

Final

**Site-Specific Unexploded Ordnance Safety Plan Attachment
Unexploded Ordnance Construction Support
3X Scrap Removal**

**Training Area T-38
Former Technical Escort Reaction Area, Parcel 186(6)
Training Area T-24A
Former Chemical Munitions Disposal Area, Parcel 187(7)**

Fort McClellan, Calhoun County, Alabama

Prepared for:

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Training Area T-38

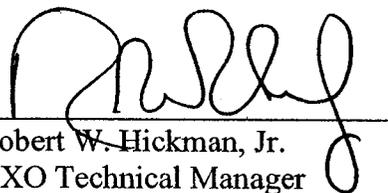
Former Technical Escort Reaction Area, Parcel 186(6)

Training Area T-24A

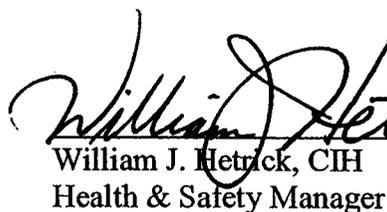
Former Chemical Munitions Disposal Area, Parcel 187(7)

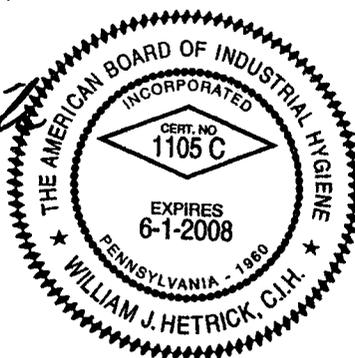
Fort McClellan, Calhoun County, Alabama

I have read and approve this site-specific unexploded ordnance (UXO) safety plan attachment for the 3X Scrap Removal: Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6); and Training Area T-24A, Former Chemical Munitions Disposal Area, Parcel 187(7), Fort McClellan, Calhoun County, Alabama, with respect to project hazards, regulatory requirements, and Shaw UXO procedures.


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29 OCT 03
Date


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Health & Safety Manager



10/23/03
Date

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1.0 General Information

This document defines unexploded ordnance (UXO) construction support and safety support procedures for activities to be performed by Shaw Environmental, Inc. (Shaw) in conjunction with the site excavation activities at T-38 and T-24A, at Fort McClellan (FTMC), Calhoun County, Alabama. Shaw will perform limited surface and subsurface UXO detection and safety support incidental to the location and excavation of subsurface anomalies at T-38 and T-24A. The purpose of this excavation is to locate, identify, sort, package and verify 3X scrap material and ship that material off site for disposal. Additionally, Shaw UXO personnel will provide support during the collection of soil and investigation-derived waste (IDW) samples.

The anomalies to be excavated at T-38 and T-24A are believed to be burial disposal pits for 3X ordnance and explosives (OE) items that were used to support training exercises. Based on the results of previous investigations, Shaw does not expect to find any hazardous OE items, chemical agents, or chemical warfare materiel (CWM). Other metallic scrap material, such as car parts, may be encountered. These sites are not defined as CWM sites. Previous investigations (Site Investigation, Science Applications International Corporation (SAIC), 1993; Remedial Investigation, SAIC, 1995; and Engineering Evaluation/Cost Analysis, Parsons Engineering Science, Inc. [Parsons], 2002) performed surface and subsurface soil sampling in excavations and borings and as part of the installation of groundwater monitoring wells. In all cases, no evidence of chemical agent or CWM has been found.

Only 3X scrap material (OE) is anticipated in the excavations. If any OE material is encountered that cannot be positively identified as inert; or if there is any indication of the presence of chemical warfare materiel (CWM), all work will be immediately halted, the site evacuated, and the appropriate individuals notified (i.e., the site and project managers, the FTMC Base Environmental Coordinator, and the USACE representative).

1.1 Site Location and Topography

Training Area T-38 was the Former Technical Escort Reaction Area, also known as the Toxic Gas Yard. Approximately 6 acres in size, the site is located along a topographic ridge, Reservoir Ridge, east of the cantonment area on the Main Post. Two burial sites will be excavated at T-38.

Training Area T-24A is located east of the cantonment area of the Main Post and ranges in elevation from approximately 985 feet to 1,145 feet, with the ground surface sloping from the southeast to the northwest across the site. A small creek, which bisects several of the ranges,

flows north along a small valley to the South Branch Cane Creek. Six burial sites will be excavated at T-24.

1.2 Site History

Training Area T-38 was reportedly used from 1961 to 1972 for training technical escort unit personnel in techniques of eliminating toxic hazards caused by mishaps to chemical munitions during transport. The area also was used for storage of toxic agents and munitions. The storage facilities included four 1-ton containers of distilled mustard (HD). In addition, decontaminants were reportedly stored at least two locations and were used for demonstration purposes. Extensive decontamination was reportedly conducted at the site for spills and for decontaminating training aids. The types of decontaminants used, quantities, and frequency of use are unknown but are assumed to include decontamination agent, non-corrosive (DANC), supertropical bleach (STB) and decontamination solution number 2 (DS2). From the early 1980's Training Area T-38 was used as a chemical agent identification area.

Training Area T-38 is fenced, with an entrance gate in the northern section. Several buildings and structures were located within the fenced area. Reportedly, a former disposal pit area approximately 10 by 20 by 10 ft, used for disposal of decontaminants and other hazardous wastes, and a burial site for the drum of HD are located in the central-eastern and southern portions of the site, respectively. Chemicals used at Training Area T-38 as decontaminating agents may have been either inorganic or organic materials that contained chlorine readily available for use as an oxidizing or chlorinating agent.

Two anomalies will be excavated at T-38: designated as T-38-12 and T-38-13. Six anomalies will be excavated at T-24A: designated as T24-5, T24-8, T24-10, T24-15, T24-25, and T24-29.

1.3 Potential OE

These areas of concern have not been used as an impact area or firing range area, the probability of encountering OE has been determined to be low. There remains, however, a remote possibility of finding residue from chemical decontamination training and/or OE materials other than OE scrap. Previous investigations at T-38 and T-24A have revealed only inert projectiles.

2.0 Technical Management Plan

2.1 General

This section describes the technical approach and procedures to be employed by Shaw in providing UXO construction support/safety support during the pit excavation, identification of OE materials and verification of 3X for recovered materials.

2.1.1 Construction Support

Construction support and safety support activities will be performed in accordance with the approved Shaw *Installation-Wide Sampling and Analysis Plan, Volume IV of IV Appendix E, Installation-Wide Ordnance and Explosives Management Plan for Support of Hazardous, Toxic, Radiological Waste Activities and Construction Activities*, Revision 2, March 2000. The work at T-38 and T-24A will conform to the requirements of USACE EP 75-1-2 *Unexploded Ordnance Support during Hazardous, Toxic and Radioactive Waste, and Construction Activities*.

Personnel and work standards will be in compliance with data item description OE-025.01.

2.2 Chemical Warfare Material

Shaw is not authorized to perform CWM-related tasks. The likelihood of encountering chemical agent or CWM during 3X removal actions at T-38 and T-24A is remote; however, if chemical agent or CWM is encountered, the procedures listed below will be followed.

- The initial Exclusion Zone for suspected agent or CWM will be established a minimum of 450 feet upwind.
- Neither the suspect item nor the area will be disturbed further after discovery.
- The discoverer will immediately notify the on-site UXO Technician.
- The UXO Technician will immediately direct the work team to stop work and evacuate the site along a cleared path in an upwind direction. Upon evacuation, the UXO Technician will account for all work site personnel.
- The UXO Technician will note the location of the suspected agent or CWM to assist with identification and relocation as required.
- The UXO Technician will designate a minimum of two individuals to position themselves at least 450 feet upwind to prevent unauthorized personnel from site entry.

- The UXO Technician will immediately notify the Shaw Project Site-Superintendent and Senior UXO Supervisor.
- The Shaw Project Site-Superintendent will immediately make notifications in accordance with the *Transition Force OE/UXO Standard Operating Procedure*, January 2002 (Appendix A).
- The UXO Technician will ensure that the area remains secured until relieved by active duty explosive ordnance disposal, Technical Escort Unit, or local authority personnel.
- Before work can resume, the site plans will be reviewed for adequacy in consideration of the hazard discovered.
- The UXO Technician will provide the Senior UXO Supervisor (SUXOS) a suspect CWM report including the following information:
 - Date and local time of event
 - Location
 - Preliminary identification of suspect CWM
 - A description of events
 - A description of any property damage, personnel casualties and/or injuries
 - A description of whether medical services or facilities were required
 - A list of immediate notification and support requirements identified during the initial emergency response assessment
 - And any other pertinent information.

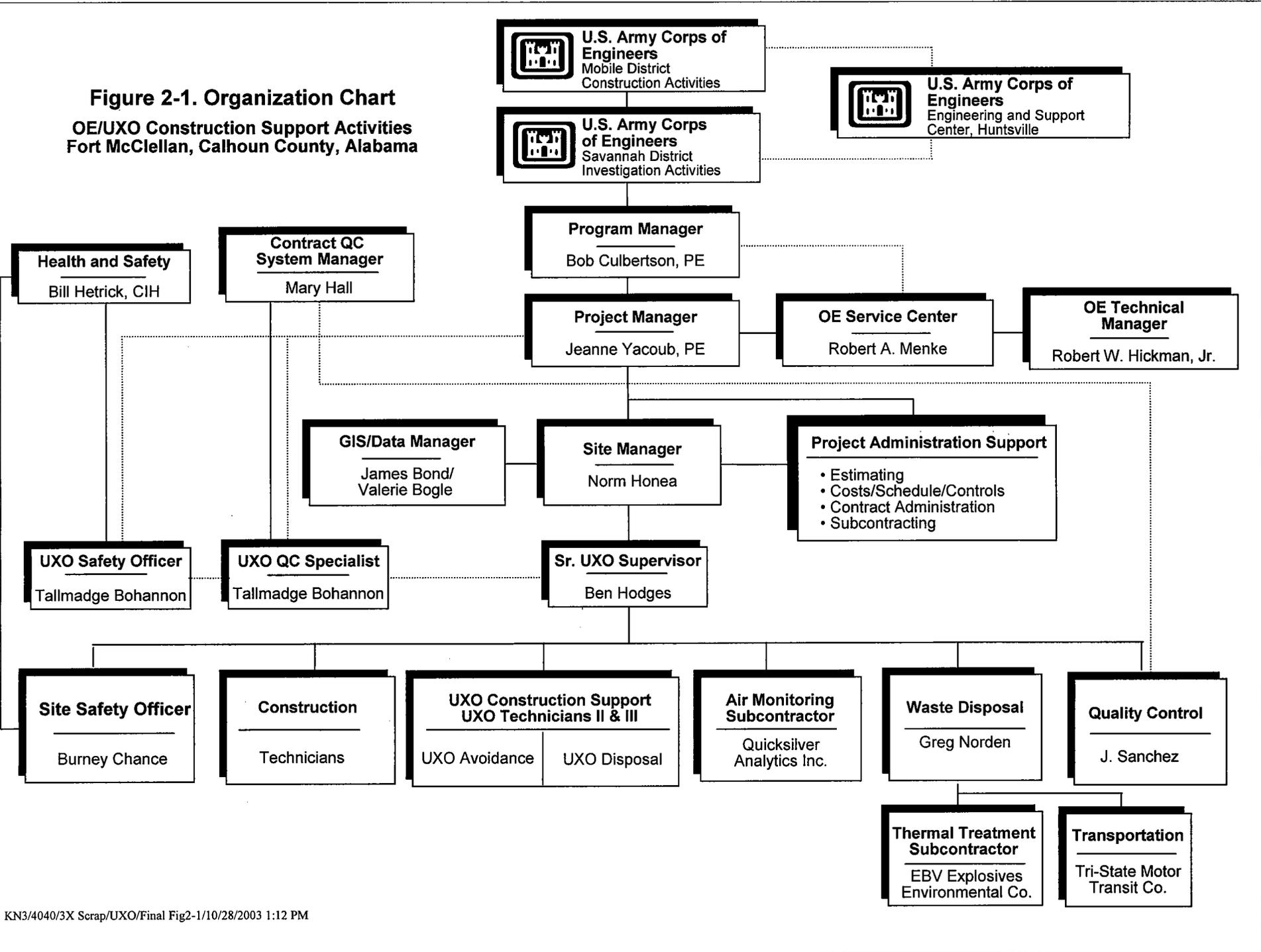
2.3 Organization

Shaw will provide five UXO personnel: a senior UXO supervisor (SUXOS), a UXO Quality Control Specialist (UXOQCS) and a UXO Safety Officer (UXOSO) (dual role), and three UXO technicians (two Technician III and one Technician II). Figure 2-1 shows the project organization for UXO construction support activities to be conducted at T-38 and T-24A.

2.3.1 UXO Personnel, Responsibilities and Authorities

This plan has been developed to address all potential scenarios for encountering OE/UXO in support of hazardous, toxic, and radioactive waste sampling activities at FTMC. Staffing of UXO personnel will be in accordance with EP 75-1-2 and DID OE-025.01. Prior to

Figure 2-1. Organization Chart
OE/UXO Construction Support Activities
Fort McClellan, Calhoun County, Alabama



mobilization, the names of all UXO personnel, their experience, and their UXO database numbers will be provided to the USACE OE Safety Specialist for all UXO personnel. Specific responsibilities are delineated below:

2.3.1.1 Senior UXO Supervisor

The SUXOS takes his direction from the Shaw FTMC site superintendent. The SUXOS is the senior UXO technician on site and plans, coordinates, and directs all UXO activities.

2.3.1.2 UXO Technician III

This individual takes daily direction from and reports to the Senior UXO Supervisor. The UXO Technician III directs the actions of a project UXO team in accordance with an approved work plan or UXO site safety plan and daily verbal direction of the Senior UXO Supervisor. The responsibilities of the UXO Technician III include, but are not limited to, the following:

- Has the authority to stop work.
- Consults and coordinates with the Site Safety and Health Officer regarding any modification to project documentation.
- Compliance with all Federal and State regulations.
- Equipment and on-site vehicles.
- The daily inspection of emergency equipment.
- Supervision and direction of OE/UXO field activities for assigned tasks.
- Assessment of the condition of any OE/UXO to determine if disposal action is required.

2.3.1.3 UXO Technician II

This individual performs assigned tasks under the direct supervision of the UXO Technician III. The UXO Technician II is responsible for the safe and efficient performance of OE/UXO field operations, including the location, identification and disposal of UXO in accordance with the approved project documentation. This individual has stop-work authority. Responsibilities include, but are not limited to, the following:

- Compliance with all safety and work related documentation.
- Work under the supervision of the UXO Technician III.

- Operates UXO detection equipment.
- Assists in the identification of UXO items.
- Identifies and oversees OE scrap removal under the supervision of the Technician III.
- Monitors excavation operations to ensure that the sampling sites are safe in regard to UXO items.
- Has stop-work authority.

2.3.1.4 UXO QC Specialist

This individual is responsible for the implementation of the approved program and project quality control (QC) plans. The UXO QC Specialist reports directly to the Contract QC System Manager and communicates directly with the SUXOS regarding the quality and performance of field activities. In the event of a quality deficiency, the UXO QC Specialist will notify the SUXOS, who will stop work until the quality deficiency has been corrected. He will ensure that needed changes to site-specific documents are written, approved and implemented.

2.3.1.5 UXO Safety Officer

The UXO Safety Officer (UXOSO) is responsible for the implementation of the approved project safety documentation. The UXOSO reports directly to the site Shaw Health and Safety Officer and is responsible for the safe and efficient performance of specific assigned tasks. In the event of a safety problem, the UXOSO is authorized to stop work until the safety discrepancy is corrected. He will ensure compliance with site-specific safety project documentation.

2.4 Mobilization

Shaw will utilize the existing FTMC field office as the control point for all construction support activities. Personnel will report to this building at the beginning of each workday for required daily health and safety briefings. All UXO health and safety records will be maintained in the field office.

2.5 General Site Practices

All excavation operational activities at T-38 and T-24A will be performed under the supervision and direction of qualified UXO personnel. Non-UXO personnel must be accompanied and/or supervised by a UXO Technician. Non-UXO personnel will be instructed and closely supervised to ensure that they do not pick-up, handle, move, or touch any UXO in any manner.

Shaw will conduct a daily tailgate safety briefing. An overall UXO safety meeting will be held at the discretion of the SUXOS in cooperation with the UXOSO. Visitors must receive a safety briefing prior to entering the operating area and must be escorted at all times. All visitors entering work areas must sign in at the Shaw field office, must receive a safety briefing, and must be escorted at all times.

To maximize safety and to ensure positive communications between the equipment operator and the UXO personnel, hand signals will be employed at FTMC.

The UXO personnel shall make every effort to identify the presence of subsurface excavation hazards such as utilities (sewer, telephone, water, fuel, electric, and pipe services).

If the situation arises where an employee must enter a trench or a hole at the excavation location, the employee will be protected from cave-ins by an adequate protective system that is either field fabricated or commercially procured. All confined space entry requirements will be met before an employee enters a trench or hole. This procedure requires contacting the Shaw FTMC Health and Safety officer prior to entry. If it is suspected that an oxygen deficiency or gaseous conditions could exist in the excavation, air in the excavation shall be tested prior to entry into the excavation. A log of tests must be maintained.

The sides of all excavations (in which employees are exposed to danger from moving ground) shall be guarded by a support system, sloping or benching of the ground, or equivalent means. Sloping and benching, if required, will be in accordance with EM 385-1-1. Additionally, Shaw personnel will follow Health and Safety Procedures HS 300 and HS 307 to ensure entry of personnel into the excavation is conducted safely. When excavations are less than 5 feet in depth, and when a "competent person" examines the site and determines there to be no potential for cave-in, protective systems are not required. Excavations greater than five (5) feet may constitute a confined space. If a situation arises where confined space entry is necessary, work will be halted until confined space entry procedures can be developed and approved.

Prior to operating mechanical excavation equipment, the operator shall extend the boom out to its maximum reach and draw an arc into the earth using the equipment's bucket. This line will define the maximum reach of the boom. This boom maximum reach area needs to be cleared of UXO prior to excavation activities. Personnel are not to come within the reach of the boom of mechanical equipment until the operator secures all moving parts and signals through positive aural and visual communication that it is safe to approach the excavation.

Personnel are not to approach an excavation (trench) from an open side. Trench frontal and rear approaches for observation and investigation are authorized with respect to wind direction. Sidewall inspections may be authorized after donning of a safety line, and with a safety observer.

