC checks, or re-logs. Multiple sample bottles for a specific analysis are labeled Bottle 1, Bottle 2, etc.

**9.5** ***Subcontracted Analysis***. Subcontract laboratories are employed to perform analysis not performed by Accutest. The quality assurance staff evaluates subcontract laboratories to assure their quality processes meet the standards of the environmental laboratory industry prior to engagement. Throughout the subcontract process, Accutest follows established procedures to assure that sample custody is maintained and the data produced by the subcontractor meets established quality criteria.

Accutest network laboratories are considered primary subcontractors.

*Subcontracting Procedure***.** Subcontracting procedures are initiated through several mechanisms, which originate with sample management. Samples for analysis by a subcontractor are logged into the Accutest system using regular login procedures. If subcontract parameters are part of the project or sample management has received subcontracting instructions for a specific project, a copy of the chain of custody is given to the appropriate project manager with the subcontracted parameters highlighted. This procedure triggers the subcontract process at the project management level. The project manager contacts an approved subcontractor to place the subcontract order. A subcontract order form (SOF) is simultaneously prepared in electronic format, by the project manager and filed with the original chain of custody. Client is notified in writing of the requirement to subcontract to the outside laboratory. The SOF and the subcontract chain of custody are forwarded to sample management, via E-Mail, for processing. A copy is filed with the original CoC.
Sample management signs the subcontract chain of custody and ships the sample(s) to the subcontractor. The subcontract COC is filed with the original
COC and the request for subcontract. Copies are distributed to the login department, the project manager, and sample management.

Subcontractor data packages are reviewed by the QA Staff to assess completeness and quality compliance. If completeness defects are detected, the subcontractor is asked to immediately upgrade the data package. If data quality defects are detected, the package is forwarded to the QA staff for further review. The QA staff will pursue a corrective action solution before releasing data to the client.

Approved subcontract data is entered into the laboratory information management system (LIMS) if possible and incorporated into the final report. All subcontract data is footnoted to provide the client with a clear indication of its source. Copies of original subcontract data are included in the data report depending on the reporting level specified by the client

*Subcontract Laboratory Evaluation***.** The QA staff evaluates subcontract laboratories prior to engagement. The subcontract laboratory must provide Accutest with a valid certification to perform the requested analysis, a copy of the laboratory Quality Systems Manual, copies of SOPs used for the subcontracted analysis, a copy of the most recent performance evaluation study for the subcontracted parameter, and copies of the most recent regulatory agency or third party accreditor audit report. Certification verification, audit reports and performance evaluation data must be submitted to Accutest annually. If possible, the QA staff conducts a site visit to the laboratory to inspect the quality system. Qualification of a subcontract laboratory may be bypassed if the primary client directs Accutest to employ a specific subcontractor.

**9.6** ***Sample Storage***. Following sample custody transfer, samples are assigned to various refrigerated storage areas by the sample custodian depending upon the test to be performed and the matrix of the samples. The location (refrigerator and shelf) of each sample is recorded on the chain of custody adjacent to the line corresponding to each sample number and also entered into the LIMS. Samples remain in storage until the laboratory technician transfers them into the laboratory for analysis.

All internal Chains of Custody must be completed regardless of who performs the transfer.

Samples for volatile organics analysis are placed in storage in designated refrigerators by the sample custodian and immediately transferred to the organics group control. Sample custody is transferred to the department designee. These samples are segregated according to matrix to limit opportunities for cross contamination to occur.

Organics staff is authorized to retrieve samples from these storage areas for analysis. When analysis is complete, the samples are placed back into storage.

**9.7** ***Sample Login***. Following sample custody transfer to the laboratory, the documentation that describes the clients analytical requirements are delivered to the sample login group for coding and entry to the Laboratory Information management System (LIMS). This process translates all information related to collection time, turnaround time, sample analysis, and deliverables into a code which enables client requirements to be electronically distributed to the various departments within the laboratory for scheduling and execution.

**9.9** ***Sample Retrieval for Analysis***. It is a responsibility of individual analyst to retrieve samples for analysis. Sample Management employs a program to facilitate sample placement and retrieval. All internal Chains of Custody must be completed.
After sample analysis has been completed, the analyst places the sample back into the storage and completes Internal COC.

**9.10** ***Sample Disposal***. Accutest retains all samples under proper storage for a minimum of 30 days following completion of the analysis report. Longer storage periods are accommodated on a client specific basis if required. Samples may also be returned to the client for disposal.

Accutest disposes of all laboratory wastes following the requirements of the Resource Conservation and Recovery Act (RCRA). The Company's has obtained and maintains a waste generator identification number, FLR00001263309002 (FLR designates State of Florida).

Sample management generates a sample disposal dump sheet from the LIMS tracking system each week, which lists all samples whose holding period has expired. Data from each sample is compared to the hazardous waste criteria established by the Florida Department of Environmental Protection (FDEP).

Samples containing constituents at concentrations above the criteria are labeled as hazardous and segregated into six separate waste categories for disposal as follows:

* Organic extracts: Chlorinated solvents
* Mixed flammable solvents (hexane, acetone, toluene, acetonitrile)
* Waste oil
* Soil (solids)
* Aqueous

* Corrosive waste

Non-hazardous aqueous samples are diluted and disposed directly into the laboratory sink. All aqueous liquids pass through a neutralization system before entering the municipal system.

Non-hazardous solids are disposed as municipal waste. Sample bottles are disposed as recyclable waste in order to crush the bottles and destroy the labels.

Laboratory wastes are collected by waste stream in designated areas throughout the laboratory. Waste streams are consolidated daily by the waste custodian and transferred to stream specific drums for disposal through a permitted waste management contractor. Filled, consolidated drums are tested for hazardous characteristics and scheduled for removal from the facility for appropriate disposal based on the laboratory data.

## 10.0 LABORATORY INSTRUMENTATION AND MEASUREMENT STANDARDS

***Requirement***: Procedures, which assure that instrumentation is performing to a pre-determined operational standard prior to the analysis of any samples, must be established by the laboratory. In general, these procedures will follow the regulatory agency requirements established in promulgated methodology. These procedures must be documented and incorporated into the standard operating procedures for the method being executed.

**10.1** ***Mass Tuning – Mass Spectrometers***. The mass spectrometer tune and sensitivity must be monitored to assure that the instrument is assigning masses and mass abundances correctly and that the instrument has sufficient sensitivity to detect compounds at low concentrations. This is accomplished by analyzing a specific mass tuning compound at a fixed concentration. If the sensitivity is insufficient to detect the tuning compound, corrective action must be performed prior to the analysis of standards or samples. If the mass assignments or mass abundances do not meet criteria, corrective action must be performed prior to the analysis of standards or samples.

**10.2** ***Wavelength Verification – Spectrophotometers***. Spectrophotometer detectors are checked on a regular schedule to verify proper response to the wavelength of light needed for the test in use. If the detector response does not meet specifications, corrective action (detector adjustment or replacement) is performed prior to the analysis of standards or samples.

**10.3** ***Inter-element Interference Checks (Metals)***. Inductively Coupled Plasma Emission Spectrophotometers (ICP) are subject to a variety of spectral interferences, which can be minimized or eliminated by applying interfering element correction factors and background correction points. Interfering element correction factors are checked on a specified frequency through the analysis of check samples containing high levels of interfering elements. Analysis of single element interferent solutions is also conducted at a specified frequency.

If the check indicates that the method criteria has not been achieved for any element in the check standard, the analysis is halted and data from the affected samples are not reported. Sample analysis is resumed after corrective action has been performed and the correction factors have been re-calculated.

New interfering element correction factors are calculated and applied whenever the checks indicate that the correction factors are no longer meeting criteria. At a minimum, correction factors are replaced once a year.

**10.4** ***Calibration and Calibration Verification***. Many tests require calibration using a series of reference standards to establish the concentration range for performing quantitative analysis. Method specific procedures for calibration are followed prior to any sample analysis.

Calibration is performed using a linear regression calculation or calibration factors calculated from the curve. The calibration must meet method specific criteria for linearity or precision. If the criteria are not achieved, corrective action (re-calibration or instrument maintenance) is performed. The instrument must be successfully calibrated before analysis of samples can be conducted.

Initial calibration for metals analysis performed using inductively coupled plasma (ICP) employs the use of a two standards and a calibration blank to establish linearity. The calibration blank contains all reagents that are placed into the calibration standard with the exception of the target elements. Valid calibration blanks must not contain any target elements.

Initial calibrations must be initially verified using a single concentration calibration standard from a second source (i.e. separate lot or different provider). The continuing validity of an existing calibration must be regularly verified using a single concentration calibration standard. The response to the standard must meet pre-established criteria that indicate the initial calibration curve remains valid. If the criteria are not achieved corrective action (re-calibration) is performed before any additional samples may be analyzed.

**10.5** ***Linear Range Verification and Calibration (ICP Metals)*** A linear range verification is performed for all ICP instrumentation. The regulatory program or analytical method specifies the verification frequency. A series of calibration standards are analyzed over a broad concentration range. The data from these analyses are used to determine the valid analytical range for the instrument. ICP instrument calibration is routinely performed using a single standard at a concentration within the linear range and a blank.

Some methods or analytical programs require a low concentration calibration check to verify that instrument is sufficient to detect target elements at the reporting limit. The analytical method or regulatory program defines the criteria used to evaluate the low concentration calibration check. If the low calibration check fails criteria, corrective action is performed and verified through reanalysis of the low concentration calibration check before continuing with the field sample analysis.

In accordance with NELAC standards minimum number of calibration points in the absence of method-specific requirements is two calibration points and a blank.

**10.6** ***Retention Time Verification (GC/HPLC/IC)***. Chromatographic retention time windows are developed for all analysis performed using gas chromatographs with conventional detectors. The windows establish the time range required for the elution of a specified target analyte on the primary and confirmation columns. Retention times must be confirmed regularly through the analysis of an authentic standard. If the target analytes do not elute within the defined range, new windows are defined using the procedures described in the methodology.

## 10.7 ***Equipment List***.

Table 10.7 Accutest Laboratories Equipment List

| **Organics** | | | |
|---|---|---|---|
| **Instrument** | **Model** | **Serial #** | **Year** |
| GC/MS | Hewlett-Packard 5973 MSD/HP 7683 AS | CN10417014 | 2004 |
| GC/MS | Hewlett-Packard 5973 MSD/HP 7683 AS | CN10418032 | 2004 |
| GC/MS | Hewlett-Packard 5973 MSD/HP 7683 AS | US21843765 | 2002 |
| GC/MS | Hewlett-Packard 5973 MSD/OI 4552/4560 Archon | US21844034 | 2002 |
| GC/MS | Hewlett-Packard 5973 MSD/OI 4552/4560 Archon | US02440350 | 2000 |
| GC/MS | Hewlett-Packard 5973 MSD/OI 4552/4560 Archon | US94240108 | 1999 |
| GC/MS | Hewlett-Packard 5973 MSD/HP 7683 AS | US82311290 | 1998 |
| GC/MS | Hewlett-Packard 5973 MSD/HP 7683 AS | US81211109 | 1998 |
| GC/MS | Hewlett-Packard 5970 MSD/OI 4552/4560 Archon | 3034A12782 | 1989 |
| GC/MS | Hewlett-Packard 5970 MSD/OI 4552/4560 Archon | 2905A11904 | 1987 |
| GC/MS | Hewlett-Packard 5970 MSD/OI 4552/4560 Archon | 2716A10454 | 1987 |
| GC | Hewlett-Packard6890/PID/PID/OI 4552/4560 Archon | CN10421047 | 2004 |
| GC | Hewlett-Packard6890/PID/FID/OI 4552/4560 Archon | US10239007 | 2002 |
| GC | Hewlett-Packard 6890N/Dual FID/HP 7683 AS | CN10425061 | 2004 |
| GC | Hewlett-Packard 6890N/Dual ECD/HP 7683 AS | US10333015 | 2003 |
| GC | Hewlett-Packard 6890/Dual ECD/HP 7683 AS | US00036916 | 2000 |
| GC | Hewlett-Packard 6890/Dual ECD/HP 7683 AS | US00028304 | 1999 |
| GC | Hewlett-Packard 5890/Dual FID/HP 7673 AS | 3336A61096 | 1995 |
| GC | Hewlett-Packard 5890/PID/ELCD/ OI 4552/4560 Archon | 3336A60617 | 1995 |
| GC | Hewlett-Packard 5890/Dual FID/HP 7673 AS | 3336A59489 | 1995 |
| GC | Hewlett-Packard 5890/PID/FID/ OI 4552/4560 Archon | 3336A51045 | 1995 |
| GC | Hewlett-Packard 5890/PID/ELCD/OI 4552/4560 Archon | 3203A41646 | 1992 |
| GC | Hewlett-Packard 5890/Dual FID/HP 7673 AS | 3126A51085 | 1991 |
| GC | Hewlett-Packard 5890/Dual ECD/HP 7673 AS | 2921A24618 | 1990 |
| GC | Hewlett-Packard 5890/PID/FID/ dual MPM 16 | 3029A29748 | 1990 |
| GC | Hewlett-Packard 5890/FID | 2843A20183 | 1988 |
| GC | Hewlett-Packard 5890/Dual ECD/HP 7673 AS | 2728A14096 | 1987 |
| HPLC | Hewlett-Packard 1100 Automated LC System | DE91604217 | 2004 |
| HPLC | Hewlett-Packard 1100 Automated LC System | DE83700740 | 1999 |
| HPLC | Hewlett-Packard 1100 Automated LC System | DE01608404 | 2000 |

| | | | |
|---|---|---|---|
| HPLC | Hewlett-Packard 1050Q Automated LC System | 3149G01430 | 1996 |
| O-Prep | TurboVap 4 units | | 2001 |
| O-Prep | TurboVap 3 units | | 2004 |
| O-Prep | Sonicator 4 units | | 2001 |
| O-Prep | Sonicator 2 units | | 2004 |
| O-Prep | Midi-Vap 2000 Kontes | 479200-2000 | 2000 |
| Data System | Hewlett-Packard/EnviroQuant | | 1999 |

| **Inorganics** | | | |
|---|---|---|---|
| **Instrument** | **Model** | **Serial #** | **Year** |
| ICP | TJA EnviroTrace 61E Simultaneous | 348490 | 1994 |
| ICP | TJA EnviroTrace 61E Simultaneous | 470790 | 1997 |
| Mercury Analyzer | Leeman Hydra AA | 2022 | 2002 |
| TOC Analyzer | Shimadzu | | 2004 |
| IC | Dionex DX-500 | 99030664 | 1999 |
| IC | Dionex | | 2004 |
| Centrifuge | CentraCL2 | 42613052 | 2003 |
| Spectrophotometer | Milton-Roy Spectronic 200 | | 2000 |
| | | | |

| **LIMS** | | |
|---|---|---|
| **Instrument** | **Model** | **Year** |
| LIMS | HP True 64 | 1999 |

## 11.0 INSTRUMENT MAINTENANCE

***Requirement***. Procedures must be established for equipment maintenance. The procedure may include a maintenance schedule if required or documentation of daily maintenance related activities. All instrument maintenance activities must be documented in instrument specific logbooks.

**11.1** ***Routine, Daily Maintenance***. Routine, daily maintenance is required on an instrument specific basis. It is performed each time the instrument is used. Daily maintenance traditionally includes activities to insure a continuation of good analytical performance. In some cases, they include performance checks that indicate whether non-routine maintenance is required. If the performance check indicates a need for higher level maintenance, the equipment is taken out of service until maintenance is performed. Analysis cannot be continued until the performance checks meet established criteria. Daily maintenance is the responsibility of the individual assigned to the instrument used for the analysis he is performing.

**11.2** ***Non-routine Maintenance***. Non-routine maintenance is reserved for catastrophic occurrences such as instrument failure. The need for non-routine maintenance is indicated by failures in general operating systems, that result in an inability to conduct required performance checks or calibration. Equipment in this category are taken out of service and repaired before attempting further analysis. Analysis cannot continue until the instrument meets all performance check criteria and is capable of being calibrated. Section supervisors are responsible for identifying non-routine maintenance episodes and initiating repair activities to bring the equipment on-line. This may include initiating telephone calls to maintenance contractors if necessary. They are also responsible for documenting all details related to the occurrence and the repair.

**11.3** ***Scheduled Maintenance***. Modern laboratory instrumentation rarely requires regular preventative maintenance. Where required, the equipment is placed on a schedule, which dictates when maintenance is required. Examples include annual balance calibration by an independent provider and optical alignment of the ICP. Section supervisors are responsible for initiating scheduled maintenance on equipment that requires scheduled preventative attention. Scheduled maintenance is documented using routine documentation practices.