Movement of unexploded ordnance is to be avoided. Movement of a fused or damaged munition may cause the munition to function. UXO will not be subjected to heat, shock, or friction.

Materials and equipment that might fall or roll into an excavation will be kept at least two feet from the edge of excavation, unless a restraining device is provided.

Personnel will not work on the sloped or benched excavation at levels above other employees.

Personnel will not work under loads that are being lifted by the digging equipment.

Personnel working with mechanical excavation teams will remain behind excavation equipment or similar cover to reduce the effects of a blast/fragmentation resulting from an accidental detonation.

2.6 UXO Construction Support Operations

2.6.1 Introduction

Shaw will provide UXO support to perform construction support activities in support of HTRW removal at T-38 and T-24A.

2.6.2 Exclusion Zone (EZ)

Neither T-38 nor T-24A has a history of use as an impact area or as an area where the disposal by detonation or ordnance burning has occurred. Therefore, during construction support activities a minimum safe separation distance of 200 feet will be established to protect individual operating units in the event of an accidental detonation while excavation operations are underway per EM 1110-1-4009, *Engineering and Design Ordnance and Explosives Response*, 2000. The 200-foot minimum distance will be used because there is no evidence of hazardous OE in the area. If, during the conduct of the operations, a hazardous or unidentifiable OE/UXO is discovered, an EZ for unintentional or accidental detonations will be established based on that item. At the point of discovery, all operations will be halted and no further work will be allowed until the item has been removed. This OE/UXO will be classified as the most probable munition (MPM). In the unlikely event that OE is discovered, the exclusion zone (EZ) safe separation distance will be re-evaluated and re-established based on the MPM found or suspected. Essential

personnel are generally considered to be the UXO Team, equipment operators, and site safety personnel.

2.7 Technical Operations

Shaw will support excavation at each of the anomaly sites. As material is removed from the burial sites, UXO personnel will monitor the sifting of that material for the presence of OE scrap. The soil and 3X material will be stockpiled in a convenient location for screening. The excavation will continue vertically and laterally until either natural soil is encountered or there are no further indications of anomalies from the use of a magnetometer. After the material has been excavated, it will be placed on a screening device to segregate waste and backfill soil from the 3X material.

Dependent upon moisture condition and rainfall quantity, Shaw will use either a trommel type screen or a vibrating bed. The material will be loaded onto the screen with a rubber tire backhoe and will pass over three different screening sizes before the fines exit the unit. The material will be screened to the following sizes:

- > 5 inches Separated by a grizzly over the hopper.
- 3 to 5 inches 1st screen, removed by conveyor.
- 1½ to 3 inches 2nd screen, removed by conveyor.
- < 1½ inches Passes 1st and 2nd screens, removed by conveyor to a plastic liner.

Each of the four piles will be screened to remove 3X material. The soil fines are anticipated to constitute the bulk of soil and will be returned to the excavation after sampling. UXO technicians will monitor each operation during the excavation and shifting process. UXO technicians will search each of the piles for metal scrap, glass vials or bottles, and/or other materials. Material from the excavation will be sorted into the following categories: soil, non-3X scrap, and 3X scrap. Car parts and other scrap metal will not be considered 3X scrap. As the soil is being inspected, the MINICAMS technician will utilize the point monitor to inspect the spoil. If the MINICAMS indicate the presence of any suspect CWM or if the UXO technicians detect the presence of any possible CWM or hazardous OE item, the operation will immediately be halted, and the site evacuated and secured.

- Shaw has estimated that 1,474 cubic yards of material will be excavated from the six anomalies at Training Area T-24A.
- Shaw has estimated that 296 cubic yards of material will be excavated from the two anomalies at Training Area T-38.

Shaw will provide UXO technicians, chemical agent air monitoring subcontractor, and a track excavator operator to excavate the trench. Site work will be performed in modified level D PPE.

2.7.1 General Excavation Safety Requirements

If the situation arises where it is necessary to enter the excavation, the employee will be protected from cave-ins by an adequate protective system.

Personnel supporting the excavation team will remain behind the excavation equipment or under similar cover to reduce the effects of a blast/fragmentation resulting from an accidental detonation. This location will be at least 200 feet from the excavation site.

The Senior UXO Supervisor will conduct a daily safety brief for all personnel involved in explosive disposal operations in the following areas:

- Care and handling of explosive materials
- Personal hygiene
- Two-man rule
- Potential trip/fall hazards
- Horse play
- Remaining alert for any explosive hazards
- Location of emergency shelter (if available)
- Parking area for vehicles (vehicles must be positioned for immediate departure with engines running)
- Wind direction (toxic fumes)
- Location of first-aid kit and fire extinguisher(s)
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency.

The SUXOS will have both a Shaw radio and a radio capable of contacting Range Control and/or Transition Force.

2.7.2 Access Corridors and Sampling Sites

Because there is a remote possibility that these areas may contain OE contamination, the UXO team must conduct a surface access survey for UXO before any type of activities commence. This includes foot and vehicular traffic.

The UXO team will conduct access surveys of the footpaths and vehicular lanes approaching and leaving each of the investigation sites. Access surveys will begin in a known clear area and proceed by the most direct route to the sampling site. The boundaries of the access route and sampling site will be marked with white tape or white pin flags.

If an OE item is found during the survey, the location will be conspicuously marked with a red pin flag. Additionally, UXO personnel will complete the Shaw FTMC "Unexploded Ordnance Report Form." Subsurface anomalies will be marked with a yellow flag. Anomalies will be investigated at the discretion of the Senior UXO Supervisor. He may choose to investigate anomalies as they are found or continue to survey the access route to locate the best and/or clearest route.

The boundaries of the access route and sampling site will be recorded in the Shaw FTMC UXO Sketch Log by the UXO technician. Additionally, anomaly locations will be recorded on this form.

Instrumentation used at this site will include the Schonstedt 52 CX and the GA 72, the CST Corporation Magna-Trak 102, or the Whites Spectrum XLT Metal Detector. All equipment will be operated according to the manufacturer's specifications. All equipment will be function-tested prior to use following the operator's instructions and the procedure in paragraph 3.2, FTMC UXO Supplementary Procedures (IT, 2001). The Whites metal detector may be used in conjunction with hand-held magnetometers in areas of high concentrations of rocks with a magnetic signature to assist in eliminating anomalies created by "hot rocks."

The access route will be twice as wide as the widest vehicle that will use the route. Footpath lanes will be a minimum of three feet wide.

No personnel will be allowed outside of the surveyed areas without a UXO escort. No unescorted access is permitted inside the corridor area until a survey has been completed and boundaries established.

The UXO team must also complete a survey of an area sufficient to support mechanical excavation equipment maneuverability, parking of support vehicles, and establishment of decontamination stations. The surveyed area should at a minimum have a dimension in all directions equal to twice the length of the largest vehicle or piece of equipment to be brought on site. White pin flags or tape will be used to mark the boundaries of the surveyed site.

Tracked vehicles, or other vehicles whose movement would disturb the soil, are authorized for use only in areas that have been surveyed and determined to be free of anomalies.

2.7.3 Excavation Operations at the Burial Sites

The excavation will be performed utilizing a UXO Team, equipment operator, an excavator. The purpose of this excavation is to locate, identify, and remove inert OE 3X scrap material.

During excavation operations, one UXO Technician III qualified individual will serve as a UXO Safety Observer and will monitor each cut as it is accomplished. Because numerous metallic debris is expected to be encountered, UXO personnel are not required to monitor with a handheld magnetometer or hand dig anomalies in the area of the burial sites. If possible, the safety observer will be positioned upwind of the excavation. This individual will be beyond the arc of the excavator's boom, but stationed in such a manner that s/he is able to visually inspect the cut as it is being taken and to monitor the area of the hole after the cut is accomplished. As the lift is being dumped, the UXO Safety Observer will reposition him or herself to monitor the spoils as they are dispersed.

If the UXO Safety Observer observes an OE item or potential OE item, the UXO Safety Observer will immediately signal the equipment operator to halt the movement of the boom and bucket.

If the boom and bucket are clear of the suspect item, the UXO Safety Observer will signal the equipment operator to return the boom and bucket to a safe position with the bucket on the ground. The UXO Safety Observer will not enter the boom's arc until the boom and bucket have been grounded, the excavator's engine is idled and the equipment operator signals "hands and feet clear".

If a suspect item is observed while being lifted, the UXO Safety Observer will immediately signal the equipment operator to halt the boom and bucket movement and inform the operator that an object of concern is in the bucket. The bucket must then be positioned in such a manner that the object can be inspected. The equipment operator will gently lower the boom until the

bucket is in contact with the ground and will then idle the engine and signal “hands and feet clear.” At that time, the UXO Safety Observer will approach the bucket and examine the object.

If necessary to gain access to an object in the bucket, the bucket may be partially opened or tilted to permit access to the contents. Every attempt should be made to ensure that the object is not dumped or spilled out of the bucket until the UXO Safety Observer can make a positive identification.

All OE scrap will be verified as inert. UXO Technicians will use non-metallic probes or other similar tools to remove earth from inside buried ordnance as required to verify the absence of hazardous explosive components.

If the object is determined to be an OE item, the UXO Safety Observer will immediately notify another UXO Technician on site. If the item cannot be positively identified as an inert OE item, operations will be halted and the SUXOS will be notified. If, after additional inspection, the item cannot be positively identified as inert, the site will be evacuated and the on-site USACE representative will be notified.

OE scrap will be identified, inspected, and certified as inert prior to packaging (see Appendix B for procedure). A certificate will be created for each item of OE scrap (DD Form 1348-1A, Appendix C). Additionally, an inventory will be maintained for all OE scrap. OE scrap will be demilitarized prior to shipment off site as required. Any OE item that is believed to be in a hazardous condition will not be moved unless instructed to do so by a USACE OE Safety Specialist.

If the object is determined to be a non-hazardous OE item, the item will be properly categorized as scrap or other and disposed of accordingly.

Anomaly excavation of suspected OE will be performed by a minimum of a two-person UXO Team after the completion of the access path clearance. Access to the site will follow established road routes into these sites; anomalies are not anticipated.

2.7.3.1 Hand Excavation Tools

UXO Technicians will use small hand tools such as shovels, spades, trowels, and pry bars to carefully hand-excavate UXO. Hand tools will be used for the majority of UXO that generally are found near the surface.

2.7.3.2 Excavator

The following procedure only applies to anomalies discovered outside the burial pit areas that require excavation. A commercial excavator (backhoe or track-mounted mechanical shovel) may be used by the UXO Team to carefully excavate the UXO or magnetic anomalies if it is believed that the UXO or magnetic anomalies are at a greater depth than can be efficiently hand excavated. Mechanical excavation will be used no closer than 1 foot to magnetic anomalies located during excavation. The UXO Team will communicate with the excavator operator via hand signals to stop the excavation if suspected ordnance is observed.

Excavation of the UXO will be initiated outside of the boundary of the subsurface anomaly detected by the magnetometer. This excavation will continue down until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with the magnetometer.

Using progressively smaller and more delicate tools to carefully remove the soil as the anomaly is approached, the UXO Team will then expand the sidewall of the excavation to expose the UXO for inspection without disturbing the UXO.

Once the item is exposed for inspection the UXO Team will determine if it is OE. If the item is not OE it will be removed and the area will be rechecked with the magnetometer to ensure that an anomaly is not hidden beneath it. The UXO Team will then annotate the results of the excavation on the FTMC Field Activity Daily Log, backfill the excavation, and remove the pin flag before proceeding to the next marked subsurface anomaly.

If the item is an OE the UXO Team will carefully remove enough soil, without disturbing the item, to allow them to either identify the item or to obtain its identification features. The UXO Team will then reposition four pin flags around the perimeter of the item to identify it as a subsurface OE and annotate the OE nomenclature or identification features on the FTMC Field Activity Log.

If a potentially hazardous OE item or a potential CWM hazard is encountered by UXO personnel, all work will be immediately halted and the Shaw Site-Superintendent notified.

2.7.4 Storage and Transportation of Explosives

Shaw will not store or transport any demolition explosives.

2.7.5 UXO Disposal and Disposition Procedures

Shaw will not perform any OE destruction incidental to construction support operations associated with this project.

2.7.6 Disposal of OE Scrap

Shaw will comply with the following procedures for processing ammunition, explosives and other dangerous articles (AEDA), and range residue for scrap recycling.

The SUXOS is responsible for the certification that all items are free of dangerous or hazardous materials. He will produce an inventory for each fiber box of OE related scrap utilizing the DD Form 1348-1A as required by DOD 4160.21-M-1, Chapter 4.

The SUXOS will certify, and the USACE OE Safety Specialist will verify, that the material is free of explosive hazards. The UXO Quality Control Officer will perform audits that monitor the collection of all scrap certification.

Once inspected, certified, verified and demilitarized as required, OE scrap will be placed in a fiber-box for shipping and banded. Each box will have a detailed inventory of the 3X scrap and an inert certification for each item. Once sealed, the boxes will be tested for CWM with the air monitoring equipment (MINICAMS). OE scrap will be secured in this container to ensure that mixing does not occur. A one-cubic-yard box will be used to secure the 3X material. The box is made of wooden fiber because a combustible container is required by the disposal agency. The scrap will remain in this container until shipped from the site to a disposal facility. Non-OE scrap will be collected and disposed of with other non-hazardous wastes generated by Shaw at FTMC.

2.7.7 Demobilization

Demobilization from FTMC will not occur; Shaw assets will be shifted to other FTMC delivery orders as required.

APPENDIX A
TRANSITION FORCE OE/UXO SOP

MEMORANDUM FOR: U.S. Army Transition Force (TF), Fort McClellan (FTMC), Alabama

SUBJECT: TF Ordnance and Explosives (OE) and Unexploded Ordnance (UXO) Standard Operating Procedure (SOP)

1. **PURPOSE:** To establish procedures for TF personnel when OE and UXO are found on FTMC.
2. **APPLICABILITY:** This SOP applies to personnel assigned to or employed by the TF. The U.S. Army Engineering and Support Center, Huntsville (CEHNC) and Mobile District Corps of Engineers (MDCE) will ensure their contractors follow this SOP and site-wide work plans.
3. **RESPONSIBILITIES:**
 - a. **TF Site Manager** will:
 - (1) Maintain overall command and control of assets involved in the cleanup of conventional or potential chemical munitions found on FTMC. This authority is in IAW with AR 385-10, The Army Safety Program.
 - (2) Resolve any conflicts involving conventional or potential chemical munitions found on FTMC.
 - (3) Approve all incident reports and public affairs information before their release.
 - b. **TF Operations Officer** will:
 - (1) Supervise Operations and Security personnel when they are required to respond to a conventional or potential chemical munitions incident.
 - (2) Keep the Site Manager informed on all operations and security actions taken.
 - (3) Initiate, staff, and transmit Chemical Event Reports if a confirmed chemical incident occurs.
 - (4) Draft and coordinate the Site Manager's approval on all releases of information.
 - c. **TF Safety Officer** will:
 - (1) Keep the Site Manager and Operations Officer informed on any safety concerns.
 - (2) Coordinate with and inform CEHNC Safety, Contractor UXO Safety, or 722nd EOD whenever a conventional munitions incident is under TF control.
 - (3) Coordinate with and inform CEHNC Safety, Contractor UXO Safety, or 722nd EOD whenever a potential chemical munitions incident occurs.

- d. **TF Base Realignment and Closure (BRAC) Environmental Coordinator (BEC)** will:
- (1) Advise the TF Site Manager on environmental issues concerning the removal or disposal of OE/UXO or potential chemical munitions items.
 - (2) Notify the BRAC Cleanup Team (BCT) of any confirmed chemical incident by transmitting a copy of the approved Chemical Event Report to the Environmental Protection Agency (EPA) Region IV and the Alabama Department of Environmental Management (ADEM) per *Appendix D, FTMC CWM SOP*.
- e. **Contractors:**
- (1) MDCE contractors will notify TF Operations or Safety whenever a conventional munitions item is discovered.
 - (2) CEHNC and MDCE contractors will notify TF Operations upon detection of a potential chemical munitions item.
 - (3) CEHNC and MDCE contractors will mark the conventional or potential chemical munitions item per their site-wide plans.
 - (4) MDCE and CEHNC contractors will keep the TF Operations or Safety Officer informed on any safety concerns involving conventional or chemical munitions items.
 - (5) MDCE and CEHNC contractors will assist the TF Operations Section as needed in the event of a confirmed chemical incident.

4. **DEFINITIONS:**

- a. Conventional ordnance are munitions not suspected of containing chemical agent. The term "UXO" means any item of explosive ordnance that failed to function as designed or has been abandoned, discarded, or improperly disposed of and yet, is still capable of causing damage to personnel or material. UXO munitions have been primed, fuzed, armed, or otherwise prepared for action, and been fired, dropped, launched, projected, or placed in such a manner as to be a hazard to operations, installation, personnel, or materiel and remain unexploded either by malfunction, design, or any other cause referenced in *Title 40 Code of Federal Regulations (CFR) 266.201, Standards For the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities*.
- b. OE consists of ammunition, ammunition components, chemical or biological warfare materiel or explosives that are abandoned, expelled from demolition pits or burning pads, lost, discarded, buried, or fired. Such ammunition, ammunition components, and explosives are no longer under the "accountable record" control of any DOD organization or activity.
- c. Chemical Warfare Material (CWM) is any abandoned, fired, burned, or otherwise disposed of equipment, munitions, devices, and containers designed for use directly in connection with the deployment, testing, or containerization of chemical agent. It includes V and G series nerve agent, H series blister agent, and Lewisite in other than munitions configurations. Chemical Agent Identification Sets (CAIS) are considered CWM. CWM is also any other equipment or materiel that are above the "3X" level of contamination defined in *AR (Army Regulation) 385-61, The Army Chemical Agent Safety Program* and *DOD Standard 6055.9, Ammunition and Explosives Safety*. An item that is XXX or 3X, has been partially decontaminated by locally approved procedures, bagged, or contained in an agent-tight barrier or approved plastic bag. **Use the *FTMC CWM SOP* for procedural guidance.**

d. Recovered CWM (RCWM) is chemical agent material, associated equipment, or surrounding contaminated media discovered either by chance or during deliberate real estate recovery/restoration operations that was used for its intended purpose or previously disposed of as waste. RCWM is classified based on the requirements of the Environmental Protection Agency (EPA) *40 CFR 266 Subpart M, EPA*. **Use the *FTMC CWM SOP* for procedural guidance.**

e. Military Munitions Rule (MMR). RCWM discovered on firing ranges or training areas will be handled per the EPA MMR with respect to classification, transportation, and disposal. RCWM found buried will be managed in compliance with environmental laws and regulations, as applicable:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Superfund Amendments and Reauthorization Act (SARA)
- Resource Conservation and Recovery Act (RCRA).

If the TF believes buried RCWM is not subject to management under the provisions of CERCLA, SARA, or RCRA, no off-site removal action will commence until the Office of the Assistant Secretary of the Army (Installations and Environment) (ASA (I&E)) has reviewed the circumstances and made a final determination. RCWM does not fall within the scope of *AR 50-6, Chemical Surety Program* except as detailed in Chapter 12 of the regulation.

f. Ordnance Scrap is military munitions or components thereof that may contain no explosive, pyrotechnic, or chemical agent. These can be but are not limited to, practice munitions without spotting charges, drill rounds, inert training munitions, or expended ejection munitions. Fragments of military munitions, which have functioned as designed or were recovered from areas where munitions were intentionally destroyed, are ordnance scrap if they have no explosive, pyrotechnic, or chemical filler. These items pose no imminent threat to public safety, but may require venting or some other action prior to release from DOD control.

g. “Other” consists of non-munitions material found at ordnance sites. This can include banding, wire, trash, auto parts, shipping boxes, or any kind of material that has been abandoned or discarded at an OE site that was never a component of military munitions. Ferrous rocks that activate geophysical instruments during investigations, which are removed from a site, should be classified as “other” under this guidance.

5. **BACKGROUND:** The diversity of FTMC work activities, multiple land ownerships, and the discovery of conventional and potential chemical munitions items throughout FTMC land areas, have revealed conflicts in reporting and disposal procedures for the TF, CEHNC, and MDCE.

a. FTMC was closed in September 1999, under the Base Realignment and Closure (BRAC) Act. FTMC land areas are being cleared of hazardous, toxic, and radiological waste (HTRW), conventional, and possible chemical munitions to allow property transfer out of Department of Defense (DOD) control. The TF has the responsibility to ensure this process is conducted efficiently and safely using regulatory guidance.

b. A challenge is determining who controls particular FTMC land areas. For example, the Alabama Department of Transportation (ALDOT) is building the Eastern Bypass (EBP) through portions of FTMC property. Part of the EBP is ALDOT-owned while other portions remain under Army control. All conventional or potential chemical munitions items found on such “civilian” land are reported to local law enforcement. This usually is the Calhoun County Sheriff’s Department. They then report the information to the 722nd Explosive Ordnance Disposal (EOD) detachment located at the Anniston Army Depot.

c. The local reuse authority, the Joint Powers Authority (JPA) is involved in selling land on FTMC. Some FTMC land areas belong to the JPA, other areas remain under DOD control awaiting transfer, and still others have already been transferred or leased to other entities. Examples include the Department of Justice (DOJ), Alabama Army National Guard (ALARNG), City of Anniston, and local businesses.

d. Environmental work activity is often conducted in old range and training areas where conventional or potential chemical munitions may be found. MDCE is the FTMC environmental program manager and their Total Environmental Remediation Contractor (TERC) is IT Corporation. IT UXO personnel check FTMC work sites using approved instrumentation before declaring an area safe for sampling and characterization. They follow anomaly avoidance procedures. Their scope of work states if a conventional or potential chemical munitions is found, the item will not be touched, disturbed, moved, or disposed of

e. The U.S. Army Engineering and Support Center, Huntsville (CEHNC) selected FWENC to perform OE/UXO response activities at FTMC. CEHNC has contract oversight of FWENC whose mission is locating, assessing, and disposing of OE materials, including UXO on FTMC.

6. U.S. ARMY TRANSITION FORCE:

a. Non-DOD Land. If conventional or potential chemical munitions are discovered on property outside DOD control, the TF will inform the reporting party to contact the Calhoun County Sheriff's Department.

b. Unknown items. The TF will determine who is the appropriate response agency and will contact them. The TF will coordinate with CEHNC Safety and the party who reported the incident, and inform them of actions being taken. This will be done prior to the response agency arriving at the incident site.

c. DOD-Land. In the event a conventional or potential chemical item is discovered and there is a question on who is to respond to the incident, the TF will either exercise a response under CEHNC oversight or notify the 722nd EOD. The TF will coordinate with CEHNC Safety and applicable contractor representatives, and update them on the situation. When the response action is completed, the TF will again notify CEHNC Safety and the applicable contractor on the completed action.

d. CWM/RCWM. The TF will follow the procedures outlined in the *FTMC CWM SOP*. Emergency on-site destruction of chemical munitions may be considered as an option to reduce risk. The TF Site Manager will direct the TF Operations Officer to coordinate on-site security between the time of discovery and time of treatment or transport. The TF BEC can provide additional information on proper actions to take such as NEPA (National Environmental Policy Act), ADEM guidance, and local requirements or procedures. All chemical agent samples drawn from CWM/RCWM will be managed in compliance with the laboratory safety and security provisions of 29 *CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories*.

7. REFERENCES

DOD Standard 6055.9, DOD Ammunition and Explosives Safety Standards.
<https://www.denix.osd.mil/denix/Public/ES-Programs/Explosives/Safety/cover.html>

29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories.
http://www.osha-slc.gov/OshStd_data/1910_1450.html

40 CFR 266 Subpart M, EPA Military Munitions Rule (MMR)
<http://www.epa.gov/epaoswer/hazwaste/military/mun-rule.htm>

40 CFR 266.201, Environmental Protection, Standards For the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
http://www.access.gpo.gov/nara/cfr/waisidx_99/40cfr266_99.html

AR 50-6, Chemical Surety
<http://www.usapa.army.mil/pdffiles/r50-6.pdf>

AR 385-61, The Army Chemical Agent Safety Program.
<http://www.usapa.army.mil/pdffiles/r385-61.pdf>

AR 385-64, Army Explosive Safety Program.
<http://www.usapa.army.mil/pdffiles/r385-64.pdf>

FTMC General Site-Wide Work Plan (FWENC)
sneill@fwenc.com

FTMC OE/UXO Safety MOA
moore@mcclellen.army.mil

FTMC CWM Standard Operating Procedures (SOP)
boltions@mcclellan.army.mil

CEHNC Base Realignment and Closure (BRAC) Ordnance and Explosives (OE) Response Projects
<http://www.hnd.usace.army.mil/ow/policy/52gpmoa.pdf>

CEHNC and 52nd Ordnance Group Memorandum of Agreement
<http://www.hnd.usace.army.mil/ow/policy/52gpmoa.pdf>

8. ACRONYMS

ADEM	Alabama Department of Environmental Management
ALARNG	Alabama Army National Guard
ALDOT	Alabama Department of Transportation
AR	Army Regulation
ASA (I&E)	Assistant Secretary of the Army (Installations and Environment)
BEC	Base Realignment and Closure Environmental Coordinator
BIP	Blow (n) In Place
BRAC	Base Realignment and Closure
CAIS	Chemical Agent Identification Sets
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CWM	Chemical Warfare Materiel
DACA	Department of the Army Contracting Agency
DOD	Department of Defense
DOJ	Department of Justice
EBP	Eastern Bypass
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EZ	Exclusion Zone
FTMC	Fort McClellan
FWENC	Foster Wheeler Environmental Corporation
HTRW	Hazardous Toxic Radiological Waste
IT	The International Technology Group
JPA	Joint Powers Authority
MDCE	Mobile District Corps of Engineers
MMR	Military Munitions Rule
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
OE	Ordnance and Explosives
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Materiel
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedures
SUXOS	Senior Unexploded Ordnance Supervisor
TERC	Total Environmental Remediation Contractor
TEU	Technical Escort Unit
TF	Transition Force
UXO	Unexploded Ordnance
XXX	3X Chemical Decontamination

APPENDIX B

OE, RR INSPECTION, CERTIFICATION, AND FINAL DISPOSITION PROCEDURES

Corps of Engineers Contractors Ordnance and Explosive (OE), Range Residue (RR) Inspection, Certification, and Final Disposition Procedures

I. OE, RR Inspection – Contractor Responsibilities and Procedures

1. The U.S. Army Corps of Engineers (USACE) contractors executing projects will comply with the following procedures for processing OE and Range Residue for final disposition as scrap metal. The objective of these procedures is to ensure that an inspection procedure of the exterior and interior surfaces of all recovered items is in place to ensure these items do not present an explosive hazard. These USACE contractor responsibilities and procedures will be contained in the project work plan.

a. Unexploded Ordnance (UXO) Sweep Personnel will only mark suspected items and will not be allowed to perform any assessment of a suspect item to determine its status.

b. Unexploded Ordnance (UXO) Tech I will only tentatively identify a located item as scrap or OE.

c. UXO Technician II will:

(1) Inspect each item as it is recovered and determine the following:

- ◆ Is the item a UXO or a component of a military munition?
- ◆ Does the item contain explosives or other dangerous materials?
- ◆ Does the item require detonation?
- ◆ Does the item require demilitarization (demil) or venting to expose internal fillers?

(2) Segregate items requiring demil or venting procedures from those items ready for certification.

(3) Items found to contain dangerous fillers will be process in accordance with applicable procedures.

d. UXO Technician III will:

(1) Inspect recovered items to determine if free of dangerous fillers.

(2) Supervise detonation of items found to contain dangerous fillers and venting/demil procedures.

(3) Supervise the consolidation of recovered scrap metal for containerization and sealing.

e. UXO Quality Control (QC) Specialist will:

(1) Conduct daily audits of the procedures used by UXO teams and individuals for processing OE or Range Residue.

(2) Perform and document, a minimum of 10% random sampling of all scrap metal collected from the various teams to ensure no items of a dangerous or explosives nature are identified as scrap metal.

(3) Perform these random checks to satisfy that OE or range residue is free from any explosive hazards, necessary for completion of the Requisition and Turn-in Document, DD Form 1348-1A.

Corps of Engineers Contractors Ordnance and Explosive (OE), Range Residue (RR) Inspection, Certification, and Final Disposition Procedures

f. UXO Site Safety Officer (UXOSO) will:

- (1) Ensure the specific procedures and responsibilities for processing OE and Range Residue for certification as scrap metal are being followed, performed safely, consistent with applicable regulations, and in accordance with the USACE approved project work plan.
- (2) Will perform random checks of processed OE and Range Residue to ensure items being identified as scrap are free from any explosive hazards.

g. Senior UXO Supervisor will:

- (1) Be responsible for ensuring work and Quality Control (QC) Plans specify the procedures and responsibilities for processing OE and Range Residue for the final disposition as scrap metal.
- (2) Ensure a Requisition and Turn-in Document, DD Form 1348-1A is completed for all scrap metal to be transferred for final disposition.
- (3) Perform random checks to satisfy that the OE or range residue is free from explosive hazards, necessary to complete the DD 1348-1A.
- (4) Certify all scrap metal generated from OE or Range Residue as free of explosive hazards.
- (5) Be responsible for ensuring that these inspected materials are secured in a closed, labeled and sealed container and documented as follows;
 - The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification that will start with **USACE/Installation Name/Contractor's Name/0001/Seal's unique identification** and continue sequentially.
 - The container will be closed in such a manner that a seal must be broken in order to open the container. A seal will bear the same unique identification as the container or the container will be clearly marked with the seal's identification if different than the container.
 - A documented description of the container will be provided by the contractor with the following information for each container; contents, weight of container; location where OE scrap was obtained; name of contractor, names of certifying and verifying individuals; unique container identification; and seal identification, if required (see paragraph I. 1.g. (5)). These documents will also be provided by the contractor in a separate section of the final report.

II. OE Scrap Certification and Verification

1. The contractor will ensure that scrap metal generated from OE or Range Clearance is properly inspected in accordance with the procedures in I. above. Only personnel who are qualified UXO personnel per USACE's Contract Data Item Description (DID) OE-025 will perform these inspections. The Senior UXO Supervisor will certify and the USACE's OE Safety Specialist will verify that the scrap metal is free of explosive hazards.
2. DD form 1348-1A will be used as certification/verification documentation. All DD 1348-1A must clearly show the typed or printed names of the contractor's Senior UXO Supervisor and the USACE's OE Safety Specialist, organization, signature, and contractor's home office and field office phone number(s) of the persons certifying and verifying the scrap metal.

Corps of Engineers Contractors Ordnance and Explosive (OE), Range Residue (RR) Inspection, Certification, and Final Disposition Procedures

- a. Local directives and agreements may supplement these procedures. Coordination with the local concerns will identify any desired or requested supplementation to these procedures.
- b. In addition to the data elements required and any locally agreed to directives, the DD 1348-1A must clearly indicate the following for scrap metal:
 - (1) Basic material content (Type of metal; e.g., steel or mixed)
 - (2) Estimated weight
 - (3) Unique identification of each of the containers and seals stated as being turned over.
 - (4) Location where OE scrap was obtained.
 - (5) Seal identification, if different from the unique identification of the sealed container.
- c. The following certification/verification will be entered on each DD 1348-1A for turn over of scrap and will be signed by the Senior UXO Supervisor and the USACE OE Safety Specialist.

"This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards."

III. Maintaining The Chain Of Custody And Final Disposition

The contractor in coordination with the Corps of Engineers, will arrange for maintaining the chain of custody and final disposition of the certified and verified material. The certified and verified material will only be released to an organization that will:

- a. Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chained of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content.
- b. Send notification and supporting documentation to the sealed container-generating contractor that the seal containers have been smelted and are now only identifiable by their basic content.
- c. This document will be incorporated by the contractor into the final report as documentation for supporting the final disposition of this scrap metal.

APPENDIX C
DD FORM 1348-1A

ATTACHMENT 4

**CHEMICAL AGENT FACT SHEETS AND
NIOSH POCKET GUIDES TO CHEMICAL HAZARDS**



[HD-Mustard](#)

[GA-Tabun](#)

[GB-Sarin](#)

[GD-Soman](#)

[VX-Nerve
Agent](#)

Chemical Agent Fact Sheet

Soman - GD

Nerve Agent

(Pinacolyl methyl phosphonofluoridate)

Description:

Soman was discovered in Germany in 1944. GD is a lethal cholinesterase inhibitor. Doses that are potentially life threatening may be only slightly larger than those producing least effects. Soman is a colorless liquid when pure with a fruity odor. The industrial version is yellow-brown with a camphor-like odor.

Signs and Symptoms:

Symptoms of overexposure may occur within minutes or hours, depending upon dose. They include: miosis (constriction of pupils) and visual effects, headaches and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety, difficulty in thinking and sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation. Severe exposure symptoms progress to convulsions and respiratory failure.

Treatment:

Inhalation: Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, in coordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by a physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention Immediately.

Eye Contact: Immediately flush eyes with water for 10-15 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken Immediately to a medical treatment facility

for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove excess decontaminant. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention Immediately. **Ingestion:** Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention Immediately.



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[GB-Sarin](#)

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[VX-Nerve
Agent](#)

Chemical Agent Fact Sheet

VX

Nerve Agent

(O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate)

Description:

Chemists in the United Kingdom searching for new insecticides came across compounds that were extremely toxic to humans. The British shared the discovery with the U.S. Army in 1953 and a systematic investigation of these new compounds was begun at Edgewood. The Army discovered they were more persistent and much more toxic than the G-series agents. In 1955, these compounds were designated V-series agents for "venomous." VX is an oily liquid that is clear, odorless and tasteless. It can be amber colored and similar in appearance to motor oil.

Signs and Symptoms:

Symptoms of overexposure may occur within minutes or hours, depending upon the dose. They include: miosis (constriction of pupils) and visual effects, headaches and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety, difficulty in thinking, difficulty sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation. Severe exposure symptoms progress to convulsions and respiratory failure.

Treatment:

Inhalation: Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, incoordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by a physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention Immediately.

Eye Contact: Immediately flush eyes with water for 10-15 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken Immediately to a medical treatment facility for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove excess decontaminant. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention Immediately.

Ingestion: Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention Immediately.



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Agent](#)

Chemical Agent Fact Sheet

Sarin - GB

Nerve Agent

(Isopropyl methylphosphonofluoridate)

Description:

Sarin was developed in 1938 in Germany as a pesticide. Its name is derived from the names of the chemists involved in its creation: Schrader, Ambros, Rudriger and van der Linde. Sarin is a colorless non-persistent liquid. The vapor is slightly heavier than air, so it hovers close to the ground. Under wet and humid weather conditions, Sarin degrades swiftly, but as the temperature rises up to a certain point, Sarin's lethal duration increases, despite the humidity. Sarin is a lethal cholinesterase inhibitor. Doses which are potentially life threatening may be only slightly larger than those producing least effects.

Signs and Symptoms:

Symptoms of overexposure may occur within minutes or hours, depending upon the dose. They include: miosis (constriction of pupils) and visual effects, headaches and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety, difficulty in thinking, difficulty sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation, with severe exposure symptoms progressing to convulsions and respiratory failure.

Treatment:

Inhalation: Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, in coordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by a physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is

difficult, administer oxygen. Seek medical attention Immediately.

Eye Contact: Immediately flush eyes with water for 10-15 minutes, then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken Immediately to a medical treatment facility for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove excess decontaminant. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention Immediately.

Ingestion: Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention Immediately.



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[HD-Mustard](#)

[GA-Tabun](#)

[GB-Sarin](#)

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[VX-Nerve
Agent](#)

Chemical Agent Fact Sheet

Tabun - GA Nerve Agent (Dimethylphosphoramido-cyanidate)

Description:

In 1936, Germany first developed Tabun as an insecticide. Dr. Gerhard Schrader first noticed the effects of nerve agents on humans when he and his lab assistant began to experience shortness of breath and contraction of the pupils. Tabun was the first nerve agent discovered. GA is a clear colorless and tasteless liquid with a slightly fruity odor.

Signs and Symptoms:

The symptoms are: runny nose; tightness of the chest; dimness of vision and pin pointing of the eye pupils; difficulty in breathing; drooling and excessive sweating; nausea; vomiting, cramps, and involuntary defecation and urination; twitching, jerking, and staggering; and headache, confusion, drowsiness, coma, and convulsions. These symptoms are followed by cessation of breathing and death. Symptoms appear much more slowly from a skin dosage than from a respiratory dosage. Although skin absorption great enough to cause death may occur in 1 to 2 minutes, death may be delayed for 1 to 2 hours. Respiratory lethal dosages kill in 1 to 10 minutes, and liquid in the eye kills almost as rapidly.