**11.4** ***Maintenance Documentation***. Routine and non-routine maintenance activities are documented in logbooks assigned to instruments and equipment used for analytical measurements. The logbooks contain preprinted forms, which specify the maintenance activities required with each use. Accutest Laboratories Southeast has adopted a problem – action – follow-up format to conduct instrument maintenance.The analyst or supervisor who performs or initiates the maintenance activity is required to check the activity upon its completion and initial the form. Non-routine maintenance (i.e. repairs, upgrades, etc.) is documented in a separate service log.

## 12.0 QUALITY CONTROL PARAMETERS, PROCEDURES, AND CORRECTIVE ACTION

***Requirement***: All procedures used for test methods must incorporate quality control parameters to monitor elements that are critical to method performance. Each quality parameter includes acceptance criteria that have been established by regulatory agencies for the methods in use. Criteria may also be established through client dictates or through the accumulation and statistical evaluation of internal performance data. Data obtained from these parameters must be evaluated by the analyst, and compared to established method criteria. If the criteria are not achieved, the procedures must specify corrective action and conformation of control before proceeding with sample analysis. QC parameters, procedures, and corrective action must be documented within the standard operating procedures for each method. In the absence of client specific objectives the laboratory must define qualitative objectives for completeness and representativeness of data.

**12.1** ***Procedure***. Bench analysts are responsible for methodological quality control and sample specific quality control. Each method specifies the control parameters to be employed for the method in use and the specific procedures for incorporating them into the analysis. These control parameters are analyzed and evaluated with every designated sample group (batch).

The data from each parameter provides the analyst with critical decision making information on method performance. The information is used to determine if corrective action is needed to bring the method or the analysis of a specific sample into compliance. These evaluations are conducted throughout the course of the analysis. Each parameter being indicative of a critical control feature. Failure of a methodological control parameter is indicative of either instrument or batch failure. Failure of a sample control parameter is indicative of control difficulties with a specific sample or samples.

**Sample Batch.** All samples analyzed in the laboratory are assigned to a designated sample batch, which contains all required quality control samples and a defined maximum number of field samples that are prepared and/or analyzed over a defined time period. The maximum number of field and quality control samples in the batch is 20. The typical batch contains a blank, laboratory control sample (LCS or spiked blank), matrix spike and matrix spike duplicate. Batch documentation includes lot specifications for all reagents and standards used during preparation of the batch.

**12.2** ***Methodological Control Parameters and Corrective Action***. Prior to the analysis of field sample the analyst must determine that the method is functioning properly. Specific control parameters indicate whether critical processes meet specified requirements before continuing with the analysis. Method specific control parameters must meet criteria before sample analysis can be conducted. Each of these parameters is related to processes that are under the control of the laboratory and can be adjusted if out of control.

**Method Blank.** A method blank is analyzed during the analysis of any field sample. The method blank is defined as a sample. It contains the same standards (internal standards, surrogates, matrix modifiers, etc.) and reagents that are added to the field sample during analysis, with the exception of the sample itself. If the method blank contains target analytes(s) at concentrations that exceed method or client requirements (typically defined as method detection limit concentrations), the source of contamination is eliminated before proceeding with sample analysis. In specific cases, contamination detected in the method blank may be acceptable if the concentrations do not exceed regulatory limits or client defined reporting limits.

**Laboratory Control Samples (LCS or Spiked Blanks).** A laboratory control sample (spiked blank or commercially prepared performance evaluation sample) is analyzed along with field samples to demonstrate that the method accuracy is within acceptable limits. These spike solutions are derived from different sources than the solutions used for method calibration. The performance limits are derived from published method specifications or from statistical controls generated from laboratory method performance data. Spiked blanks are blank matrices (reagent water or clean sand) spiked with the targeted parameters and analyzed using the same method used for samples. Accuracy data is compared to laboratory experimentally derived limits to determine if the method is in control. Laboratory control samples (LCS) are commercially prepared spiked samples in an inert material. Performance criteria for recovery of spiked analytes is pre-established by the commercial entity preparing the sample. This sample is analyzed in the laboratory as an external reference.

Accuracy data is compared to the applicable performance limits. If the spike accuracy exceeds the performance limits, corrective action, as specified in the SOP for the method is performed and verified before continuing with a field sample analysis. In some cases, decisions are made to continue with sample analysis if performance limits are exceeded; provided the unacceptable result has no negative impact on the sample data.

Blanks and spikes are routinely evaluated before samples are analyzed. However, in situations where sample analysis is performed using an autosampler, they may be evaluated after sample analysis has occurred. If the blanks and spikes do not meet criteria, sample analysis is repeated.

**Proficiency Testing.** Performance evaluation samples (PEs) are single or double blind spikes, introduced to the laboratory to assess method performance. PEs may be introduced as double blinds submitted by commercial clients, single or double blinds from regulatory agencies, or internal blinds submitted by the QA group.

A minimum of two single blind studies must be performed each year for every parameter in aqueous and solid matrices for each field of testing for which the laboratory maintains accreditation. Proficiency samples must be purchased as blinds from an NIST NVLAP accredited vendor. Data from these studies are provided to the

laboratory by the vendor and reported to accrediting agencies. If unsatisfactory performance is noted, corrective action is performed to identify and eliminate any sources of error. A new single blind must be analyzed to demonstrate continuing proficiency.

PE samples performed for accrediting agencies or clients, which do not meet performance specifications, require a written summary that documents the corrective action investigation, findings, and corrective action implementation.

Single or double blind proficiency test samples are employed for self-evaluation purposes. Data from these analyses are compared to established performance limits. If the data does not meet performance specifications, the system is evaluated for sources of acute or systematic error. If required, corrective action is performed and verified before initiating or continuing sample analysis.

**Trend Analysis for Control Parameters.** Accuracy data for selected spiked parameters from the laboratory control sample (LCS) is statistically evaluated daily for trends. Data from selected LCS parameters and surrogates are pooled on a method, matrix, and instrument basis. This data is evaluated by comparison to existing control and warning limits. Trend analysis is performed automatically as follows:

- Any point outside the control limit
- Any three consecutive points between the warning and control limits
- Any eight consecutive points on the same side of the mean.
- Any six consecutive points increasing or decreasing

The results of the trend analysis are printed for supervisory evaluation prior to sample analysis. Trends that indicate the potential loss of statistical control are further evaluated to determine the impact on data quality and to determine if corrective action is necessary. If corrective action is indicated, the supervisor informs the analysts of the corrective actions to be performed. Return to control is demonstrated before analysis resumes.

**12.3** ***Sample Control Parameters and Corrective Action***. The analysis of samples can be initiated following a successful demonstration that the method is operating within established controls. Additional controls are incorporated into the analysis of each sample to determine if the method is functioning within established specifications for each individual sample. Sample QC data is evaluated and compared to established performance criteria. If the criteria are not achieved the method or the SOP specifies the corrective action required to continue sample analysis. In many cases, failure to meet QC criteria is a function of sample matrix and cannot be remedied. Each parameter is designed to provide quality feedback on a defined aspect of the sampling and analysis episode.

**Duplicates.** Duplicate sample analysis is used to measure analytical precision. This can also be equated to laboratory precision for homogenous samples. Precision

criteria are method dependent. If precision criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

**Laboratory Control Duplicate, Spikes & Spiked Duplicates.** Spikes and spiked duplicates are used to measure analytical precision and accuracy for the sample matrix selected. Precision and accuracy criteria are method dependent. If precision and accuracy criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

**Serial Dilution (Metals).** Serial dilutions of metals samples are analyzed to determine if analytical matrix effects may have impacted the reported data. If the value of the serially diluted samples does not agree with the undiluted value within a method-specified range, the sample matrix may be causing interference, which may lead to either a high or low bias. If the serial dilution criterion is not achieved, it must be flagged to indicate possible bias from matrix effects. *Accutest-SE uses this procedure as opposed to post-digestion spike.*

**Post Digestion Spikes**. Digested samples are spiked and analyzed to determine if matrix interferences are creating biases in the results. If the value of the spike is outside the control limits established in the method, the sample is diluted and re-analyzed as a spiked and unspiked sample to minimize the impact of the sample matrix on the analysis. The process is repeated until the post spike accuracy meets the method criteria.