Treatment:

Inhalation: Hold breath until respiratory protective mask is donned. If severe signs of agent exposure appear (chest tightens, pupil constriction, in coordination, etc.), immediately administer, in rapid succession, all three Nerve Agent Antidote Kit(s), Mark I injectors (or atropine if directed by a physician). Injections using the Mark I kit injectors may be repeated at 5 to 20 minute intervals if signs and symptoms are progressing until three series of injections have been administered. No more injections will be given unless directed by medical personnel. In addition, a record will be maintained of all injections given. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination exists. If breathing is difficult, administer oxygen. Seek medical attention Immediately.

Eye Contact: Immediately flush eyes with water for 10-15 minutes,

then don respiratory protective mask. Although miosis (pinpointing of the pupils) may be an early sign of agent exposure, an injection will not be administered when miosis is the only sign present. Instead, the individual will be taken Immediately to a medical treatment facility for observation.

Skin Contact: Don respiratory protective mask and remove contaminated clothing. Immediately wash contaminated skin with copious amounts of soap and water, 10% sodium carbonate solution, or 5% liquid household bleach. Rinse well with water to remove excess decontaminant. Administer nerve agent antidote kit, Mark I, only if local sweating and muscular twitching symptoms are observed. Seek medical attention Immediately.

Ingestion: Do not induce vomiting. First symptoms are likely to be gastrointestinal. Immediately administer Nerve Agent Antidote Kit, Mark I. Seek medical attention Immediately.



This page last updated on 30 April 2001

[HD-Mustard](#)[GA-Tabun](#)[GB-Sarin](#)[GD-Soman](#)[VX-Nerve
Agent](#)

Chemical Agent Fact Sheet

Mustard - HD Blister Agent (bis- (2-chloroethyl) sulfide)

Description:

Although first synthesized in the 1800's, the Germans first used mustard in 1917 during World War I. Mustard (liquid) is colorless when pure, but is normally a brown oily substance. Mustard (vapor) has a slight garlic- or mustard-like odor. Mustard remains a health hazard for an extended period of time. Mustard is a toxic agent that is considered non-lethal by the Army. However, complications from mustard exposure can lead to death.

Signs and Symptoms:

An individual exposed to mustard will feel very little pain and will not notice symptoms for quite some time. However, the longer the exposure without removal of the mustard agent, the more severe will be the damage to affected areas of the body. Mustard is a blister agent that affects the eyes, lungs and skin. The eyes are very susceptible, reacting to very low concentrations from mustard. Exposure to mustard on the skin can range from redness and inflammation to severe blisters and extreme soreness. Inhalation of the agent will cause irritation of throat, tightness of chest, hoarseness and coughing. If medical treatment is not received in the early stages of contamination, severe bronchopneumonia with accompanying high fever can occur.

Treatment:

There is no known antidote for mustard exposure; the process of cellular destruction is irreversible. Therefore, it is very important to remove the mustard as quickly as possible. The best means of removal is by flushing with water and household bleach, or washing with soap and water after using an absorber of mustard, such as flour. **Inhalation:** Hold breath until respiratory protective mask is donned. Remove from the source. Immediately. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination is present. Seek medical attention Immediately.

Eye Contact: Speed in decontaminating the eyes is absolutely

essential. Remove the person from the liquid source; flush the eyes Immediately with water for at least 15 minutes by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the patient to a medical facility Immediately.

Skin Contact: Don respiratory protective mask. Remove the victim from agent sources Immediately. Immediately wash skin and clothes with 5% solution of sodium hypochlorite or liquid household bleach within one minute. Cut and remove contaminated clothing, flush contaminated skin area again with 5% sodium hypochlorite solution, then wash contaminated skin area with soap and water. Seek medical attention Immediately.

Ingestion: Do not induce vomiting. Give victim milk to drink. Seek medical attention Immediately.



This page last updated on 30 April 2001

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ToxFAQs™ for

Blister Agents: Lewisite (L) Mustard-Lewisite Mixture (HL)

CAS#**Lewisite 541-25-3****Mustard-Lewisite Mixture CAS# Not Available****April 2002**

This fact sheet answers the most frequently asked health questions about lewisite and mustard-lewisite. For more information, you may call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: It is unlikely that the general population will be exposed to blister agents Lewisite or Mustard-Lewisite. People who breathe in vapors of Lewisite or Mustard-Lewisite may experience damage to the respiratory system. Contact with the skin or eye can result in serious burns. Lewisite or Mustard-Lewisite also can cause damage to bone marrow and blood vessels. Exposure to high levels may be fatal. Blister agents Lewisite and Mustard-Lewisite have not been found in any of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are lewisite and mustard-lewisite?

Lewisite is an oily, colorless liquid with an odor like geraniums. Mustard-Lewisite Mixture is a liquid with a garlic-like odor. Mustard-Lewisite is a mixture of Lewisite and a sulfur mustard known as HD.

Lewisite might have been used as a chemical weapon by Japan against Chinese forces in the 1930s, but such reports have not been confirmed. Any stored Lewisite in the United States must be destroyed before April 2007, as mandated by the Chemical Weapons Convention.

What happens to lewisite and mustard-lewisite when it enters the environment?

- Blister agents Lewisite and Mustard-Lewisite could enter the environment from an accidental release.
- In air, blister agents Lewisite and Mustard-Lewisite will be broken down by compounds that are found in the air, but they may persist in air for a few days before being broken down.
- Lewisite and Mustard-Lewisite will be broken down in water quickly, but small amounts may evaporate.
- Lewisite and Mustard-Lewisite will be broken down in moist soil quickly, but small amounts may evaporate.
- Lewisite and Mustard-Lewisite do not accumulate in the food chain.

How might I be exposed to lewisite and mustard-lewisite?

- The general population will not be exposed to blister agents Lewisite or Mustard-Lewisite.
- Lewisite and Mustard-Lewisite are no longer produced in the United States.
- It is used in many industries and in hospitals and laboratories.
- People that are potentially exposed to Lewisite or Mustard-Lewisite are soldiers who might be exposed to chemical weapons or people who work at military sites where these compounds are stored.

How can lewisite and mustard-lewisite affect my health?

If you breathe Lewisite or Mustard-Lewisite vapors, your airways will immediately become irritated. You could experience burning pain in the nose and sinuses, laryngitis, cough, shortness of breath, nausea, and vomiting. You could also experience airway tissue damage and accumulation of fluid in your lungs, which could result in death.

Contact of the skin with Lewisite or Mustard-Lewisite vapors or liquid will result in local pain, swelling, and rash, followed by blistering that might be delayed for hours. If Lewisite or Mustard-Lewisite vapors or liquid contact your eyes, you will suffer immediate pain and rapid swelling, as well as serious damage to the cornea and other parts of the eye.

Ingestion of Lewisite or Mustard-Lewisite will burn your mouth and throat, will cause severe stomach pain, nausea, vomiting, and bloody stools.

If some of the Lewisite and Mustard-Lewisite that you breathe, touch, or ingest, pass to your blood stream, it can cause bone marrow damage and fluid loss from your blood vessels, which could result in low blood

pressure and damage to the rest of your body.

We do not know if exposure to Lewisite or Mustard-Lewisite causes reproductive effects in humans.

How likely are lewisite and mustard-lewisite to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified Lewisite as to its carcinogenicity. Both the DHHS and IARC have classified the blister agent H/HD (the sulfur mustard used in the Mustard-Lewisite mixture) as a human carcinogen. We do not know whether the Mustard-Lewisite mixture might also be a human carcinogen.

How does lewisite and mustard-lewisite affect children?

There is no information on children exposed to Lewisite or Mustard-Lewisite, but children would probably be affected in the same ways as adults. We do not know whether children differ from adults in their susceptibility to these blister agents.

We do not know whether Lewisite or Mustard-Lewisite can cause developmental effects in humans.

How can families reduce the risk of exposure to lewisite and mustard-lewisite?

It is unlikely that families will be exposed to Lewisite or Mustard-Lewisite.

Is there a medical test to show whether I've been exposed to lewisite and mustard-lewisite?

There are no specific tests to indicate whether you have been exposed to Lewisite or Mustard-Lewisite. The presence of arsenic in the urine could indicate if you have been exposed to one of these blister agents.

Has the federal government made recommendations to protect human health?

An Airborne Exposure Limit (as recommended by the Surgeon General's Working Group, U.S. Department of Health and Human Services) of 0.003 milligrams of Lewisite and Mustard-Lewisite per cubic meter of air (0.003 mg/m³) has been established as a time-weighted average (TWA) for the workplace.

Source of Information

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information?

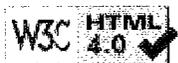
ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-888-422-8737
FAX: (404)498-0057
ToxFAQs Internet address via WWW is
<http://www.atsdr.cdc.gov/toxfaq.html>

External safety and chemistry information (please see our [disclaimer](#)):

Lewisite
 $C_2H_2AsCl_3$



ATSDR Information Center / ATSDRIC@cdc.gov / 1-888-422-8737

This page last updated on September 27, 2002

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FACT SHEET

Facts About Lewisite

What lewisite is

- Lewisite is a type of chemical warfare agent. This kind of agent is called a vesicant or blistering agent, because it causes blistering of the skin and mucous membranes on contact.
- Lewisite is an oily, colorless liquid in its pure form and can appear amber to black in its impure form.
- Lewisite has an odor like geraniums.
- Lewisite contains arsenic, a poisonous element.
- Lewisite is also known by its military designation, "L."

Where lewisite is found and how it is used

- Lewisite was produced in 1918 to be used in World War I, but its production was too late for it to be used in the war.
- Lewisite has been used only as a chemical warfare agent. It has no medical or other practical use.
- Lewisite is not found naturally in the environment.

How people can be exposed to lewisite

- People's risk for exposure depends on how close they are to the place where the lewisite was released.
- If lewisite gas is released into the air, people may be exposed through skin contact or eye contact. They may also be exposed by breathing air that contains lewisite.
- If lewisite liquid is released into water, people may be exposed by drinking water that contains lewisite or by getting the water on their bodies.
- If lewisite liquid comes into contact with food, people may be exposed by eating the contaminated food.
- People can be exposed by coming into direct contact with liquid lewisite.
- Lewisite vapor is heavier than air, so it will settle in low-lying areas.
- Lewisite remains a liquid under a wide range of environmental conditions, from below freezing to very hot temperatures. Therefore, it could last for a long time in the environment.

How lewisite works

- Adverse health effects caused by lewisite depend on the amount people are exposed to, the route of exposure, and the length of time that people are exposed.
- Lewisite is a powerful irritant and blistering agent that immediately damages the skin, eyes, and respiratory (breathing) tract.
- Because it contains arsenic, lewisite has some effects that are similar to arsenic poisoning, including stomach ailments and low blood pressure.

Facts About Lewisite

(continued from previous page)

Immediate signs and symptoms of lewisite exposure

- Most information on the health effects of lewisite is based on animal studies.
- Signs and symptoms occur immediately following a lewisite exposure. Lewisite can have the following effects on specific parts of the body:
 - *Skin*: pain and irritation within seconds to minutes, redness within 15 to 30 minutes followed by blister formation within several hours. The blister begins as a small blister in the middle of the red areas and then expands to cover the entire reddened area of skin. The lesions (sores) from lewisite heal much faster than lesions caused by the other blistering agents, sulfur mustard and nitrogen mustards, and the discoloring of the skin that occurs later is much less noticeable.
 - *Eyes*: irritation, pain, swelling, and tearing may occur on contact.
 - *Respiratory tract*: runny nose, sneezing, hoarseness, bloody nose, sinus pain, shortness of breath, and cough
 - *Digestive tract*: diarrhea, nausea, and vomiting.
 - *Cardiovascular*: "Lewisite shock" or low blood pressure may occur
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to lewisite.

What the long-term health effects may be

- Extensive skin burning, as seen with sulfur mustard, is less likely.
- Extensive breathing in of the vapors may cause chronic respiratory disease.
- Extensive eye exposure may cause permanent blindness.
- Unlike sulfur mustard, lewisite is not known to suppress the immune system.

How people can protect themselves and what they should do if they are exposed to lewisite

- Leave the area where the lewisite was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to lewisite.
 - If the lewisite release was outdoors, move away from the area where the lewisite was released. Go to the highest ground possible, because lewisite is heavier than air and will sink to low-lying areas.
 - If the lewisite release was indoors, get out of the building.
- If you think you may have been exposed, remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing*:
 - Quickly take off clothing that has liquid lewisite on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
 - If you placed your clothes in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
 - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body*:
 - As quickly as possible, wash any liquid lewisite from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.

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Facts About Lewisite

(continued from previous page)

- If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and place them in the bags with the contaminated clothing. Do not put the contacts back in your eyes. If you wear eyeglasses, wash them with soap and water. You can put the eyeglasses back on after you wash them.
- If you have ingested (swallowed) lewisite, do not induce vomiting or drink fluids.
- **Seek medical attention right away. Dial 911 and explain what has happened.**

How lewisite exposure is treated

Treatment consists of removing lewisite from the body as soon as possible and providing supportive medical care in a hospital setting. An antidote for lewisite is available and is most useful if given as soon as possible after exposure.

How people can get more information about lewisite

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
 - Public Response Hotline (CDC)
 - English (888) 246-2675
 - Español (888) 246-2857
 - TTY (866) 874-2646
 - Emergency Preparedness and Response Web site (<http://www.bt.cdc.gov/>)
 - E-mail inquiries: cdcresponse@ashastd.org
 - Mail inquiries:
Public Inquiry c/o BPRP
Bioterrorism Preparedness and Response Planning
Centers for Disease Control and Prevention
Mailstop C-18
1600 Clifton Road
Atlanta, GA 30333
- Agency for Toxic Substances and Disease Registry (ATSDR) (1-888-422-8737)
 - E-mail inquiries: atsdric@cdc.gov
 - Mail inquiries:
Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

Last reviewed on 03/14/03.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

For more information, visit www.bt.cdc.gov or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

March 14, 2003

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NIOSH Pocket Guide to Chemical Hazards

Barium chloride (as Ba)		CAS 10361-37-2	
BaCl ₂		RTECS CQ8750000	
Synonyms & Trade Names Barium dichloride		DOT ID & Guide 1564 154 (barium compounds, n.o.s.)	
Exposure Limits	NIOSH REL*: TWA 0.5 mg/m ³ [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
	OSHA PEL*: TWA 0.5 mg/m ³ [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
IDLH 50 mg/m ³ (as Ba) See: IDLH INDEX		Conversion	
Physical Description White, odorless solid.			
MW: 208.2	BP: 2840°F	MLT: 1765°F	Sol: 38%
VP: Low	IP: ?		Sp.Gr: 3.86
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, oxidizers			
Measurement Methods NIOSH 7056; OSHA ID121 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA			
Up to 5 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator			
Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			
Up to 25 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			
Up to 50 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus			
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

Target Organs Eyes, skin, respiratory system, heart, central nervous system

See also: [INTRODUCTION](#) See ICSC CARD: [0614](#) See MEDICAL TESTS: [0021](#)

NIOSH Pocket Guide to Chemical Hazards

Lead		CAS 7439-92-1	
Pb		RTECS OF7525000	
Synonyms & Trade Names Lead metal, Plumbum		DOT ID & Guide	
Exposure Limits		NIOSH REL*: TWA 0.050 mg/m ³ See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]	
		OSHA PEL*: [1910.1025] TWA 0.050 mg/m ³ See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]	
IDLH 100 mg/m ³ (as Pb) See: 7439921		Conversion	
Physical Description A heavy, ductile, soft, gray solid.			
MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 11.34
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form.			
Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids			
Measurement Methods NIOSH 7082, 7105, 7300, 7700, 7701, 7702; OSHA ID121, ID125G, ID206 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA			
Up to 0.5 mg/m ³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator			
Up to 1.25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter			
Up to 2.5 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			
Up to 50 mg/m ³ : (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode			
Up to 100 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus			
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

See also: [INTRODUCTION](#) See ICSC CARD: [0052](#) See MEDICAL TESTS: [0127](#)

NIOSH Pocket Guide to Chemical Hazards

Portland cement		CAS 65997-15-1	
		RTECS VV8770000	
Synonyms & Trade Names Cement, Hydraulic cement, Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]		DOT ID & Guide	
Exposure Limits		NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)	
		OSHA PEL †: TWA 50 mppcf	
IDLH 5000 mg/m ³ See: 65997151		Conversion	
Physical Description Gray, odorless powder.			
MW: ?	BP: NA	MLT: NA	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
F.L.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500; OSHA ID207 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Fresh air Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH			
Up to 50 mg/m ³ : (APF = 5) Any dust respirator			
Up to 100 mg/m ³ : (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator			
Up to 250 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust filter			
Up to 500 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			
Up to 5000 mg/m ³ : (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode			
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus			
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose; cough, expectoration; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [1425](#) See MEDICAL TESTS: [0196](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclonite		CAS 121-82-4	
$C_3H_6N_6O_6$		RTECS XY9450000	
Synonyms & Trade Names Cyclotrimethylenetrinitramine; Hexahydro-1,3,5-trinitro-s-triazine; RDX; Trimethylenetrinitramine; 1,3,5-Trinitro-1,3,5-triazacyclohexane		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 1.5 mg/m ³ ST 3 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D. See: IDLH INDEX		Conversion	
Physical Description White, crystalline powder. [Note: A powerful high explosive.]			
MW: 222.2	BP: ?	MLT: 401°F	Sol: Insoluble
VP(230°F): 0.0004 mmHg	IP: ?		Sp.Gr: 1.82
Fl.P: Explodes	UEL: ?	LEL: ?	
Combustible Solid [EXPLOSIVE!]			
Incompatibilities & Reactivities Strong oxidizers, combustible materials, heat [Note: Detonates on contact with mercury fulminate.]			
Measurement Methods NIOSH 0500 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
<div style="background-color: black; color: white; padding: 2px; display: inline-block;">READ FIRST</div>			
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, irritability, lassitude (weakness, exhaustion), tremor, nausea, dizziness, vomiting, insomnia, convulsions			
Target Organs Eyes, skin, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

Kerosene		CAS 8008-20-6	
		RTECS OA5500000	
Synonyms & Trade Names Fuel Oil No. 1, Range oil [Note: A refined petroleum solvent (predominantly C9-C16), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics & 5% dinuclear aromatics.]		DOT ID & Guide 1223 <u>128</u>	
Exposure Limits	NIOSH REL: TWA 100 mg/m ³		
	OSHA PEL: none		
IDLH N.D. See: IDLH INDEX	Conversion		
Physical Description Colorless to yellowish, oily liquid with a strong, characteristic odor.			
MW: 170 (approx)	BP: 347-617°F	FRZ: -50°F	Sol: Insoluble
VP(100°F): 5 mmHg	IP: ?		Sp.Gr: 0.81
F.L.P: 100-162°F	UEL: 5%	LEL: 0.7%	
Class II Combustible Liquid: F.L.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1550 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH Up to 1000 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 2500 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) Up to 5000 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			