**Method of Standard Addition.** The method of additions may be used to eliminate interferences for metals analysis performed by graphite furnace if the matrix interference is not eliminated with dilutions. Known, fixed amounts of different standards are added to several aliquot of a sample immediately prior to analysis. The sample aliquots are analyzed in sequence. A linear regression is calculated for the aliquots. The absolute value of the negative x-intercept is defined as the sample value. MSA criteria is satisfied if the linear regression correlation coefficient is 0.995 or better and the associated method blank value is less than the detection limit.

**Surrogate Spikes (Organics).** Surrogate spikes are organic compounds that are similar in behavior to the target analytes but unlikely to be found in nature. They are added to all quality control and field samples to measure method performance for each individual sample. Surrogate accuracy limits are derived from published method specifications or by statistical evaluation of laboratory generated surrogate accuracy data. Accuracy data is compared to the applicable performance limits. If the surrogate accuracy exceeds performance limits, corrective action, as specified in the method or SOP is performed before sample data can be reported.

**Internal Standards (Organic Methods).** Internal standards are retention time and instrument response markers added to every sample to be used as references for

quantitation. Their response is compared to reference standards and used to evaluate instrument sensitivity on a sample specific basis. Internal standard retention time is also compared to reference standards to assure that target analytes are capable of being located by their individual relative retention time.

If internal standard response criteria are not achieved, corrective action or additional action may be required. The recommended action must be completed before sample data can be reported.

If the internal standard retention time criteria are not achieved corrective action or additional action may be required. This may include re-calibration and re-analysis. Additional action must be completed before sample data is reported.

**Internal Standards (ICP Metals).** Internal standards are used on some ICP instruments to compensate for variations in response caused by differences in sample matrices. This adjustment is performed automatically during sample analysis. The internal standard response of replicated sample analysis is monitored to detect potential analytical problems. If analytical problems are suspected, then the field samples are reanalyzed.

**12.4** ***Laboratory Derived Quality Control Criteria.*** Control criteria for in-house methods and client specific modifications that exceed the scope of published methodology are defined and documented prior to the use of the method. The responsibility for control criteria needs is identified by the Quality Assurance Director. Control parameters and criteria, based on best technical judgement are established using input provided by the operations staff. These control parameters and criteria are documented and incorporated into the method.

The laboratory derived criteria are evaluated for technical soundness on spiked samples prior to the use of the method on field samples. The technical evaluation is documented and archived by the Quality Assurance Staff.

When sufficient data form the laboratory developed control parameter is accumulated, the data is statistically processed and the experimentally derived control limits are incorporated into the method.

**12.5** ***Bench Review & Corrective Action***. The bench chemists are responsible for all QC parameters. Before proceeding with sample analysis, they are required to successfully meet all instrumental QC criteria. They have the authority to perform any necessary corrective action before proceeding with sample analysis. Their authority includes the responsibility for assuring that departures from documented policies and procedures do not occur.

The bench chemists are also responsible for all sample QC parameters. If the sample QC criteria are not achieved, they are authorized and required to perform the method specified corrective action before reporting sample data.

**12.6** ***QA Monitoring***. The QA staff prior to client release conducts a spot review of completed data packages. This review includes an examination of QC data for compliance and trends indicative of systematic difficulties. If non-conformances are detected, the QA staff places an immediate stop on the release of the data and initiates corrective action to rectify the situation. The data package is released when the package becomes compliant with all quality requirements.

If the review reveals trends indicative of systematic problems, QA initiates an investigation to determine the cause. If process defects are detected, a corrective action is implemented and monitored for effectiveness.

**Performance Limits**. The Quality Assurance Officer is responsible for compilation and maintenance of all precision and accuracy data used for performance limits. Quality control data for all test methods are accumulated and stored in the laboratory information management system (LIMS). Parameter specific QC data is extracted annually and statically processed to eliminate outliers and develop laboratory specific warning limits and confidence limits. The new limits are reviewed and approved by the supervisory staff prior to their use for data assessment. The new limits are used to evaluate QC data for compliance with method requirements for a period of one year. Laboratory generated limits appear on all data reports.

**12.7** ***Data Package Review***. Accutest employs multiple levels of data review to assure that reported data has satisfied all quality control criteria and that client specifications and requirements have been met. Three departments have data review requirements, which must be conducted before data is released to the client.

**Analytical Review.** The analyst conducts the primary review of all data. This review begins with a check of all instrument and method quality control and progresses through sample quality control concluding with a check to assure that the client's requirements have been executed. The analyst has the authority and responsibility to perform corrective action for any out-of-control parameter or nonconformance at this stage of review.

Secondary data reviews are performed at the peer level by analysts who have met the qualification criteria for the method in use. Qualification requirements include a valid demonstration of capability and demonstrated understanding of the method SOP. Section supervisors may perform secondary review in-lieu of a peer review Supervisors review 100% of the data produced by their department. It includes a check of all manual calculations; an accuracy check of manually transcribed data from bench sheets to the LIMS, a check of all QC criteria and a comparison of the data package to client specified requirements. Supervisors have the authority to reject data and initiate re-analysis, corrective action, or reprocessing.

All laboratory data requiring manual entry into LIMS system is double checked by the analysts performing initial data entry and the section supervisor. Verification of

supervisory review is indicated on the raw data summary by the supervisor's initials and date.

Electronic data that is manually edited at the bench by the primary analysts is automatically flagged by the instrument data system indicating an override by the analyst. All manual overrides must be verified and approved by a supervisor who initials and dates all manual changes.

Hard copies of manually integrated chromatographic peaks are printed that clearly depict the manually drawn baseline. The hard copy is reviewed and approved by the section supervisor (initialed and dated) and included in the data package of all full tier reports or the archived batch records of commercial report packages.

Electronic data that has been committed to the LIMS can only be edited by a manager or supervisor. These edits may be required if needs for corrections are indicated during the final review. An audit record for all electronic changes in the LIMS is automatically appended to the record.

The group manager performs a tertiary review on a spot check basis. This review includes an evaluation of QC data against acceptance criteria and a check of the data package contents to assure that all analytical requirements and specifications were executed.

**Report Generation Review.** The report generation group reviews all data and supporting information delivered by the laboratory for completeness and compliance with client specifications. Missing deliverables are identified and obtained from the laboratory. The group also reviews the completed package to verify that the delivered product complies with all client specifications. Non-analytical defects are corrected before the package is sent to the client.

**Project Management/Quality Assurance Review.** Spot-check data package reviews are performed by the project manager. Project management reviews focus on project specifications. If the project manager identifies defects in the product prior to release, he initiates immediate corrective action to rectify the situation.

The QA Staff reviews approximately 10% of the data produced. The QA review focuses on all elements of the deliverable including the client's specifications and requirements, analytical quality control, sample custody documentation and sample identification. QA reviews at this step in the production process are geared towards systematic process defects, which require procedural changes to effect a corrective action. However, if defects are identified that can be corrected prior to data release, the QA staff returns the package to the laboratory for corrective action. QA data review cannot be used in lieu of a peer level review or a supervisory review.

**Data Reporting**. Analytical data is released to clients following a secondary review by the group supervisor. Data release at this stage of the process is limited to electronic

information, which is released to clients through a secure, encrypted, password protected, Internet connection.

Hard copy support data is compiled by the report generation group and assembled into the final report. The report is sent to the client following reviews by report generation, quality assurance, and the company president.

**12.8** ***Electronic Data Reduction.*** Raw data from sample analysis is entered into the laboratory information management system (LIMS) using automated processes or manual entry. Final data processing is performed by the LIMS using procedures developed by the Company.

All LIMS programs are tested and validated prior to use to assure that they consistently produce correct results. Validation testing is performed by the Information Technology Staff. The testing procedures are documented in an SOP. Programs are not approved for use until they have demonstrated that they are capable of performing the required calculations.

**12.9** ***Representativeness***. Data representativeness is based on the premise that qualitative and quantitative information developed for field samples is characteristic of the sample that was collected by the client and analyzed in the laboratory. The laboratory objective for representativeness defines data as representative if the criteria for all quality parameters associated with the analysis of the sample are achieved.

**12.10** ***Comparability***. Analytical data is defined as comparable when data from a sample set analyzed by the laboratory is representatively equivalent to other sample sets analyzed separately regardless of the analytical logistics. The laboratory will achieve 100% comparability for all sample data which meets the criteria for the quality parameters associated with its analysis using the method requested by the client.