Symptoms Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)

Target Organs Eyes, skin, respiratory system, central nervous system

See also: [INTRODUCTION](#) See ICSC CARD: [0663](#)

NIOSH Pocket Guide to Chemical Hazards

Tetrachloroethylene		CAS 127-18-4
$\text{Cl}_2\text{C}=\text{CCl}_2$		RTECS KX3850000
Synonyms & Trade Names Perchloroethylene, Perchloroethylene, Perk, Tetrachloroethylene		DOT ID & Guide 1897 160
Exposure Limits	NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A	
	OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)	
IDLH Ca [150 ppm] See: 127184	Conversion 1 ppm = 6.78 mg/m ³	
Physical Description Colorless liquid with a mild, chloroform-like odor.		
MW: 165.8	BP: 250°F	FRZ: -2°F
VP: 14 mmHg	IP: 9.32 eV	Sol: 0.02%
FLP: NA	UEL: NA	LEL: NA
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.		
Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash		
Measurement Methods NIOSH 1003 ; OSHA 1001 See: NMAM or OSHA Methods		
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench	First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST		
Respirator Recommendations NIOSH At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus		
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact		
Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]		
Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system		
Cancer Site [in animals: liver tumors]		
See also: INTRODUCTION See ICSC CARD: 0076 See MEDICAL TESTS: 0179		

NIOSH Pocket Guide to Chemical Hazards

Toluene		CAS 108-88-3	
$C_6H_5CH_3$		RTECS XS5250000	
Synonyms & Trade Names Methyl benzene, Methyl benzol, Phenyl methane, Toluol		DOT ID & Guide 1294 130	
Exposure Limits	NIOSH REL: TWA 100 ppm (375 mg/m ³) ST 150 ppm (560 mg/m ³)		
	OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)		
IDLH 500 ppm See: 108883		Conversion 1 ppm = 3.77 mg/m ³	
Physical Description Colorless liquid with a sweet, pungent, benzene-like odor.			
MW: 92.1	BP: 232°F	FRZ: -139°F	Sol(74°F): 0.07%
VP: 21 mmHg	IP: 8.82 eV		Sp.Gr: 0.87
Fl.P: 40°F	UEL: 7.1%	LEL: 1.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500, 1501, 3800, 4000; OSHA 111 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH Up to 500 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/(APF = 10) Any supplied-air respirator/(APF = 50) Any self-contained breathing apparatus with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage			
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys			
See also: INTRODUCTION See ICSC CARD: 0078 See MEDICAL TESTS: 0232			

NIOSH Pocket Guide to Chemical Hazards

Methyl chloroform		CAS 71-55-6	
CH ₃ CCl ₃		RTECS KJ2975000	
Synonyms & Trade Names Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)		DOT ID & Guide 2831 160	
Exposure Limits	NIOSH REL: C 350 ppm (1900 mg/m ³) [15-minute] See Appendix C (Chloroethanes)		
	OSHA PEL†: TWA 350 ppm (1900 mg/m ³)		
IDLH 700 ppm See: 71556		Conversion 1 ppm = 5.46 mg/m ³	
Physical Description Colorless liquid with a mild, chloroform-like odor.			
MW: 133.4	BP: 165°F	FRZ: -23°F	Sol: 0.4%
VP: 100 mmHg	IP: 11.00 eV		Sp.Gr: 1.34
F.L.P.: ?	UEL: 12.5%	LEL: 7.5%	
Combustible Liquid, but burns with difficulty.			
Incompatibilities & Reactivities Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]			
Measurement Methods NIOSH 1003 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA Up to 700 ppm: (APF = 10) Any supplied-air respirator*/(APF = 50) Any self-contained breathing apparatus with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage			
Target Organs Eyes, skin, central nervous system, cardiovascular system, liver			
See also: INTRODUCTION See ICSC CARD: 0079 See MEDICAL TESTS: 0141			

NIOSH Pocket Guide to Chemical Hazards

Nitric acid		CAS 7697-37-2	
HNO ₃		RTECS QU5775000	
Synonyms & Trade Names Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)		DOT ID & Guide 1760 154 (<=40% acid) 2031 157 (>40% acid) 2032 157 (fuming)	
Exposure Limits	NIOSH REL: TWA 2 ppm (5 mg/m ³) ST 4 ppm (10 mg/m ³)		
	OSHA PEL†: TWA 2 ppm (5 mg/m ³)		
IDLH 25 ppm See: 7697372		Conversion 1 ppm = 2.58 mg/m ³	
Physical Description Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor. [Note: Often used in an aqueous solution. Fuming nitric acid is concentrated nitric acid that contains dissolved nitrogen dioxide.]			
MW: 63.0	BP: 181°F	FRZ: -44°F	Sol: Miscible
VP: 48 mmHg	IP: 11.95 eV		Sp.Gr(77°F): 1.50
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but increases the flammability of combustible materials.			
Incompatibilities & Reactivities Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]			
Measurement Methods NIOSH 7903; OSHA ID165SG See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash (pH<2.5), Quick drench (pH<2.5)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST Respirator Recommendations NIOSH/OSHA Up to 25 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion			

Target Organs Eyes, skin, respiratory system, teeth

See also: [INTRODUCTION](#) See ICSC CARD: [0183](#) See MEDICAL TESTS: [0158](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfuric acid		CAS 7664-93-9	
H_2SO_4		RTECS <u>WS5600000</u>	
Synonyms & Trade Names Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous)		DOT ID & Guide 1830 <u>137</u> 1831 <u>137</u> (fuming) 1832 <u>137</u> (spent)	
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL: TWA 1 mg/m ³		
IDLH 15 mg/m ³ See: <u>7664939</u>	Conversion		
Physical Description Colorless to dark-brown, oily, odorless liquid. [Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.]			
MW: 98.1	BP: 554°F	FRZ: 51°F	Sol: Miscible
VP: 0.001 mmHg	IP: ?		Sp.Gr: 1.84 (96-98% acid)
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but capable of igniting finely divided combustible materials.			
Incompatibilities & Reactivities Organic materials, chlorates, carbides, fulminates, water, powdered metals [Note: Reacts violently with water with evolution of heat. Corrosive to metals.]			
Measurement Methods NIOSH 7903; OSHA <u>ID113</u> , <u>ID165SG</u> See: <u>NMAM</u> or <u>OSHA Methods</u>			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash (>1%), Quick drench (>1%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA Up to 15 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with acid gas cartridge(s) in combination with a high-efficiency particulate filter [£] (APF = 50) Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis			

Target Organs Eyes, skin, respiratory system, teeth

See also: [INTRODUCTION](#) See ICSC CARD: [0362](#) See MEDICAL TESTS: [0218](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium hydroxide		CAS 1310-73-2	
NaOH		RTECS WB4900000	
Synonyms & Trade Names Caustic soda, Lye, Soda lye, Sodium hydrate		DOT ID & Guide 1823 154 (dry, solid) 1824 154 (solution)	
Exposure Limits	NIOSH REL: C 2 mg/m ³		
	OSHA PEL†: TWA 2 mg/m ³		
IDLH 10 mg/m ³ See: 1310732	Conversion		
Physical Description Colorless to white, odorless solid (flakes, beads, granular form).			
MW: 40.0	BP: 2534°F	MLT: 605°F	Sol: 111%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.13
F.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.			
Incompatibilities & Reactivities Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]			
Measurement Methods NIOSH 7401 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£] /(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION See ICSC CARD: 0360 See MEDICAL TESTS: 0210			

NIOSH Pocket Guide to Chemical Hazards

Methyl alcohol		CAS 67-56-1	
CH ₃ OH		RTECS PC1400000	
Synonyms & Trade Names Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit		DOT ID & Guide 1230 131	
Exposure Limits	NIOSH REL: TWA 200 ppm (260 mg/m ³) ST 250 ppm (325 mg/m ³) [skin]		
	OSHA PEL†: TWA 200 ppm (260 mg/m ³)		
IDLH 6000 ppm See: 67561		Conversion 1 ppm = 1.31 mg/m ³	
Physical Description Colorless liquid with a characteristic pungent odor.			
MW: 32.1	BP: 147°F	FRZ: -144°F	Sol: Miscible
VP: 96 mmHg	IP: 10.84 eV		Sp.Gr: 0.79
F.P.: 52°F	UEL: 36%	LEL: 6.0%	
Class IB Flammable Liquid: F.I.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2000, 3800; OSHA 91 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA Up to 2000 ppm: (APF = 10) Any supplied-air respirator Up to 5000 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 6000 ppm: (APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis			
Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract			
See also: INTRODUCTION See ICSC CARD: 0057 See MEDICAL TESTS: 0137			

NIOSH Pocket Guide to Chemical Hazards

Phosgene		CAS 75-44-5	
COCl ₂		RTECS SY5600000	
Synonyms & Trade Names Carbon oxychloride, Carbonyl chloride, Carbonyl dichloride, Chloroformyl chloride		DOT ID & Guide 1076 125	
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.4 mg/m ³) C 0.2 ppm (0.8 mg/m ³) [15-minute]		
	OSHA PEL: TWA 0.1 ppm (0.4 mg/m ³)		
IDLH 2 ppm See: 75445		Conversion 1 ppm = 4.05 mg/m ³	
Physical Description Colorless gas with a suffocating odor like musty hay. [Note: A fuming liquid below 47°F. Shipped as a liquefied compressed gas.]			
MW: 98.9	BP: 47°F	FRZ: -198°F	Sol: Slight
VP: 1.6 atm	IP: 11.55 eV	RGasD: 3.48	Sp.Gr: 1.43 (Liquid at 32°F)
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Moisture, alkalis, ammonia, alcohols, copper [Note: Reacts slowly in water to form hydrochloric acid & carbon dioxide.]			
Measurement Methods OSHA 61 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support	
READ FIRST Respirator Recommendations NIOSH/OSHA Up to 1 ppm: (APF = 10) Any supplied-air respirator* Up to 2 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Irritation eyes; dry burning throat; vomiting; cough, foamy sputum, dyspnea (breathing difficulty), chest pain, cyanosis; liquid: frostbite			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION See ICSC CARD: 0007 See MEDICAL TESTS: 0186			

NIOSH Pocket Guide to Chemical Hazards

Phosphorus (yellow)		CAS 7723-14-0	
P ₄		RTECS TH3500000	
Synonyms & Trade Names Elemental phosphorus, White phosphorus		DOT ID & Guide 1381 136	
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 5 mg/m ³ See: 7723140		Conversion	
Physical Description White to yellow, soft, waxy solid with acrid fumes in air. [Note: Usually shipped or stored in water.]			
MW: 124.0	BP: 536°F	MLT: 111°F	Sol: 0.0003%
VP: 0.03 mmHg	IP: ?		Sp.Gr: 1.82
FLP: ?	UEL: ?	LEL: ?	
Flammable Solid			
Incompatibilities & Reactivities Air, oxidizers (including elemental sulfur & strong caustics), halogens [Note: Ignites SPONTANEOUSLY in moist air.]			
Measurement Methods NIOSH 7905 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact* [*Note: Flame retardant personal protective equipment should be provided.] Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 2.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode ^f Up to 5 mg/m ³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, respiratory tract; eye, skin burns; abdominal pain, nausea, jaundice; anemia; cachexia; dental pain, salivation, jaw pain, swelling			
Target Organs Eyes, skin, respiratory system, liver, kidneys, jaw, teeth, blood			
See also: INTRODUCTION See ICSC CARD: 0628 See MEDICAL TESTS: 0188			

NIOSH Pocket Guide to Chemical Hazards

Sodium aluminum fluoride (as F)		CAS 15096-52-3	
Na_3AlF_6		RTECS WA9625000	
Synonyms & Trade Names Cryocide, Cryodust, Cryolite, Sodium hexafluoroaluminate		DOT ID & Guide	
Exposure Limits	NIOSH REL*: TWA 2.5 mg/m ³ [*Note: The REL also applies to other inorganic, solid fluorides (as F).]		
	OSHA PEL*: TWA 2.5 mg/m ³ [*Note: The PEL also applies to other inorganic, solid fluorides (as F).]		
IDLH 250 mg/m ³ (as F) See: fluoride		Conversion	
Physical Description Colorless to dark odorless solid. [pesticide] [Note: Loses color on heating.]			
MW: 209.9	BP: Decomposes	MLT: 1832°F	Sol: 0.04%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.90
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 7902; OSHA ID110 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Fresh air Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH/OSHA			
Up to 12.5 mg/m ³ : (APF = 5) Any dust and mist respirator			
Up to 25 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator*			
Up to 62.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*+			
Up to 125 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter+/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			
Up to 250 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus			
Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter+ /Any appropriate escape-type, self-contained breathing apparatus			
+Note: May need acid gas sorbent			

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, respiratory system; nausea, abdominal pain, diarrhea; salivation, thirst, sweating; stiff spine; dermatitis; calcification of ligaments of ribs, pelvis

Target Organs Eyes, skin, respiratory system, central nervous system, skeleton, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

Cyanogen chloride		CAS 506-77-4	
CICN		RTECS GT2275000	
Synonyms & Trade Names Chlorocyan, Chlorine cyanide, Chlorocyanide, Chlorocyanogen		DOT ID & Guide 1589 125 (inhibited)	
Exposure Limits	NIOSH REL: C 0.3 ppm (0.6 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D. See: IDLH INDEX		Conversion 1 ppm = 2.52 mg/m ³	
Physical Description Colorless gas or liquid (below 55°F) with an irritating odor. [Note: Shipped as a liquefied gas. A solid below 20°F. Forms cyanide in the body.]			
MW: 61.5	BP: 55°F	FRZ: 20°F	Sol: 7%
VP: 1010 mmHg	IP: 12.49 eV	RGasD: 2.16	Sp.Gr: 1.22 (Liquid at 32°F)
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Water, acids, alkalis, ammonia, alcohols [Note: Can react very slowly with water to form hydrogen cyanide. May be stabilized to prevent polymerization.]			
Measurement Methods None available See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
READ FIRST Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact (liquid)			
Symptoms Irritation eyes, upper respiratory system; cough, delayed pulmonary edema; lassitude (weakness, exhaustion), headache, dizziness, confusion, nausea, vomiting; irregular heartbeat; irritation skin (liquid)			
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system			
See also: INTRODUCTION See ICSC CARD: 1053			

NIOSH Pocket Guide to Chemical Hazards

Hydrogen cyanide		CAS 74-90-8	
HCN		RTECS MW6825000	
Synonyms & Trade Names Formonitrile, Hydrocyanic acid, Prussic acid		DOT ID & Guide 1051 117 (>20% solution) 1051 117 (anhydrous) 1613 154 (<=20% solution)	
Exposure Limits	NIOSH REL: ST 4.7 ppm (5 mg/m ³) [skin]		
	OSHA PEL†: TWA 10 ppm (11 mg/m ³) [skin]		
IDLH 50 ppm See: 74908		Conversion 1 ppm = 1.10 mg/m ³	
Physical Description Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. [Note: Often used as a 96% solution in water.]			
MW: 27.0	BP: 78°F (96%)	FRZ: 7°F (96%)	Sol: Miscible
VP: 630 mmHg	IP: 13.60 eV		Sp.Gr: 0.69
F.L.P: 0°F (96%)	UEL: 40.0%	LEL: 5.6%	
Class IA Flammable Liquid Flammable Gas			
Incompatibilities & Reactivities Amines, oxidizers, acids, sodium hydroxide, calcium hydroxide, sodium carbonate, caustics, ammonia [Note: Can polymerize at 122-140°F.]			
Measurement Methods NIOSH 6010 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST Respirator Recommendations NIOSH Up to 47 ppm: (APF = 10) Any supplied-air respirator Up to 50 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes			
Target Organs central nervous system, cardiovascular system, thyroid, blood			
See also: INTRODUCTION See ICSC CARD: 0492 See MEDICAL TESTS: 0117			

NIOSH Pocket Guide to Chemical Hazards

Chloropicrin		CAS 76-06-2	
CCl ₃ NO ₂		RTECS PB6300000	
Synonyms & Trade Names Nitrochloroform, Nitrotrichloromethane, Trichloronitromethane		DOT ID & Guide 1580 154 1583 154 (mixture, n.o.s.) 2929 131 (flammable mixture)	
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.7 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.7 mg/m ³)		
IDLH 2 ppm See: 76062		Conversion 1 ppm = 6.72 mg/m ³	
Physical Description Colorless to faint-yellow, oily liquid with an intensely irritating odor. [pesticide]			
MW: 164.4	BP: 234°F	FRZ: -93°F	Sol: 0.2%
VP: 18 mmHg	IP: ?		Sp.Gr: 1.66
F.L.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong oxidizers [Note: The material may explode when heated under confinement.]			
Measurement Methods None available See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
<div style="background-color: black; color: white; padding: 2px; display: inline-block;">READ FIRST</div> Respirator Recommendations NIOSH/OSHA Up to 2 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [§] /(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) [§] /(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; lacrimation (discharge of tears); cough, pulmonary edema; nausea, vomiting			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION See ICSC CARD: 0750 See MEDICAL TESTS: 0049			

NIOSH Pocket Guide to Chemical Hazards

Dinitrotoluene		CAS 25321-14-6	
$\text{CH}_3\text{C}_6\text{H}_3(\text{NO}_2)_2$		RTECS <u>XT1300000</u>	
Synonyms & Trade Names Dinitrotoluol, DNT, Methyl dinitrobenzene [Note: Various isomers of DNT exist.]		DOT ID & Guide 1600 <u>152</u> (molten) 2038 <u>152</u> (solid)	
Exposure Limits	NIOSH REL: Ca TWA 1.5 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 1.5 mg/m ³ [skin]		
IDLH Ca [50 mg/m ³] See: 25321146		Conversion	
Physical Description Orange-yellow crystalline solid with a characteristic odor. [Note: Often shipped molten.]			
MW: 182.2	BP: 572°F	MLT: 158°F	Sol: Insoluble
VP: 1 mmHg	IP: ?		Sp.Gr: 1.32
Fl.P: 404°F	UEL: ?	LEL: ?	
Combustible Solid, but difficult to ignite.			
Incompatibilities & Reactivities Strong oxidizers, caustics, metals such as tin & zinc [Note: Commercial grades will decompose at 482°F, with self-sustaining decomposition at 536°F.]			
Measurement Methods OSHA 44 See: <u>NMAM</u> or <u>OSHA Methods</u>			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST			
Respirator Recommendations NIOSH At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Anoxia, cyanosis; anemia, jaundice; reproductive effects; [potential occupational carcinogen]			
Target Organs Blood, liver, cardiovascular system, reproductive system			
Cancer Site [in animals: liver, skin & kidney tumors]			
See also: <u>INTRODUCTION</u> See ICSC CARD: 0465			