## 13.0 CORRECTIVE ACTION SYSTEM

***Requirement***. The laboratory must have polices and procedures for correcting defective processes, systematic errors, and quality defects, which enables the staff to systematically improve product quality. The system must include procedures for communicating items requiring corrective action, corrective action tracking procedures, corrective action documentation, monitoring of effectiveness, and reports to management. The system must be documented in a standard operating procedure.

**13.1** ***Procedure***. Corrective action is the step that follows the identification of a process defect. The type of defect determines the level of documentation, communication, and training necessary to prevent re-occurrence of the defect or non-conformance.

**Routine Corrective Action**. Routine corrective action is defined as the procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters or analytical system specifications.

Bench analysts have full responsibility and authority for performing routine corrective action. The resolution of defects at this level does not require a procedural change or staff re-training. The analyst is free to continue work once corrective action is complete and the analytical system has been returned to control.

**13.2** **Procedural Modifications**. Corrective actions in this category require process change. They may be the result of systematic defects identified during audits, the investigation of client inquiries, product defects identified during data review, or method updates. Resolution of defects of this magnitude require formal identification of the defect, development and documentation of a corrective action plan, and staff training to communicate the procedural change.

**13.3** ***Documentation & Communication***. Routine corrective actions are documented as part of the analytical record. Notations are made in the comments section of the analytical chronicle or data sheet detailing the nonconformance. Continuation of the analysis indicates that return to control was successful.

Corrective actions for process changes are documented, tracked and monitored for effectiveness. Corrective actions may be initiated by any supervisor or senior staff member by completing the corrective action form.

The corrective action database is an Access application. The initiator generates the corrective action investigation form, which is documented, tracked, distributed to responsible parties and archived through the application. The application assigns a tracking number initiation data and due date to each corrective action initiated and copies the corrective action form to the corrective action database. The application also distributes an E-mail message containing the form to the responsible parties for resolution.

Corrective Action system employs Deficiency – Root Cause – Immediate Fix – Corrective action approach, further divided into categories of Analytical Error, Omission Error, Random Error, Systemic Error and Training Issue.

The responsible party develops and implements the procedural change. Existing documentation such as SOPs are edited to reflect the change. The affected staff is informed of the procedural change through a formal training session. The training is documented and copies are placed into individual training files. The corrective action form is completed and closed in CA database.

Initial and completed corrective action forms are maintained in the Corrective Action directory. This information is archived daily. Copies of training records describing corrective actions are appended to the involved individuals training files.

**Monitoring**. The QA Staff monitors the implemented corrective action until it is evident that the corrective action has been effective and the systematic deficiency has been eliminated. The corrective action database is updated by QA to reflect closure of the corrective action. The QA staff also assigns an error code to the corrective action for classification of the type of errors being committed.

If QA determines that the corrective action procedure has not effectively remedied the deficiency, the process continues with a re-initiation of the corrective action. Corrective action continues until the defective process is eliminated. If another procedural change is required, it is treated as a new corrective action, which is documented and monitored using established procedures.

**Client Notification.** Defective processes, systematic errors, and quality defects, detected during routine audits may have negative impacts on data quality. In some cases, data that has been released to clients may be affected. If defective data has been released for use, Accutest will notify the affected clients of the defect and provide specific details regarding the magnitude of the impact to their data.

## 14.0 PROCEDURES FOR EXECUTING CLIENT SPECIFICATIONS

***Requirement***. Systems must be established for evaluating and processing client specifications for routine and non-routine analytical services. The systems must enable the client services staff to identify, evaluate, and document the requested specifications to determine if adequate resources are available to perform the analysis. The system must include procedures for communicating the specifications to the laboratory staff for execution and procedures for verifying the specifications have been executed.

**14.1** ***Client Specific Requirements***. The project manager is the primary contact for clients requesting laboratory services. Client specifications are communicated using several mechanisms. The primary source of information is the client's quality assurance project plan (QAPjP) which details analytical and quality control specifications for the project. In the absence of a QAPjP, projects specifications can also be communicated using contracts, letters of authorization, or letters of agreement, which may be limited to a brief discussion of the analytical requirements and the terms and conditions for the work. These documents may also include pricing information, liabilities, scope of work, in addition to the analytical requirements. QAPjPs include detailed analytical requirements and data quality objectives, which supersede those found in the referenced methods. This information is essential to successful project completion.

The project manager is responsibility for obtaining project documents, which specify the analytical requirements. Following project management review, copies are distributed to the QA Director and the appropriate departmental managers for review and comment. The original QAPP is numbered with a document control number and filed in a secure location.

**14.2** ***Requirements for Non-Standard Analytical Specifications***. Client requirements that specify departures from documented policies, procedures, or standard specifications must be submitted to Accutest in writing. These requirements are reviewed and approved by the technical staff before the project is accepted. Once accepted, the non-standard requirements become analytical specifications, which follow the routine procedure for communicating client specifications. Departures from documented policies, procedures, or standard specifications that do not follow this procedure are not permitted.

**14.3** ***Evaluation of Resources.*** A resource evaluation is completed prior to accepting projects submitted by clients. The evaluation is initiated by the client services staff who prepares a brief synopsis that includes the logistical requirements of the project. Logistical specifications for new projects are summarized in writing for evaluation by the affected departments. The specification are evaluated by the department manager from a scheduling and hardware resources perspective. The project is not accepted unless the department managers have the necessary resources to execute the project according to client specifications.

**14.4** ***Documentation***. New projects are initiated using a project set up form, which is completed prior to the start of the project. This form details all of the information needed to correctly enter the specifications for each client sample into the laboratory information management system (LIMS, see example). The form includes data reporting requirements, billing information, data turnaround times, QA level, state of origin, and comments for detailing project specific requirements. The project manager is responsible for obtaining this information from the client and completing the form prior to sample arrival and login.

Sample receipt triggers project creation and the login process. The information on the set-up form is entered into the LIMS immediately prior to logging in the first sample. The set up form may be accompanied by a quotation, which details the analytical product codes and sample matrices. These details are also entered into the LIMS during login.

Special information is distributed to the laboratory supervisors and login department in electronic or hardcopy format upon project setup. All, project specific information is retained by the project manager in a secure file. The project manager maintains a personal telephone log, which details conversations with the client regarding the project.

**14.5** ***Communication***. A pre-project meeting is held between client services and the operations managers to discuss the specifications described in the QAPjP and/or related documents. Project logistics are discussed and finalized and procedures are developed to assure proper execution of the client's analytical specifications and requirements. Questions, raised in the review meeting, are discussed with the client for resolution. Exceptions to any requirements, if accepted by the client, are documented and incorporated into the QAPjP or project documentation records.

Non-standard specifications for individual clients are documented in the LIMS at the client account level. Once entered into the LIMS, these specifications become memorialized for all projects related to the client account. Upon sample arrival, these specifications are accessed through a terminal or printed as a hard copy and stored in a binder for individuals who require access to the specification. Specifications that are not entered into the LIMS are prohibited unless documented in an interdepartmental memo, which clearly identifies the project, client and effective duration of the specification.

**14.6** ***Operational Execution***. A work schedule is prepared for each analytical department on a daily basis. Analytical specifications from recently arrived samples have now been entered into the LIMS database. The database is sorted by analytical due date and holding time, into product specific groups. Samples are scheduled for analysis by due date and holding time. The completed schedule, which is now defined as a work list, is printed. The list contains the client requested product codes and specifications required for the selected sample(s). Special requirements are communicated to the analyst using the comments section or relayed through verbal instructions provided by

the supervisor. The bench analyst assumes full responsibility for performing the analysis according to the specifications printed on the work sheet.

**14.7** ***Verification***. Prior to the release of data to the client, laboratory section managers and the report generation staff review the report and compare the completed product to the client specifications documentation to assure that all requirements have been met. Project managers perform a spot check of projects with unique requirements to assure that the work was executed according to specifications.

**15.0**

## CLIENT COMPLAINT RESOLUTION PROCEDURE

***Requirement***. A system for managing and reconciling client complaints must be implemented in the laboratory. The system must include procedures for documenting client complaints and communicating the complaint to the appropriate department for resolution. The system must also include a quality assurance evaluation to determine if the complaint is related to systematic defects requiring process changes.

**15.1** ***Procedure***. Client complaints are communicated to client services representatives, quality assurance staff, or senior management staff for resolution. The individual receiving the complaint retains the responsibility for documentation and communicating the nature of the complaint to the responsible department(s) for resolution. The responsible party addresses the complaint. The resolution is communicated to quality assurance (QA) and the originator for communication to the client. QA reviews the complaint and resolution to determine if systematic defects exist. If systematic defects are present, QA works with the responsible party to develop a corrective action that eliminates the defect.

**15.2** ***Documentation***. Client's complaints are documented by the individual receiving the complaint using the Data Query and Corrective Action Inquiry Form. This form is an Excel spreadsheet that contains detailed information essential to the complaint resolution. A record of the telephone conversation is maintained by client services. The form is distributed by E-Mail to QA and the party responsible for resolution. The complaint resolution is documented on the form by the responsible party and returned to the originator. A copy is sent to QA for review and database archiving.

**15.3** ***Corrective Action***. Responses to data queries are required from the responsible party. At a minimum, the response addresses the query and provides an explanation to the complaint. Corrective action may focus on the single issue expressed in the complaint. Corrective action may include reprocessing of data, editing of the initial report, and re-issue to the client. If the QA review indicates a systematic error, process modification is required. The defective process at the root of the complaint is changed. SOPs are either created or modified to reflect the change. The party responsible for the process implements process changes.

**15.4** ***QA Monitoring***. Process changes, implemented to resolve systematic defects, are monitored for effectiveness by QA. If monitoring indicates that the process change has not resolved the defect, QA works with the department management to develop and implement an effective process. If monitoring indicates that the defect has been resolved, monitoring is slowly discontinued. Continued monitoring is incorporated as an element of the annual system audit.

## 16.0 CONTROL OF NONCONFORMING PRODUCT

***Requirement:*** Policies and procedures have been developed and implemented that describe the procedures employed by the laboratory when any aspect of sample analysis or data reporting do not conform to established procedures or client specifications. These procedures include steps to ensure that process defects are corrected and affected work is evaluated to assess its impact to the client.

***Procedure.*** Nonconforming product is identified through routine internal review and audit practices or through client inquiry. The individuals who identify the nonconformance or receiving a nonconformance inquiry immediately inform the Laboratory Director and the Quality Assurance Director. The Laboratory Director initiates an evaluation of the nonconformance through the Quality Assurance Department and takes full responsibility for managing the process and identifying the course of action to take, initiating corrective action and mitigating the impact of the nonconformance to the client.

**16.1** ***Corrective Action.*** The outcome of the evaluation dictates the course of action. This may include at a minimum client notification, but may also include corrective action. Immediate corrective action is performed using the SOP-specified procedures. However, additional action may be required including cessation of analysis and withholding and or recalling data reports. If the evaluation indicates that nonconforming data may have been issued to clients, the client is immediately notified and data may be recalled following the procedures specified in respective SOPs. If work has been stopped because of a nonconformance, the Laboratory Director is the only individual authorized to direct a resumption of analysis.

Nonconformances caused by systematic process defects require retraining of the personnel involved as an element of the corrective action solution.

## 17.0 CONFIDENTIALITY PROTECTION PROCEDURES

***Requirements***: Policies and procedures are required to protect client data from release to unauthorized parties or accidental release of database information through accidental electronic transmission or illegal intrusion. These policies must be communicated to clients and staff. Electronic systems must be regularly evaluated for effectiveness.

**17.1** ***Client Anonymity***. Information related to the Company's clients is granted to employees on a "need to know" basis. An individual's position within the organization defines his "need to know". Individuals with "need to know" status are given password access to systems that contain client identity information and access to documents and document storage areas containing client reports and information. Access to client information by individuals outside of the Company is limited to the client and individuals authorized by the client.

Individuals outside of the Company may obtain client information through subpoena issued by a court of valid jurisdiction. Clients are informed when subpoenas are received ordering the release of their information.

**17.2** ***Documents***. Access to client documents is restricted to employees in need to know positions. Copies of all client reports are stored in secure archive with restricted access. Reports and report copies are distributed to individuals who have been authorized by the client to receive them. Documents are not released to third parties without verbally expressed or written permission from the client.

**Confidential Business Information (CBI).** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between Accutest and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat .PDF format only. See also Sec. 6.5.

**17.3** ***Electronic Data***.

**Database Intrusion**. Direct database entry is authorized for employees of Accutest only on a need to know basis. Entry to the database is restricted through a user specific multiple password entry system. Direct access to the database outside of the facility is possible through a dial-up connection. A unique password is required for access to the local area network. A second unique password is required to gain access to the database. The staff receives read or write level authorization on a hierarchical privilege basis.

**Internet Access.** Access to client information is through an HTTP Web application only. It does not contain a mechanism that allows direct access to the database. Clients can gain access to their data only using a series of Accutest assigned, client and user specific passwords. The viewable data, which is encrypted during transmission, consists of an extraction of database information only.

**Client Accessibility**. Accessibility to client data delivered via electronic means follows strict protocols to insure confidentiality. Clients accessing electronic data are assigned a company account. The account profile, which is established by the MIS staff, grants explicit access to explicit information pertaining to the clients project activity. Passwords are assigned on an individual basis within a client account. These accounts can be activated or deactivated by the MIS staff only.

**17.4** ***Information Requests***. Client specific data or information is not released to third parties without verbally expressed or written permission from the client. Written permission is required from third parties, who contact the Company directly for the release of information. Verbal requests will be honored only if they are received directly from the client. These requests must be documented in a record of communication maintained by authorization recipient.

**17.5** ***Transfer of Records***. Archived data, which has previously been reported and transmitted to clients, is the exclusive property of Accutest Laboratories. In the event of a cessation of business activities due to business failure or sale, The Company's legal staff will be directed to arrange for the final disposition of archived data.

The final disposition of archived data will be accomplished using the approach detailed in the following sequence:

1. All data will be transferred to the new owners for the duration of the required archive period as a condition of sale.

2. If the new owners will not accept the data or the business has failed, letters will be sent to clients listed on the most recent active account roster offering them the option to obtain specific reports (identified by Accutest Job Number) at their own expense.

3. A letter will be sent to the NELAC accrediting authority with organizational jurisdiction over the company offering them the option to obtain all unclaimed reports at their own expense.

4. All remaining archived data will be recycled using the most expedient means possible.

## 18.0 QUALITY AUDITS AND SYSTEM REVIEWS

***Requirement***: The quality assurance group will conduct regularly scheduled audits of the laboratory to assess compliance with quality system requirements, technical requirements of applied methodology, and adherence to documentation procedures. The information gathered during these audits will be used to provide feedback to senior management and perform corrective action where needed for quality improvement purposes.

**18.1** ***Quality Systems Review***. Quality system audits are performed annually by the Quality Assurance Director for the Company President. In this audit, the laboratory is evaluated for compliance with the Laboratory Quality Systems Manual (LQSM) and the quality system standards of the National Environmental Laboratory Accreditation Conference. Findings, which indicate non-compliance or deviation from the LQSM, are flagged for corrective action. Corrective actions require either a return to compliance or a plan change to reflect an improved quality process. The Quality Assurance Director is responsible for making and documenting changes to the LQSM. These changes are reviewed by the Company President and The Laboratory Director prior to the approval of the revised system.

**18.2** ***Quality System Audits.*** Quality system audits are conducted to evaluate the effectiveness and laboratory compliance with individual quality system elements. These audits are conducted on an established schedule. Audit findings are documented and communicated to the management staff and entered into the corrective action system for resolution. If necessary, retraining is conducted to assure complete understanding of the system requirements.

**18.3** ***Technical Compliance Audits***. Technical compliance audits are performed monthly. Selected analytical procedures are evaluated for compliance with standard operating procedures (SOPs) and method requirements. If non-conformances exist, the published method serves as the standard for compliance. SOPs are edited for compliance if the document does not reflect method requirements. Analysts are trained to the new requirements and the process is monitored by quality assurance. Analysts are retrained in method procedures if an evaluation of bench practices indicates non-compliance with SOP requirements.

**18.4** ***Documentation Audits***. Documentation audits are conducted monthly. This audit includes a check of measurement processes that require manual documentation. It also includes checks of data archiving systems and a search to find and remove any inactive versions of SOPs that may still be present in the laboratory and being accessed by the analysts. Non-conformances are corrected on the spot. Procedural modifications are implemented if the evaluation indicates a systematic defect.