NIOSH Pocket Guide to Chemical Hazards

2,4,6-Trinitrotoluene		CAS 118-96-7	
<chem>CH3C6H2(NO2)3</chem>		RTECS XU0175000	
Synonyms & Trade Names 1-Methyl-2,4,6-trinitrobenzene; TNT; Trinitrotoluene; sym-Trinitrotoluene; Trinitrotoluol		DOT ID & Guide 1356 113 (wet)	
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL†: TWA 1.5 mg/m ³ [skin]		
IDLH 500 mg/m ³ See: 118967		Conversion	
Physical Description Colorless to pale-yellow, odorless solid or crushed flakes.			
MW: 227.1	BP: 464°F (Explodes)	MLT: 176°F	Sol(77°F): 0.01%
VP: 0.0002 mmHg	IP: 10.59 eV		Sp.Gr: 1.65
Fl.P: ? (Explodes)	UEL: ?	LEL: ?	
Combustible Solid (Class A Explosive)			
Incompatibilities & Reactivities Strong oxidizers, ammonia, strong alkalis, combustible materials, heat [Note: Rapid heating will result in detonation.]			
Measurement Methods OSHA 44 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
READ FIRST Respirator Recommendations NIOSH Up to 5 mg/m ³ : (APF = 10) Any supplied-air respirator* Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 25 mg/m ³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 500 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation skin, mucous membrane; liver damage, jaundice; cyanosis; sneezing; cough, sore throat; peripheral neuropathy, muscle pain; kidney damage; cataract; sensitization dermatitis; leukocytosis (increased blood leukocytes); anemia; cardiac irregularities			
Target Organs Eyes, skin, respiratory system, blood, liver, cardiovascular system, central nervous system, kidneys			

ATTACHMENT 5
CHEMICAL AGENT MONITORING PLAN

Chemical Agent Monitoring Plan

3X Scrap Removal

Training Area T-38, Former Technical Escort
Reaction Area, Parcel 186(6)

Training Area T-24A, Former Chemical Munitions
Disposal Area, Parcel 187(7)

Fort McClellan
Calhoun County, Alabama

QuickSilver Analytics, Inc.
September 18, 2003

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1.0 Introduction

This Chemical Agent Monitoring Plan is developed for Shaw Environmental, Inc. (Shaw) in support of the 3X scrap removal at Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6) and Training Area T-24A, Former Chemical Munitions Disposal Area, Parcel 187(7) at Fort McClellan, Alabama.

Shaw will conduct 3X scrap removal at Training Areas T-38 and T-24A at Fort McClellan, Alabama. The Army has determined that 3X scrap material consists of Chemical Warfare Materiel (CWM) related scrap and Ordnance and Explosive (OE) related scrap. However, previous investigations have not identified any CWM or breakdown products. 3X scrap does not include scrap metal or vehicle parts.

2.0 Scope of Work

During initial baseline, excavation, scrap sorting, and site closeout, QuickSilver Analytics, Inc. (QuickSilver) will provide chemical agent air monitoring for Sulfur Mustard (HD), Lewisite (L), Sarin (GB), and nerve agent (VX). Category 2 compounds (Cyanogen Chloride [CK] and Phosgene [CG]) will be monitored by Shaw.

During excavation and screening activities, QuickSilver will perform continuous near real time monitoring and will monitor the ambient air of the project site for the specified chemical agents. Miniature continuous air monitoring system (MINICAMS[®]) will be used for this task.

One MINICAMS will be used for GB and VX detection, and a second MINICAMS will be used for monitoring HD and L. The MINICAMS will be used at the excavation site to monitor the air in the workspace area of the workers. Backup MINICAMS will be available, capable of monitoring H/L or GB/VX. For the Category 2 compounds, Dräger[®] tubes will be used for air monitoring. Shaw personnel in the exclusion zone will monitor CK and CG as necessary.

At least three Depot Area Agent Monitoring Stations (DAAMS) will be deployed at the perimeter of the exclusion zone to determine if any of the monitored compounds have left the site. One of the DAAMS will be located next to the MINICAMS line. Duplicate tubes for HD/L and GB/VX will be sampled. These samples will be routinely collected, but only analyzed if the MINICAMS alarms.

Air monitoring surveys will occur prior to excavation (baseline), during excavation, during sorting/screening operations and 3X clearing of waste in the hot boxes. The recovered and sorted scrap will be monitored to clear it to the 3X decontamination level. This includes daily instrument performance checks and calibration as necessary.

2.1 Personnel Qualifications

Personnel assigned to air monitoring duties will have the following training:

- current 40-hour OSHA and 8-hour OSHA refresher training for all workers, including respirator training, fit testing, and medical doctor approval for respirator use
- current first aid and CPR training
- documentation of training for the specific operations being performed by the individual, to include operation, field calibration and maintenance of instruments
- familiarity with the site specific documentation and requirements of this project

Shaw will maintain documentation of all training and certifications within the project files.

2.2 Air Monitoring

During baseline operations, excavation and screening operations, air monitoring will be performed for workplace safety. MINICAMS will be used to provide near real time monitoring for HD, L, GB, and VX, and Dräger tubes will be used to monitor for CK and CG. Air monitoring stations containing solid sorbent tubes will be used to collect samples at the perimeter of the exclusion zone, and will be routinely collected, but will not be analyzed unless the MINICAMS alarms. A gas chromatography/mass selective detector/flame photometric detector (GC/MSD/FPD) will be available on-site to analyze the solid sorbent tubes should an alarm occur.

2.3 3X Scrap Monitoring

Excavation material will be sorted by size into four piles (>5 inch, 3 to 5 inch, 1.5 to 3 inch, and <1.5 inch) and inspected by qualified UXO technicians. Materials from the piles will be re-sorted into the following categories: soil, 3X scrap and non-3X scrap. Soils will be placed back into the excavation and will not be monitored. Car parts and miscellaneous steel (non-OE) are non-3X scrap and will be placed in a bin to be sold as scrap. MINICAMS and DAAMS stations will be used to monitor HD, L, GB, and VX during sorting operations, and Dräger tubes will be used to monitor GC and CK.

Excavated 3X material will be placed in special 1-cubic-yard fiber boxes for monitoring, and the boxes covered. The boxes will remain at the project site in direct sunlight to assist in the creation of headspace gases. After the boxes reach the temperature of 70°F and remain at 70°F for a minimum of four hours, the vapors inside the headspace in the box will be monitored for chemical agent using MINICAMS. If a TWA reading >1.0 is obtained from the MINICAMS, a solid sorbent tube will be used to sample the headspace air and will be analyzed by GC/MSD/FPD for confirmation. If CG or CK monitoring is determined to be required, Dräger tubes will be used.

3.0 Air Monitoring

3.1 Tasks/Site Layout

Figures 2-1 and 2-2 of the Site-Specific Work Plan contain proposed locations of exclusion zones at the T-38 and T-24A sites. Excavation will occur in areas T-38 (T38-12 and T38-13) and T-24A (T24-5, T24-8, T24-10, T24-15 and T24-29). A mobile laboratory van will be used to transport the analytical equipment from one area to another, and to house the GC/MSD.

At each site, the MINICAMS heat trace line will be located immediately downwind of the excavation area, and will monitor the air continuously during operations. The heat trace line is a heavy rubber tube (typically 25 to 50 feet in length) containing a small-bore Teflon[®] inner lining (the actual sample transmission line). The heat trace line transfers the air sample from the sample point to the sampling instrument. Electrical heating tape is incorporated into the line to warm the sample and improve sample transfer. The use of this line allows the MINICAMS to be placed away from the point of activity.

In addition, two DAAMS stations will also be established downwind of the operations, near the edge of the exclusion zone (the exact location will be dependent on site and weather conditions). The third DAAMS station will be located as near to the end of the heat trace line as possible, to recreate the sampling conditions at the inlet of the heat trace line. The DAAMS tubes will be collected every eight hours during normal operations. However, in the event that a MINICAMS alarms, the tubes will be collected immediately, and transferred to the mobile laboratory and analyzed by the GC/MSD/FPD to confirm (or negate) the alarm.

Dräger tubes will be used to monitor for CK and CG, as needed.

During screening operations and sorting of the removed scrap, two MINICAMS with a heat trace line (one for HD/L and one for GB/VX), and a DAAMS stations, will be placed adjacent to the screening and sorting operations, and will monitor HD, L, GB, and VX. The DAAMS station solid sorbent tubes will be collected every eight hours, or immediately upon a MINICAMS alarm.

3.2 Action Levels and Exposure Limit Criteria

Table 1 summarizes the action levels for the target compounds. For the chemical agents, the 8-hour time weighted average (TWA) is listed, and for phosgene and cyanogen chloride, the airborne exposure limit (AEL) is listed.

Table 1. Action Levels for Workers in Modified Level D

Analyte	Action Level	Required Action
HD	0.00225 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact Site Safety and Health Officer (SSHO) and USACE
L	0.00225 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
GB	0.000075 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
VX	0.0000075 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
CG (phosgene)	0.075 ppm (0.3 mg/m ³)	Stop work, evacuate work area, contact SSHO and USACE
CK (cyanogen chloride)	0.225 ppm (0.45 mg/m ³)	Stop work, evacuate work area, contact SSHO and USACE

3.3 Monitoring Equipment

3.3.1 MINICAMS

Two MINICAMS will be used for chemical agent air monitoring during baseline, excavation, scrap sorting, and site closeout. One will be equipped with a halogen-specific detector (XSD) to allow for the monitoring of HD and L. The second will be equipped with a flame photometric detector (FPD) for GB and VX monitoring. VX monitoring will require the use of a conversion pad (containing silver fluoride) to convert the VX to a more volatile G-analog that will move down the heat traced sample line.

Both MINICAMS will be initially calibrated before use, and a daily calibration check performed at the beginning and end of the workday. A single point calibration (at the TWA level) is used. The continuing calibration verification (CCV) must fall within $\pm 25\%$ of the target value. Recalibration is performed if two consecutive attempts fall outside the acceptability window. The MINICAMS/XSD system will detect HD and L below the time weighted average allowable exposure limit of 0.003 mg/m³ in air. The MINICAMS/FPD is capable of detecting GB and VX below their time weighted averages (0.0001 and 0.00001 mg/m³ respectively) in air. The MINICAMS alarm values will be established at 0.75 of the TWA for the agents of concern. This will allow the instrument to alarm before potential employee exposure to chemical agents.

Table 2. Equipment Calibration and QC Requirements

Monitor Type	Calibration Method	Calibration Frequency	QC Requirements
MINICAMS	1 point calibration	Before initial use	Initially calibrated before use, daily CCVs, if two consecutive CCVs fail, re-calibrate
GC/MSD	3-5 point calibration	Before initial use	Initially calibrated before use, daily CCVs, if two consecutive CCVs fail, re-calibrate
Dräger Tubes	pumps require calibration per manufacturers specifications	N/A	N/A
DAAMS tube sampling stations	pumps require calibration	N/A	flow rate measurement

3.3.2 DAAMS Tubes

DAAMS tubes are actually solid sorbent tubes containing a sorbent capable of selectively trapping the compounds of interest. A sampling pump is used to draw air through the tubes at a controlled flow rate, for a known period of time. Duplicate tubes (2 for HD/L sample collection and 2 for GB/VX sample collection) are collected during each sampling period. A silver fluoride conversion pad (or alternatively, derivatized with 1,2-ethanedithiol or 1,3-propanedithiol) is used to convert VX to a more volatile G-analog. Based on knowledge of the flow rate and sampling time, the amount of sample collected can be calculated, and when analyzed by GC/FPD, the sample concentration can be quantitatively reported. No calibration is required for the solid sorbent tubes, although a physical inspection of the tube should be conducted before use, to check for broken tubes, discolored sorbent, or loose sorbent bed.

3.3.3 GC/MSD/FPD

The GC/MSD/FPD (Hewlett Packard Model 6852 GC/MSD/FPD) will be equipped with a CDS Thermal Desorber system. Using the thermal desorption system, a solid sorbent tube can be desorbed directly onto a focusing tube, desorbed into the GC column and thus into the flame photometric detector (FPD or MSD). The GC/MSD/FPD can confirm the identify the compound(s) detected by the MINICAMS because the GC/MSD/FPD system will use a different type of GC column than the MINICAMS and by the mass spectrum of the detected compounds.

The GC/MSD/FPD will be initially calibrated before use, and challenged by CCV prior to daily operations. A CCV sample will be analyzed after every 10 samples, or if less than 10 samples are analyzed per day, at the end of the day, to verify that the GC is still within calibration. CCVs must fall within 25% of the target value to be acceptable. A CCV is prepared by spiking a solid sorbent tube with an known concentration, and analyzing that sample. Recalibration is performed if two consecutive attempts fall outside the acceptability window. Blanks (clean sorbent tubes) will also be analyzed at the beginning of each day.

Samples being analyzed for the presence of Lewisite will required a small amount of 1,2-ethanedithiol or 1,3-propanedithiol to be injected unto the solid sorbent tube prior to analysis, to convert the Lewisite into a more volatile, analyzable compound.

3.3.4 Dräger Tubes

Tubes for the specific compounds of concern (cyanogen chloride, CK and phosgene, CG) will be used on site to detect the presence of either compound. The tube, and the associated sampling pump, is purchased directly from the manufacturer. Calibration is not required of the tubes; the sampling pump does require periodic calibration. The cyanogen chloride tube has a standard measuring range of 0.25 to 5 ppm, while the phosgene tubes are available in two ranges, 0.02 to 1 ppm or 0.04 to 1.5 ppm. The AEL for cyanogen chloride is 0.3 ppm and for phosgene is 0.1 ppm.

3.3.5 Backup Equipment

The repair components for the most likely MINICAMS failures, such as extra XSD and FPD instrumental modules and pre-concentrator tubes will be provided to maintain MINICAMS operation.

Extra sampling stations will also be available. DAAMS tubes and Dräger tubes will be provided in sufficient quantities to support the task.

The GC/FPD is a remarkably robust instrument, and most common malfunctions can be fixed by the operator. Extra GC/FPD supplies will be provided for the most common problems (GC column, focusing tube, injection port liners, ferrules, etc.). As the use of the GC/MSD is expected to be limited, a second one will not be provided.

3.4 Reporting

Air monitor reporting will consist of daily report summaries (see Appendix), and following the completion of the project, copies of the raw data generated from MINICAMS and GC/MSD (if used), at the customer's request. The raw data will include calibrations, blanks, and CCVs, as appropriate. QuickSilver will retain the original copy of the raw data.

4.0 3X Scrap Monitoring

4.1 Tasks

Following excavation and screening of the soil and 3X material, the 3X scrap will be placed in hot boxes for screening. The hot boxes will be located in a designated area, and will be located in direct sunlight. Shaw will be responsible for monitoring hot box temperatures and heating times. After the interior temperature of the boxes has reached 70°F for a minimum of 4 hours (for non-permeable materials, the time may be shortened), the headspace inside the box will be monitored using the MINICAMS. Both the HD/L and GB/VX MINICAMS will be used to monitor each box. If the MINICAMS detects a ≥ 1.0 TWA response for HD, L, GB and/or VX, duplicate DAAMS tubes will also be collected from each box and analyzed by GC/MSD/FPD. Dräger tubes will also be used to sample the headspace, to detect the presence of phosgene and/or cyanogen chloride.

4.2 Action Levels and Exposure Limit Criteria

The action levels for 3X monitoring are identified in DA PAM 385-61, 27 March 2002, page 18 and are summarized in the table below.

The 3X symbol indicates that the item in question has been surface decontaminated by locally approved procedures, has been bagged or contained in an agent-tight barrier of sufficient volume to permit sample air to be withdrawn while minimizing dilution with incoming air, and/or appropriate tests or monitoring have verified that concentrations are less than the values listed in Table 3. [DA PAM 385-61, 27 March 2002, Chapter 5, page 18]

Table 3. Decontamination Levels for 3X Material

Chemical	XXX
HD	<0.003 mg/m ³
L	<0.003 mg/m ³
GB	<0.0001 mg/m ³
VX	<0.00001 mg/m ³
CG	<0.4 mg/m ³
CK	<0.6 mg/m ³

mg/m³ - milligram per cubic meter

4.3 Monitoring equipment

4.3.1 MINICAMS

Two MINICAMS will be used for 3X scrap monitoring. One will be equipped with an XSD detector to allow for the monitoring of HD and L. The second will be equipped with a FPD detector for GB and VX monitoring. VX monitoring will require the use of a conversion pad (silver fluoride) to convert the VX to a more volatile G-analog.

Both MINICAMS will be initially calibrated before use, and a calibration check performed at the beginning and end of the workday. A single point calibration (at the TWA level) is used. The CCV (also at the TWA level) must fall within $\pm 25\%$ of the target value. Recalibration is performed if two consecutive attempts fall outside the acceptability window. The MINICAMS/XSD system will detect HD and L below the time weighted average allowable exposure limit of 0.003 mg/m³ in air. The MINICAMS/FPD is capable of detecting GB and VX below their time weighted averages (0.0001 and 0.00001 mg/m³ respectively) in air.

4.3.2 DAAMS Tubes

If MINICAMS monitoring indicates a target chemical present at or above the 1.0 TWA concentration, DAAMS samples will be collected and analyzed to confirm the MINICAMS response. The sampling is conducted as for the perimeter monitoring, using a sampling pump, duplicate tubes (for both HD/L and GB/VX), and measured flow rates and sample collection times. Based on knowledge of the flow rate and sampling time, the amount of sample collected can be calculated, and when analyzed by GC/MSD, the sample concentration can be quantitatively reported. No calibration is required for the solid sorbent tubes, although a physical inspection of the tube should be conducted before use, to check for broken tubes, discolored sorbent, or loose sorbent bed.

4.3.3 GC/MSD/FPD

Should the MINICAMS detect a concentration of agent greater than the TWA value, DAAMS tubes will be collected and analyzed via GC/MSD/FPD to confirm the presence of that agent.

The GC/MSD/FPD will be initially calibrated before operations and checked by CCV daily thereafter. CCVs will be analyzed after every 10 samples, or at the end of the day if less than 10

samples are analyzed. CCVs must fall within 25% of the target value to be acceptable. A CCV is prepared by spiking a solid sorbent tube with a known concentration and analyzing that sample. Recalibration is performed if two consecutive attempts fall outside the acceptability window. Blanks (clean sorbent tubes) will also be analyzed at the beginning of each day.

Samples being analyzed for the presence of Lewisite will require a small amount of 1,2-ethanedithiol or 1,3-propanedithiol to be injected onto the solid sorbent tube prior to analysis, to convert the Lewisite into a more volatile, analyzable compound. Samples collected for the presence of VX will require a silver fluoride conversion pad on the sorbent tube inlet.

4.3.4 Dräger Tubes

Dräger tubes will also be used to sample the headspace vapor of the hotboxes for the presence of phosgene and/or cyanogen chloride. The phosgene and cyanogen chloride tubes are capable of detecting concentrations of these chemicals below their AEL values (see section 3.4.4 for detection limits for the Dräger tubes).

4.3.5 Backup Equipment

The same backup equipment available for the safety monitoring (see section 3.4.5) will be available to support the 3X monitoring.

4.4 Reporting

3X reporting will consist of daily report summaries (see Appendix), information needed to produce the 3X certification, and following the completion of the project, copies of the raw data generated from MINICAMS and GC/MSD (if used), at the customer's request. The raw data will include calibrations, blanks, and CCVs, as appropriate. QuickSilver will retain the original copy of the raw data.

5.0 Contingency Plan

5.1 Required Response Actions During Site Operations

In the event that chemical agent or a suspect CWM item is encountered during operations, site workers will be alerted to evacuate the site upwind. The initial exclusion zone for suspected agent or CWM will be established a minimum of 450 feet upwind. The suspect item will not be disturbed after discovery. EOD and the Site Safety and Health Officer (SSHO) will be notified immediately. EOD will mitigate the situation according to the procedures outlined in detail in Section 2.2 of the UXO Safety Plan.

Following an alarm, all personnel will immediately evacuate the site. Two UXO technicians will cover the monitored CWM item and the end of the monitoring hose with plastic sheeting (or a tarp) and place sandbags (or suitable weighted objects) on the sheeting to secure it. Prior to exiting the exclusion zone, the UXO technicians will retrieve the DAAMS station, carry it to the monitoring personnel, and place it into a Ziploc bag.

The monitoring personnel will pull the solid sorbent tubes from the DAAMS station, and place clean tubes in the DAAMS station to continue monitoring the air. The retrieved solid sorbent tubes will be analyzed by GC/MSD in selected ion monitoring (SIM) mode (tubes collected from the other DAAMS stations may be analyzed at a later time at the discretion of the SSHO and monitoring staff). Using the SIM mode allows the operator to target the analyte of interest (by its characteristic ions) and gain sensitivity for that compound.

If the analysis of the original solid sorbent tubes does not confirm the MINICAMS alarm, the second tube will be collected and analyzed in the GC/MS scan mode, which will reveal all constituents of the sample, both target analytes and possible interferences. The GC/MSD analysis is capable of identifying the compound causing the alarm, and can discriminate between an actual target compound release and the presence of an interference causing a false positive. All analytical results will be provided to the SSHO, who will determine when it is safe to resume operations, based on the concentration of target compounds found, or the clear identification of an interference.

The concentration of the detected target analyte will guide the decision to resume operations. If the MINICAMS stops alarming, and GC/MSD analysis indicates no agent was present, and the response was a false positive, the SSHO can approve resumption of activities.

If the MINICAMS continues to alarm, and the GC/MSD identifies the clear presence of an interference, it is the decision of the SSHO to resume or stop operations. The stop operation decision may be based on the inability of the MINICAMS to distinguish between the interference and target analyte, thus making air monitoring difficult.

If the GC/MSD confirms the presence of target analyte (as identified by the MINICAMS) monitoring will continue until the level of target compound is confirmed to be below 1.0 TWA, at which point activities can be resumed. If the level of target compound is confirmed to be near 1.0 TWA, activities can only be resumed if the level of personnel protective equipment is

upgraded. If the level of target compound is above 1.0 TWA, excavation is stopped, and decontamination and mitigation activities are initiated.

If the MINICAMS monitoring the screening and sorting operations alarms, the screening/sorting operations will stop, and the immediate and downwind areas evacuated. In this event, DAAMS solid sorbent tubes would be collected, clean tubes reinstalled, and GC/MSD analysis of the initial tubes performed. If the GC/MSD confirms the presence of target analyte (as identified by the MINICAMS), monitoring will be continued until the level of target compound is confirmed to be below 1.0 TWA, at which point activities can be resumed. If the level of target compound is confirmed to be near 1.0 TWA, activities can only be resumed if the level of personnel protective equipment is upgraded. If the level of target compound is above 1.0 TWA, excavation is stopped, and decontamination and mitigation activities are initiated.

If the presence of chemical agent is confirmed by the GC/MSD, the reporting procedures established in “*Transition Force Standard Operating Procedures for Responding to Suspected CWM*” (Fort McClellan, Alabama, DAIM-BO-H-MC, Memorandum, dated 26 September 2003) will be followed. The SOP is included as Attachment 6 of the SSHP.

5.2 Required Response Actions During 3X Scrap Monitoring

In the event that a MINICAMS alarms during 3X scrap monitoring, the mobile lab staff will notify the SSHO on-site, and will mark the container containing the scrap with an “X” (which indicates contamination). Additionally, EOD will be notified to mitigate the situation.

The mobile lab staff, wearing the proper protective equipment, will collect the solid sorbent tubes in the DAAMS stations, and transport them to the mobile laboratory. The solid sorbent tubes will be analyzed by GC/MSD, and the results transmitted to the SSHO. If the presence of chemical agent was not confirmed by the analysis of the solid sorbent tubes, the mobile lab personnel will return to the container and mark it “3X”.

If the presence of chemical agent is confirmed by the GC/MSD, the reporting procedures established in “*Transition Force Standard Operating Procedures for Responding to Suspected CWM*” (Fort McClellan, Alabama, DAIM-BO-H-MC, Memorandum, dated 26 September 2003) will be followed. The SOP is included as Attachment 6 of the SSHP.

If the GC/MSD monitoring of the 3X material confirms the presence of chemical agent >1.0 AEL, the site will be evacuated and the CACM secured. The CACM will remain in possession of the Army pending final Army disposition.

APPENDIX

Quality Control Forms

Daily Quality Control Report
Daily NRT Monitoring Report
40-Year Records

Daily Quality Control Report

DATE:				REPORT NO.	
				FIELD CONTRACT	
TIME:	BEGIN:	END:		NAME:	ADDRESS:
INSTRUMENT MODEL			WEATHER CONDITIONS		
INSTRUMENT SERIAL NO.			AM:	PM:	
MONITORING LOCATIONS		INSTRUMENT CHALLENGES		INSTRUMENT CALIBRATIONS	
1)		AM @ (circle one)	Passed/Failed	AM @ (circle one)	Passed/Failed
2)		PM @ (circle one)	Passed/Failed	PM @ (circle one)	Passed/Failed
3)					
4)					
5)					
GENERAL DESCRIPTION OF DAILY ACTIVITIES:					
ANALYTES MONITORED (list)					
CORRECTIVE ACTIONS					
QS REFERENCE #				QS REFERENCE #	
QS REFERENCE #				QS REFERENCE #	
LABORATORY PERSONNEL					
NAME			AFFILIATION		
VISITORS					
NAME			AFFILIATION		
Subcontractor's Verification: On behalf of the Subcontractor, I certify that this report is complete and correct, and all materials used and work performed during this reporting period are in compliance with the contract plans and specifications to the best of my knowledge, except as may be noted above.					
Reviewed by:				Date:	
Reviewed by:				Date:	

Daily NRT Monitoring Report

Project Identification:

Date:

Analyst(s), Name/Signature:

Monitoring Results:

_____ All monitoring results were below the reportable limits of _____ TWA¹ for GB, VX, HD and L.

_____ Monitoring results indicate levels at or above reportable limits of _____ TWA for GB, VX, HD or L. See additional documentation (attached) for further information.

This is a preliminary report. Should subsequent information or data evaluation contradict this report, a corrected report will be issued. Full information and data will be included in the project's final report and 40 year records.

Report received by:

Client POC

Date

¹ The equal to or greater than action limit concentration (expressed in TWA units) as established by the site or project.

40-Year Records Final Report

Project Identification:

Client:

Project Start Date:

Project End Date:

Monitoring Information:

Analysis Technique/Information²:

Standards³:

Concentration Range of Standards (High/Low)⁴

QC Information⁵:

Monitoring Results:

_____ All monitoring results were below the detection limit⁶ of _____ TWA for GB, VX, HD and L.

_____ Monitoring results indicate levels at or above detection limit of _____ TWA for GB, VX, HD or L. See addition documentation for further information.

² Including instrumentation/technique used (i.e., HP 6890 GC/MS/ACEM), sample introduction method (i.e., direct injection, heated sampling line, DAAMS tube, etc.) and data processing system (i.e., ChemStation).

³ Include source of standards, and the chemicals used as standards (i.e., CASARM, GB, VX).

⁴ Include the most commonly used concentration range of the working standards, i.e., 0.2 TWA to 1.5 TWA.

⁵ Include the types of quality controls samples analyzed (blanks, challenge); calibration curves, etc.

⁶ The concentration of the lowest standard routinely analyzed, expressed in TWA units.

40-Year Records

Information to be included in 40-year records:

- Identification of technique, instrument system (including serial numbers)
- Identification of detection system:
- Identification of sample introduction method:
- Identification of column (if appropriate):
- Data from any validation/qualification testing of the system:
- Calibration Data and Curves
- Quality Control information and data (blanks, challenges, etc.)
- Control Charts
- Sampling Locations, Dates and Times
- Sample Analysis Results (including chromatograms, spectra, etc.)
- Site entry roster (all individuals on-site, with location, social security number and time in/out)

Storage

The data collected during this monitoring project are stored at the office of QuickSilver Analytics, Inc., in Abingdon, Maryland. Data are stored in hard copy and electronic format (ASCII).

¹ Including instrumentation/technique used (i.e., HP 6890 GC/MS/ACEM), sample introduction method (i.e., direction injection, heated sampling line, DAAMS tube, etc.) and data processing system (i.e., ChemStation).

ATTACHMENT 6

TRANSITION FORCE SOP FOR RESPONDING TO SUSPECTED CWM

For Official Use Only

DAIM-BO-H-MC

26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

MEMORANDUM FOR: All Personnel, USAG Transition Force, Fort McClellan, Alabama

- 1) **PURPOSE:** To establish procedures for Transition Force personnel to use in the event suspected chemical warfare material is found.
- 2) **APPLICABILITY:** This Standard Operating Procedure applies to all personnel assigned to, or employed by the Transition Force.
- 3) **RESPONSIBILITIES:**
 - a) All personnel are responsible for knowing and following the procedures listed below.
 - b) The Site Manager will:
 - i) Maintain overall command and control of all assets involved in the removal/disposal of the Item.
 - ii) Designate personnel to make up the Initial Response Team to Report the removal/disposal. The team will be comprised of:
 - (1) The Operations Officer
 - (2) The BEC
 - (3) The Contracting Officer
 - (4) The Security Supervisor
 - c) Approve all Chemical Event Reports and public affairs information before they are sent.
 - d) The Operations Officer will:
 - (1) Lead the Initial Response Team and supervise the reporting of the operation.
 - (2) Keep the Site Manager informed of the status of the removal/disposal operation.
 - (3) Initiate, staff, and transmit all Chemical Event Reports regarding the incident to the DA Operations Center, and other elements of the Chain of Command (see Appendix B for examples).
 - (4) Draft and coordinate for Site Manager's approval all releases of information to the public.
 - (5) Oversee the logistics requirements of the operation.
 - (6) Lead the Initial Response Team in the absence of the Operations Officer.
 - e) The BEC will:
 - i) Advise the Site Manager on all environmental issues concerning the removal/disposal operation.

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SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

- ii) Notify the BRAC Cleanup Team of the incident by transmitting a copy of the approved Chemical Event Report to the EPA Region IV and ADEM (see Appendix D).
 - f) The Security Supervisor will:
 - i) Coordinate directly with the Corps of Engineers Safety Officer responsible for on site safety during the removal/disposal operation.
 - ii) Keep the Site Manager and the Operations Officer informed of any safety concerns.
 - iii) Coordinate directly with the contractor, civil law enforcement and the fire department on all matters concerning security of the site.
 - iv) Assist the Operations Officer as required.
 - v) Maintain a Journal of all activities related to the removal/disposal operation.
 - g) Contractors will:
 - i) Notify the TF Operations Section upon detection of a suspected CWM.
 - ii) Mark the area closest to the suspected CWM without disturbing the item.
 - iii) Keep the Site Manager and the Operations Officer informed of any safety concerns.
 - iv) Assist the TF Operations Section as needed.
- 4) DEFINITIONS:
- a) **Chemical event (Suspect Chemical Warfare Material Sites)**: On Fort McClellan this includes only those areas specifically sited in the CWM EE/CA. Maps identifying these areas are attached at Appendix C. A chemical agent release from non-stockpile chemical weapons is any detection of agent outside the munition body or bulk storage container into the atmosphere outside of a closed containment system that is confirmed and exceeds Airborne Exposure Limitations (AEL).
 - b) **Unconfirmed release (RING-OFF)**: Monitors (Mini-cams) at the site have indicated the presence of chemical agent but confirmation has not been made by Depot Area Air Monitoring System (DAAMS).
 - c) **Confirmed release**: Depot Area Air Monitoring System (DAAMS) has confirmed the presence and/or a release of chemical agent.
 - i) Confirmed detection of agent above threshold concentration occurring for any period outside the primary engineering control.
 - ii) Actual exposure of personnel to agent above allowable limits.
 - iii) Any terrorist or criminal act directed toward chemical agent storage, laboratory or demilitarization facility or any deliberate release of chemical agent.
 - iv) Loss of chemical agent.
 - d) **Chemical Event (Conventional OE Sites)**: On Fort McClellan this includes areas of the installation not included in the CWM EE/CA.

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- i) Discovery of an actual or suspected chemical agent munition or container that may require emergency transportation and/or disposal.
 - ii) Confirmed release of agent from munitions and/or containers.
 - iii) Actual exposure of personnel to agent above allowable limits.
 - iv) Any terrorist or criminal act directed toward chemical agent storage, laboratory or demilitarization facility or any deliberate release of chemical agent.
 - v) Loss of chemical agent.
- e) **Suspected release (RING-OFF)**: Item is believed to be releasing agent but confirmation has not been made.
- f) **Confirmed release**: Item has tested positive for presence and/or release of a chemical agent.
- 5) PROCEDURES: All personnel will follow these procedures:
- a) **Notification Procedures**: You will immediately notify TF Operations when you become aware of a suspected CWM item:
 - i) **During duty hours (0730-1630) notify the Operations Section at 848-5680/4824.**
Note: Do not stop there if contact is not immediately made; if there is no answer keep trying, it is imperative that this notification be made as soon as possible.
 - ii) **After duty hours, holidays and weekends, notify the Security Guards, at their cell phone # 256-591-6157/6158/6159/6160.** If you are unable to make contact with security personnel start notifications with the Transition Force alert roster (Notification Roster # 1 located at Appendix A).
 - b) Be prepared to give the following information:
 - i) Location of Item.
 - ii) Wind direction at the site, if available.
 - iii) Physical description of the item.
 - iv) Whether the item is on the surface or subsurface.
 - v) If it appears to be intact or damaged.
 - vi) Accessibility limitations.
 - c) If you are receiving the information from an outside source record the message verbatim and attempt to obtain the above information. Ascertain the name, organization, location and call back number or call sign of person reporting the item.
 - d) The person in operations receiving the call will notify the Operations Officer, Executive Officer, and Site Manager of the incident. This notification will take place immediately without respect to chain of command. Do not wait to find the Operations Officer when the Site Manager is available, notify the Site Manager and back brief as necessary.
 - e) The Operations Section will initiate and maintain a separate Journal for all events related to the incident.

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- f) During off-duty hours, immediately initiate notification of personnel on Notification Roster # 1 located at Appendix A.
- g) Immediately place security on the item. Security requirements will vary based on the situation.
- h) Notifications to agencies outside of the Transition Force must first be approved by the Site Manager or his designated representative, once approved, use the applicable notification roster(s) located at Appendix A. However, in the event an individual is injured at one of the sites and that injury might be related to a possible chemical agent exposure you will notify the Calhoun County Emergency Management Agency as soon as possible and inform them of the incident.
- i) Suspected CWM found outside of the CWM EE/CA Sites (Conventional OE Sites) will immediately come under control of the Transition Force for evaluation. The item(s) will remain under Army control until assessed and subsequently transferred to the appropriate agency for storage or destruction. In this case, the 722nd EOD will be notified rather than COE/Tech Escort. If the incident occurs outside of the CWM EE/CA footprint notify the COE Safety Officer of the incident. **NOTE:** Mitigation of the site within the CWM EE/CA footprint will begin after the "Ring-Off"; DAAMS may or may not have confirmed a release at that point. A confirmation (positive or negative) will be made whether or not mitigation has been completed.
- j) All non-public releases of information regarding the incident, and all Chemical Event reports generated will be staffed through the TF Operations Section and approved by the Site Manager or his designated representative.

JOSEPH H. DOYLE
Site Manager

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DAIM-BO-H-MC

26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

**APPENDIX A
NOTIFICATION ROSTERS**

Transition Force Personnel

	NAME	WORK PHONE	HOME PHONE	CELL PHONE	TIME NTFD.
SITE MANAGER	MR. DOYLE	256-848-5436/6561			
OPERATIONS OFFICER	MR. HARVEY	256-848-7347/4503			
SECURITY SUPERVISOR	MR. BOLTON	256-848-5680/4732			
BEC	MR. LEVY	256-848-3539/6853			

NOTE: The above roster contains unlisted home phone numbers, personal cell phone, and pager numbers. These numbers will not be given to anyone outside of the TF HQ and Operations sections without prior approval of that individual.