**18.5** ***Corrective Action Monitoring***. Defects or non-conformances that are identified during client or internal audits are shared with management and entered into CA database for attention by the responsible party. Audit findings are corrected through

process modifications and/or retraining. Once a corrective action has been designed and implemented, it is monitored for compliance on a regular basis by the QA staff. Monitoring of the corrective action continues until satisfactory implementation has been verified.

**18.6** ***Preventive Action.*** Laboratory systems or processes, which may be faulty and pose the potential for nonconformances, errors, confusing reports or difficulties establishing traceability may be identified during internal audits. These items are highlighted for systematic change using the corrective action system and managed to resolution using appropriate procedures for corrective action.

**18.7** ***Management Reports***. Formal reports of all audit activities are prepared for the management staff. These reports are prepared annually. The report details the status of the Quality System

The formal report also addresses the following topics:

- Status and results of internal and external audits,
- Status and results of internal and external proficiency testing,
- Identification of quality control problems in the laboratory,
- Discussion of corrective action program issues,
- Status of external certifications and approvals,
- Status of staff training and qualifications,
- Discussion of new quality system initiatives.
- Recommendations for further action on listed items are included in the report.

# Appendix I

# Glossary of Terms

## GLOSSARY OF TERMS

**Acceptance Criteria:** specified limits placed on characteristics of an item, process, or service defined in requirement documents.

**Accreditation**: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one.

**Accuracy**: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

**Analyst**: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

**Audit**: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity.

**Batch**: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

**Blank:** a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results.

**Blind Sample**: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

**Calibration**: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements.

**Calibration Curve**: the graphical relationship between the known values, such as

concentrations, of a series of calibration standards and their instrument response.

**Calibration Method**: a defined technical procedure for performing a calibration.

**Calibration Standard**: a substance or reference material used to calibrate an instrument.

**Certified Reference Material (CRM**): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.

**Chain of Custody**: an unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples.

**Clean Air Act**: the enabling legislation in 42 U.S.C. 7401 *et seq.*, Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and to enforce them.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund)**: the enabling legislation in 42 U.S.C. 9601-9675 *et seq*., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601*et seq.*, to eliminate the health and environmental threats posed by hazardous waste sites.

**Confirmation**: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to second column confirmation, alternate wavelength, derivatization, mass spectral , interpretation, alternative detectors or, additional cleanup procedures.

**Conformance**: an affirmative indication or judgement that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.

**Corrective Action**: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence.

**Data Audit**: a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria).

**Data Reduction**: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form.

**Demonstration of Capability**: a procedure to establish the ability of the analyst to generate acceptable accuracy.

**Document Control:** the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

**Duplicate Analyses**: the analyses or measurements of the variable of interest performed identically on two sub-samples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.

**Federal Water Pollution Control Act (Clean Water Act, CWA)**: the enabling legislation under 33 U.S.C. 1251 *et seq.*, Public Law 92-50086 Stat. 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance.

**Field of Testing**: NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff).

**Holding Times (Maximum Allowable Holding Times)** the maximum times that samples may be held prior to analysis and still be considered valid or not compromised.

**Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample )**: a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

**Matrix:** the component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated a potable or potential potable water source. Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Biological Tissue: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges and other matrices with >15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device.

**Matrix Spike (spiked sample or fortified sample)**: a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of Target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

**Matrix Spike Duplicate (spiked sample or fortified sample duplicate)**: a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

**Method Blank**: a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest, which is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

**Method Detection Limit:** the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

**National Institute of Standards and Technology (NIST)**: an agency of the US Department of Commerce's Technology Administration that is working with EPA, States, NELAC, and other public and commercial entities to establish a system under which private sector companies and interested States can be accredited by NIST to provide NIST-traceable proficiency testing (PT) to those laboratories testing drinking water and wastewater.

**National Environmental Laboratory Accreditation Conference (NELAC)**: a voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP.

**National Environmental Laboratory Accreditation Program (NELAP)**: the overall National Environmental Laboratory Accreditation Program of which NELAC is a part.

**NELAC Standards**: the plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference.

**Performance Audit**: the routine comparison of independently obtained *qualitative and*

quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

**Precision**: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

**Preservation**: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample.

**PT Fields of Testing**: NELAC's approach to offering proficiency testing by regulatory or environmental program, matrix type, and analyte.

**Proficiency Testing:** a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

**Proficiency Test Sample (PT)**: a sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.

**Quality Assurance**: an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

**Quality Control**: the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

**Quality Manual**: a document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

**Quality System**: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

**Quantitation Limits:** the maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user.

**Range:** the difference between the minimum and the maximum of a set of values.

**Raw Data:** any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted.

**Reagent Blank (method reagent blank or method blank)**: a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.

**Reference Material:** a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

**Reference Method**: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so.

**Reference Standard**: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

**Replicate Analyses:** the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval.

**Requirement:**. denotes a mandatory specification; often designated by the term “shall”.

**Resource Conservation and Recovery Act (RCRA)**: the enabling legislation under 42 USC 321 *et seq.* (1976), that gives EPA the authority to control hazardous waste from the “cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal.

**Safe Drinking Water Act (SDWA)**: the enabling legislation, 42 USC 300f *et seq.* (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

**Sample Duplicate**: two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis.

**Spike:** a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

**Standard:** the document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies.

**Toxic Substances Control Act (TSCA)**: the enabling legislation in 15 USC 2601 *et seq.*, (1976), that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture.

**Traceability:** the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

**United States Environmental Protection Agency (EPA)**: the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends.

**Validation:** the process of substantiating specified performance criteria.

**Verification:** confirmation by examination and provision of evidence that specified requirements have been met.
NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment. The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

# *Appendix F*
# *Response to Comments on Draft Work Plan*

# *Response to Comments May 2006*

**Comments on Draft Work Plan Interim Removal Action at**
**Site 57 - Building 292 TCE Contamination**
**Naval District Washington Indian Head**
**March 2006**

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Comments from Naval Support Facility, Indian Head (NSF-IH)
Received from Cathy Gardner, dated March 30, 2006

**Comment 1**
The final document must have signatures on the required pages. (Front page, Appendix C, Attachment 7, Appendix D, Letters of Appointments, Program Quality Control Plan Signature Page, etc.)

***Response:*** *Comment noted, signatures will be included in the final document.*

**Comment 2**
Emergency telephone numbers page – Please change to read:

Department of Navy

LT Michael O'Donnell, DROICC (301-744-2177)

Christine Foskey-Brown, Contracting Officer (757-322-4165)

Cathy Gardner - Contracting Officer Technical Representative (301-744-2181)

***Response:*** *The names, titles and phone numbers mentioned above will be revised in Table 9.1 of the SSHSP (Appendix C) and in Attachment B of the Hurricane Preparedness Plan (Attachment 6 of the SSHSP) of the Final Work Plan.*

Comments from Naval Support Facility, Indian Head (NSF-IH)
Received from Shawn Jorgensen, dated April 10, 2006

**Comment 1**
Please ensure that our correct facility name is used throughout the document, including in the list of acronyms. Since September 2005, we have become the Naval Support Facility, Indian Head (NSF-IH). NSF-IH is a Naval Support Activity South Potomac (NSASP) facility within the Naval District Washington Region.

***Response:*** *Comment noted, the correct acronym will be listed, and the facility name will be revised throughout the Final Work Plan.*

**Comment 2**
Figure 3-1
There is a concern with the location of the material storage pad. Currently, personnel in Building 160 have equipment stored on the paved area and they also have a trailer that is located within the material storage pad shown on Figure 3-1. As such, we may need to find another location if they are unable or unwilling to move their equipment and trailer. Likewise, the decontamination pad location may be an issue. The grassy area to the west-northwest of Building 292 may be a more adequate location for the

materials handling pad, as long as moving the material around the site doesn't adversely affect operations in Building 292.

***Response:*** *The locations of the material storage pad and the decontamination pad will be determined at the Pre-Construction Conference (May 25, 2006 at 1300 hours) to ensure that operations at Buildings 160 and 292 are not adversely impacted.*

**Comment 3**

Section 3.3 Utility Relocation, pages 3-2 and 3-3

Stating that you will move the existing phone and electrical lines and Smoking Gazebo to locations designated by the Contracting Officer is not adequate for the work plan. As we have learned from the Olsen Road Landfill project, we should pin down as much as we can prior to getting out into the field. We cannot afford to have the same issues we had at the ORL. Suggest that you contact Bob Maletto to determine where the electric lines can be relocated and Roger Dyson to determine where the phone lines can be relocated. In addition, you need to determine from each of them whether or not they will have to do any work, such as the actual line relocating, just the final hook-ups, or if you need to do all of the work. Also, the work plan should include a drawing showing where these lines will be relocated.

The Smoking Gazebo will be another issue. IHDIV-NSWC Explosive Safety personnel will have to assist with this determination. I will begin communications with them on this issue.

***Response:*** *After an additional visit to Site 57, FSSI/Shaw has determined that the electrical lines overhead of Area A are positioned at a high enough elevation that they will not need to be relocated. In addition, there are no phone lines to be relocated. The Smoking Gazebo will be relocated to the asphalt parking lot southeast of its current location. The approximate locations of the utility poles and overhead lines near to Area A and the existing and new locations for the Smoking Gazebo will be included on Figure 3-1 of the Final Work Plan and Figure 2-1 of the Erosion and Sediment Control Plan.*

**Comment 4**

Section 3.4 Erosion and Sediment Control Installation, page 3-3

Although, in general, we do not have to obtain permits for CERCLA projects, we are required to comply with the substantive requirements of the permitting process. In the past, we have typically had the MDE review our erosion and sediment control plans and incorporated their comments into the plan in order to meet their requirements. I don't know if Curtis DeTore of the MDE received a copy of this version of the work plan and if he has passed it on to the appropriate Water Management Administration personnel for review. If not, we should consider doing this. Otherwise, when Nadine Pierre-Charles, our MDE stormwater inspector, comes on-site to review the project, she may require alternative sediment and erosion controls to those that will have already been put into place.

***Response:*** *The Draft Work Plan for Site 57 including the Erosion and Sediment Control Plan was sent to Curtis DeTore of the MDE. Comments from the MDE review are included within this Response to Comments document.*

**Comments on Draft Work Plan Interim Removal Action at**
**Site 57 - Building 292 TCE Contamination**
**Naval District Washington Indian Head**
**March 2006**

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**Comment 5**
Section 3.5 Field Sampling and Offsite Analysis, page 3-4
"Confirmation sampling within the removal areas will be conducted by the Navy." Has NAVFAC contracted with another contractor to perform this sampling? If not, then confirmatory samples will need to be taken by FSSI/Shaw. "The Navy" (NSF-IH) does not have the resources to conduct this sampling.

***Response:*** *Confirmation sampling will be conducted by Tetra Tech NUS, Inc. The Final Work Plan will be revised accordingly.*

**Comment 6**
Section 3.6 Contaminated Material Excavation and Handling, page 3-4
The first paragraph, first sentence. Reference to Figure 1-2 should be Figure 3-1.

***Response:*** *The first sentence in Section 3.6 will be revised accordingly in the Final Work Plan.*

**Comment 7**
Section 3.6 Contaminated Material Excavation and Handling, page 3-4
The second paragraph, first sentence. Suggest adding that contaminated soil will be removed by hand excavation only near existing utility lines. It would be quite a task to remove all of the contaminated soil by hand.

***Response:*** *Section 3.6 will be revised accordingly in the Final Work Plan.*

**Comment 8**
Section 3.12 Closeout Report, page 3-8
An electronic version of the Closeout Report should be provided with a hard copy or copies, and electronic files (AutoCAD or ArcINFO/ArcView/ArcGIS) of the final survey should be included on the disk for easy inclusion in our GIS.

***Response:*** *Electronic files will be provided on a disk and included with the hardcopy of the Final Closeout Report. Section 3.12 of the Final Work Plan will be revised accordingly.*

Comments from the Site 57 Onboard Review
Received during meeting held April 19, 2006

**Comment 1**
What type of chemical analysis needs to be completed for the incoming backfill material?

***Response:*** *The backfill material will be chemically analyzed for Toxicity Characteristic Leaching Procedure (TCLP). Sections 2.2, 3.0 and 3.3, and Tables 2-1 and 3-2 of the Field Sampling and Analysis Plan (Appendix E) will be revised accordingly. In addition, a borrow source letter will need to be obtained stating that the material is a native borrow source and/or the material is not known to be hazardous. Sections 3.8.1 and 3.8.2 of the Final Work Plan will be revised accordingly.*

**Comments on Draft Work Plan Interim Removal Action at**
**Site 57 - Building 292 TCE Contamination**
**Naval District Washington Indian Head**
**March 2006**

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**Comment 2**
Monitoring well locations need added to the figures. Will monitoring wells disturbed within the excavation activities need to be reinstalled? How will the monitoring wells be abandoned within the excavations?

***Response:*** *The monitoring well locations will be shown on Figure 3-1 of the Final Work Plan and Figure 2-1 of the Erosion and Sediment Control Plan. The monitoring wells disturbed within the excavation activities will not be replaced. The top portions of the monitoring wells within the excavation will be broken off and removed. The remaining portions of the monitoring wells below the excavation limits will be abandoned in accordance with the Code of Maryland Regulations (COMAR), 26.04.04.11 Abandonment Standards. Section 3.6, Contaminated Material Excavation and Handling, will be revised accordingly in the Final Work Plan.*

Comments from Maryland Department of Environment (MDE)
Waste Management Administration (WMA)
Sediment and Stormwater Plan Review Division
on Appendix B Erosion and Sediment Control Plan (ESCP)
Received from Jim Tracy, dated May 17, 2006

**Comment 1**
Section 3.0 Sequence of Construction, page 3-1:

a. Item 1: After Contracting Officer, please add "and MDE Inspector."
b. Item 6: After Contracting Officer, please add ", MDE Inspector"
c. Please insert Item 6 between Items 3 and 4 and renumber the sequence.

***Response:*** *Items 1 and 6 and renumbering of the sequence of construction within Section 3.0 of the Erosion and Sediment Control Plan will be revised accordingly in the Final Work Plan.*

**Comment 2**
Section 3.0 Sequence of Construction, page 3-2:

Please begin Item 14 as follows: "With approval of the MDE Inspector,"

***Response:*** *Item 14 within Section 3.0 of the Erosion and Sediment Control Plan will be revised accordingly in the Final Work Plan*

**Comment 3**
Figure 2-1:

a. Please show the Limit of Disturbance (LOD). The LOD must include all excavated areas and E/S practices.

b. Because of the porosity of straw bales, their effectiveness as diversion berms, particularly on paved surfaces, is questionable. Please consider alternatives such as an asphalt or sand bag berm, placed at an angle to the contour to create a grade for positive flow. In vegetated areas, earth berm or diversion fence may be considered.

c. Please indicate the work access point for Area A (ideally from the paved area at the west end).

d. Please provide a Material Storage and Decontamination Pad Details with appropriate E/S measures.

***Response:*** *The LOD will be shown on Figure 2-1 of the Erosion and Sediment Control Plan. A sand bag diversion berm placed at an angle to the contour will be used instead of a straw bale diversion berm on the paved surfaces to divert water away from the excavation area. An earth dike will be used to divert water away from an excavation in a vegetated area. Details will be provided for the material storage and decontaminations pads. The Erosion and Sediment Control Plan of the Final Work Plan will be revised accordingly.*

**Comment 4**

Figure 2-3:

a. Please complete the Site Information, Note 26.

b. Please use the current Designer's Certification (copy Attached).

a. Please complete and sign the Certifications.

b. There is an access location shown at the northeast side that is not shown on Figure 2.

***Response:*** *Figure 2-3 of the Erosion and Sediment Control Plan will be revised and completed accordingly in the Final Work Plan.*

**Comment 5**

If the disturbed area is less than 5000 S.F., the project is exempt from Stormwater Management requirements.

***Response:*** *The disturbed area is greater than 5,000 square feet. FSSI/Shaw is submitting the Stormwater Management Waiver Application in accordance with Section 3.3.A.1 of the Stormwater Management Guidelines since the disturbed area will be returned to a predevelopment runoff condition.*

Comments from Maryland Department of Environment (MDE)
Federal Facilities Division Hazardous Waste Program
Received from Curtis DeTore, dated May 17, 2006

No Comments.