Emergency Agencies

AGENCY NAME	PHONE	TIME NTFD.
ANNISTON POLICE DEPT (Dispatch)	256-238-1800	
ANNISTON FIRE DEPT (Dispatch)	256-237-3541	
ANNISTON FIRE DEPT (Ft McClellan)	256-231-7684	
CALHOUN COUNTY SHERIFF	256-236-6600	
ALABMA STATE POLICE	256-435-3521	
JACKSONVILLE POLICE DEPT	256-435-6448	
OXFORD POLICE DEPT	256-831-3121	
WEAVER POLICE DEPT	256-820-0530	
AMBULANCE SERVICES	911	
CALHOUN COUNTY EMA	256-435-0543	

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SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

APPENDIX B SAMPLE CHEMICAL EVENT REPORT

CHEMICAL EVENT REPORT (UNCLASSIFIED)

HEADER: THIS IS A CHEMICAL EVENT REPORT, RCS: CSGPO-453

BODY:

1. **Date and Time of Event/Control number:** 151048 local /Mar/01 – FMC 01-01
2. **Location:** 16SFN 14253090, May 96, 1:25,000
3. **Quantity and Type of Munitions/Agent involved:** 1 each, Livens Projectile, MK II, Liquid Filled, Agent - Unk
4. **Description of what has happened:** On 14 Mar 01 @ approximately 1048 hrs local, during the Alpha Phase EE/CA operation to characterize the area for the presence of lack of Unexploded Ordnance (UXO), Huntsville Corps of Engineers contractor located a Livens projectile laying on the ground surface, not covered by earth or leaves (see attachment) at FN 14253090. The COE contractor notified the Fort McClellan (FMC) Operations section @ 11:11hrs local. FMC Operations notified the 722nd EOD Company @ 11:30hrs local. The 722nd EOD Company responded and completed their assessment by 1300hrs local. The 722nd assessment was that the projectile was intact, not leaking and liquid filled. The U.S. Army Technical Escort Unit (TEU) arrived on site to further assess the situation @ 1600hrs local. TEU determined the liquid fill line of the projectile and the presence of a burst tube. Both assessments could not rule out a chemical fill. Upon receipt of initial data assessment from TEU by FMC's Operations, the FMC Site Manager notified TRADOC EOC and the Army Operations Center of the site finding @ 1620, 14 Mar 01.
5. **Emergency notification level:**
 - Department of the Army Operation Center (SSG Williams)
 - TRADOC – EOC, TRADOC BRAC
 - Fort Benning Garrison Commander
 - Environmental Protection Agency – Region IV
 - Alabama Department of Environmental Management
6. **Description of property damage:**
7. **Personnel casualties and/or injuries:** NONE
8. **Whether or not medical services and/or facilities were required:** NONE
9. **State if SRF commander is required:** NONE
10. **Assistance required:** Technical Escort Unit, 722nd EOD Company conducted initial verification of projectile and fill.
11. **Any other pertinent information:** The Technical Escort Unit personnel are on site, but not all the their equipment. TEU anticipates having the necessary equipment to confirm projectile fill NLT 17 Mar 01 at which time fill will be confirmed.
12. **Commander's assessment of the situation:** The site in which the projectile is located is secured and will remain secured until the projectile fill is identified and TEU determines the disposition of the projectile.

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26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

- 13. **In reporting emergency destruction of hazardous munitions:** N/A
- 14. **Elements of media release:** Media release is projected for 19 Mar 01, if verification of CWM is confirmed.
- 15. **Notification of senior government official:** Department of the Army Operations Center
- 16. **Name of person preparing report:** Glynn D. Ryan, Fort McClellan Site Manager

For Questions: Gary E. Harvey, Fort McClellan Operations Officer
256.848-7347/4503, gary.harvey@mcclellan.army.mil

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26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

SAMPLE CHEMICAL EVENT FOLLOW-UP REPORT

CHEMICAL EVENT REPORT (UNCLASSIFIED)

HEADER: THIS IS A CHEMICAL EVENT FOLLOW-UP REPORT, RCS: CSGPO-453

BODY:

1. Date and Time of Event/Control number: 161600 local /Mar/01 – FMC 01-02

2. Location: 16SFN 14253090, May 96, 1:25,000

3. Quantity and Type of Agent/Agent involved: 1 each, Livens Projectile, MK II, Liquid Filled, Agent - Unk

4. Update to Chemical Event on 14 Mar 01: On 16 Mar 01 @ approximately 0900 hrs local, Livens projectile was placed inside a Multiple Round Container (MRC), Field Portable Digital Radiography and Computed Technology (DRCT) set up to mobile van. First X-ray scan image of the Livens Projectile showed the projectile to be filled about half full with an unknown liquid and burster running the length of the projectile. Physical integrity of the Livens Projectile was good with no evidence of leakage. PC measurements of the round were taken. At approximately 1315 began another DRCT scan of the Livens Projectile at a slower scan for better resolution of x-rays. Expect Portable Isotopic Neutron Spectroscopy (PINS) test to be completed at approximately 1630 hours, local. The Data from the PINS test is to be processed and analyzed by Edgewood on Monday 19 Mar 01. The Projectile remains in place and guarded until the contents and final disposal method can be determined.

5. Emergency notification level:

Department of the Army Operation Center
TRADOC – EOC, TRADOC BRAC
Fort Benning Garrison Commander
Environmental Protection Agency – Region IV
Alabama Department of Environmental Management

6. Description of property damage:

7. Personnel casualties and/or injuries: NONE

8. Whether or not medical services and/or facilities were required: NONE

9. State if SRF commander is required: NONE

10. Assistance required: Technical Escort Unit, 722nd EOD Company conducted initial verification of projectile and fill.

11. Any other pertinent information:

12. Commander's assessment of the situation: The site in which the projectile is located is secured and will remain secured until the projectile fill is identified and TEU determines the disposition of the projectile.

13. In reporting emergency destruction of hazardous munitions: N/A

14. Elements of media release: Media release is projected for 19 Mar 01, if verification of CWM is confirmed.

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26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

15. Notification of senior government official: Department of the Army Operations Center

16. Name of person preparing report: Glynn D. Ryan, Fort McClellan Site Manager

For Questions: Gary E. Harvey, Fort McClellan Operations Officer
256.848-7347/4503, gary.harvey@mcclellan.army.mil

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26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

SAMPLE CHEMICAL EVENT FINAL REPORT

**CHEMICAL EVENT REPORT
(UNCLASSIFIED)**

HEADER: THIS IS A CHEMICAL EVENT FINAL REPORT, RCS: CSGPO-453

BODY:

- 1. Date and Time of Event/Control number:** 201100 local /Mar/01 – FMC 01-03
- 2. Location:** 16SFN 14253090, May 96, 1:25,000
- 3. Quantity and Type of Agent/Agent involved:** 1 each, Livens Projectile, MK II, Liquid Filled, Agent - FM
- 4. Update to Chemical Event on 14 Mar 01:** On 20 Mar 01 @ approximately 0950 hrs local, assessment by the Material Assessment Review Board (MARB) determined with high confidence that the projectile contained FM smoke. MARB recommendation was that the projectile be disposed of locally.
- 5. Emergency notification level:**
 - Department of the Army Operation Center
 - TRADOC – EOC, TRADOC BRAC
 - Fort Benning Garrison Commander
 - Environmental Protection Agency – Region IV
 - Alabama Department of Environmental Management
- 6. Description of property damage:**
- 7. Personnel casualties and/or injuries:** NONE
- 8. Whether or not medical services and/or facilities were required:** NONE
- 9. State if SRF commander is required:** NONE
- 10. Assistance required:** None
- 11. Any other pertinent information:**
- 12. Commander's assessment of the situation:** Agrees with MARB determination of FM smoke and recommendation that the round be disposed of locally.
- 13. In reporting emergency destruction of hazardous munitions:** N/A
- 14. Elements of media release:** Not Planned.
- 15. Notification of senior government official:** Department of the Army Operations Center
- 16. Name of person preparing report:** Glynn D. Ryan, Fort McClellan Site Manager

For Questions: Gary E. Harvey, Fort McClellan Operations Officer
256.848-3847/4503, gary.harvey@mcclellan.army.mil

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SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

APPENDIX C
SUSPECT CHEMICAL WARFARE MATERIAL SITES

Final CWM EE/CA for Fort McClellan, Alabama

Figure 2.2

Parsons Engineering Science, Inc.

June 2002

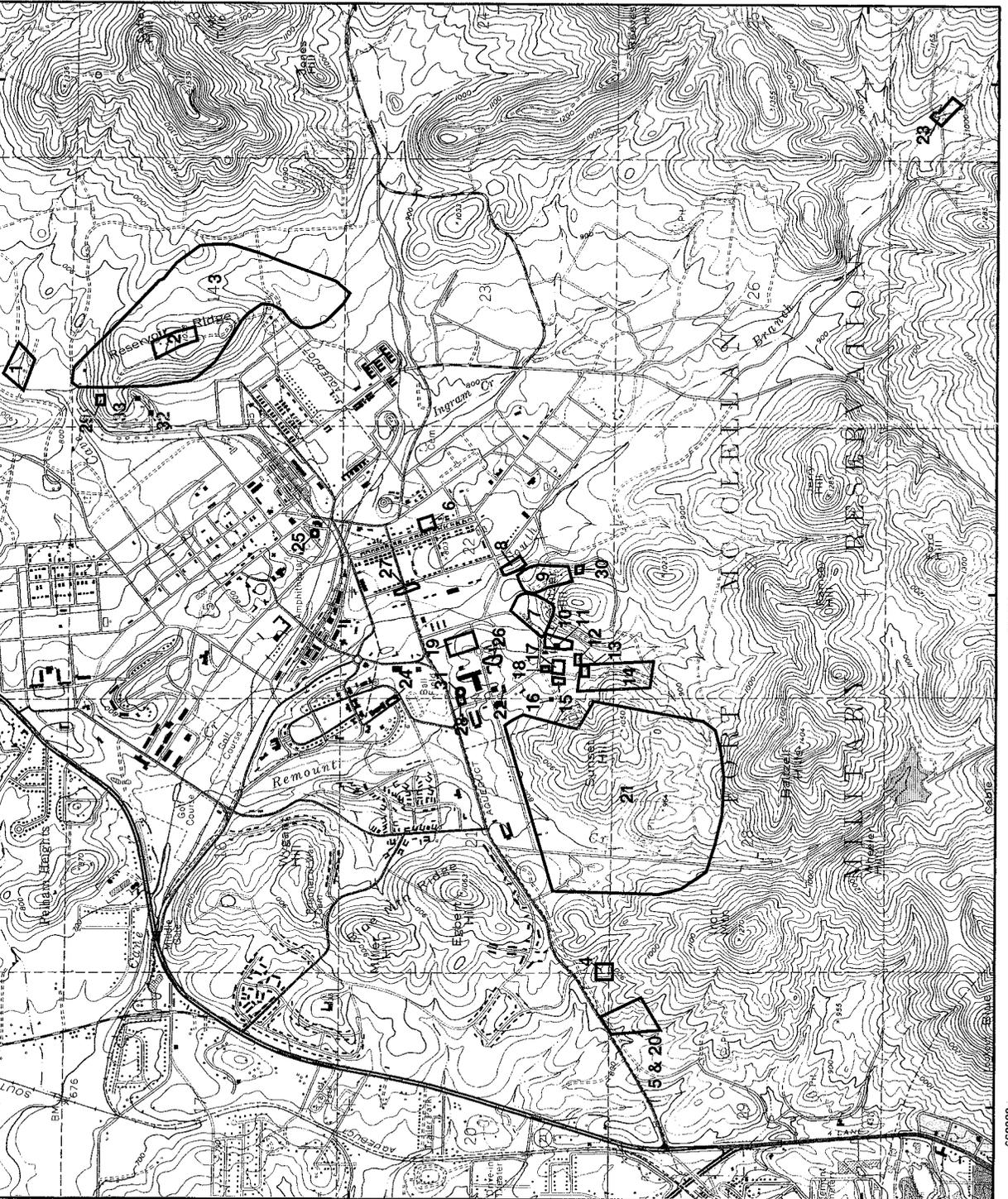


Figure 2.2

CWM EE/CA SITE LOCATION MAP

No. Site ID

- 1 Training Area 31
- 2 T-38 (Reservoir Ridge)
- 3 Smoke Ranges R & S
- 4 T-4 Biological Warfare Area
- 5 Old Chemical Weapons Demo Area
- 6 Agent ID Area
- 7 Sandell Field
- 8 Cane Creek Training Area
- 9 Naylor Field
- 10 Blacktop Training Area
- 11 Fenced Yard in Blacktop Area
- 12 Dog Training Area
- 13 Dog Kennel Area
- 14 Reaction Area T-5
- 15 D & I Area
- 16 Old Burn Pit
- 17 Field Personnel Decontamination Area
- 18 Decontamination Building 3185
- 19 CBR Proficiency Area
- 20 South Gate Toxic Gas Yard
- 21 Sunset Hill Area
- 22 Old Toxic Training Area
- 23 Training Area 24A
- 24, 25, 26, 27, 31 Mustard Spills
- 28, 29, 30 Goat Yards
- 32 Building 4415 (Igl0013)
- 33 Building 4416 (Igl00 14)

□ Site Boundary

Source: US Geological Survey Topographic Map
Anniston 1972



PARSONS ENGINEERING SCIENCE, INC.		U.S. ARMY CORPS OF ENGINEERS HUNTSVILLE CENTER	
DESIGNED BY	MAD	FORT McLELLAN ANNISTON, ALABAMA CALHOUN COUNTY	
DRAWN BY	MAD	SCALE	1 inch equals 2,000 feet
CHECKED BY	JC/JU	DATE	May 2002
SUBMITTED BY	JC/JU	FILE	734643
		PROJECT NUMBER	734643
		DATE	May 2002
		FILE	734643
		SCALE	1 inch equals 2,000 feet
		DATE	May 2002
		FILE	734643



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26 September 2003

SUBJECT: Transition Force Standard Operating Procedure for Responding to Suspected CWM

**APPENDIX D
ENVIRONMENTAL NOTIFICATIONS**

1. **PURPOSE:** To Inform members of the BCT/Regulatory Community of the discovery of a potential chemical warfare material item at Fort McClellan.
2. **PROCEDURES:** The BEC or his designated representative will be responsible for making notifications to the following agencies:

a. Alabama Department of Environmental Management (ADEM)

Primary POC: Mr. Phillip Stroud
Phone #: (334) 279-5646
Fax #: (334) 279-3050
Email: PNS@adem.state.al.us

Alternate POC: Mr. Shannon Golden
Phone #: (334) 270-5610
Fax #: (334) 279-3050
Email: SGG@adem.state.al.us

b) Environmental Protection Agency Region IV (EPA)

Primary POC: Mr. Doyle Brittain
Phone #: (404) 562-8459
Fax #: (404) 562-8518
Email: BRITTAIN.doyle@epamail.epa.gov

c) Other agencies as directed by the Site Manager.

ATTACHMENT 7
MEMORANDUM OF AGREEMENT

REPLY TO
ATTENTION OF**DEPARTMENT OF THE ARMY**
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, AL 36628-0001

October 22, 2003

Environmental and HTRW Section
Engineering DivisionNortheast Alabama Regional Medical Center
Attn: Mr. Allen Fletcher
P.O. Box 2208
Anniston, AL 36202

Dear Sirs:

This letter is to give notice that the Mobile District U.S. Army Corps of Engineers will be performing removal of chemical warfare material scrap and ordnance explosives scrap at Fort McClellan. The work will be conducted from November 10, 2003 through the end of February 2003 at two former training areas, T-38 and T-24A, within the base. Shaw Environmental, Inc. will be performing the fieldwork on behalf of the Mobile District. Up to 10 persons will be working on the sites at one time and they could be potentially exposed to chemical warfare materials.

Although we do not anticipate encountering any chemical warfare materials, we thought it prudent to inform your facility of these fieldwork activities in case an unforeseen event occurs. If such an event occurs, we intend to transport the exposed site worker(s) to your facility for primary medical treatment.

Enclosed is a copy of the Memorandum of Agreement (MOA) between the U.S. Army Corps of Engineers and the Northeast Alabama Regional Medical Center. The MOA, dated March of 2000, outlines the responsibilities between both parties for the off-site treatment of potential chemical agent exposure to on-site workers.

For your information, a final copy of the Site Specific Work Plan (SSWP) will be forwarded to your offices before the commencement of field activities. The SSWP describes the history of the site and includes a Site Specific Health and Safety Plan (SSHP). The SSHP details the standard operating procedures for the fieldwork, to include material safety data sheets and NIOSH chemical hazard information for all the chemical agents of concern.

If you have any questions concerning this work, please contact me at telephone (251) 690-3099.

Sincerely,

A handwritten signature in black ink, appearing to read "Lee D. Coker".

Lee D. Coker
Authorized Representative
of the Contracting Officer

CF: Leake/PM-MS

~~CONFIDENTIAL PROJECT REPORT BK~~

MEMORANDUM OF AGREEMENT
BETWEEN
U.S. ARMY CORPS OF ENGINEERS
AND
NORTHEAST ALABAMA REGIONAL MEDICAL CENTER

SUBJECT: Off-Site Treatment of Chemical Agent Casualties; Fort
McClellan, Alabama

1. PURPOSE: The purpose of this Memorandum of Agreement (MOA) is to clearly establish the roles and responsibilities and the organizational relationship between the U.S. Army Corps of Engineers and North East Alabama Regional Medical Center. This MOA defines the agreements made between the U. S. Army Corps of Engineers and Northeast Alabama Regional Medical Center in relation to the medical treatment to be provided by the Northeast Alabama Regional Medical Center to workers potentially exposed to chemical agent while working at Fort McClellan (to include Department of the Army and contract employees).

2. RESPONSIBILITIES:

2.1 The U. S. Army Corps of Engineers hereby agrees to the following provisions:

2.1.1 To provide Northeast Alabama Regional Medical Center with a list of chemical agents to which on-site workers could be exposed while working at suspect chemical warfare materiel sites at Fort McClellan, Alabama along with a description of potential health effects these chemical agents may cause.

2.1.2 To ensure that any individual potentially exposed to chemical agent is decontaminated using approved Department of the Army decontamination solutions and procedures to remove any residual chemical agent prior to transporting the individual to the Northeast Alabama Regional Medical Center for medical treatment;

2.1.3 To arrange for the provision of initial and annual refresher (for the duration of work at chemical warfare materiel sites at Fort McClellan) medical training for the treatment of chemical agent casualties to those Northeast Alabama Regional Medical Center personnel who may be involved with the medical treatment of workers at Fort McClellan who become exposed to chemical agent..

2.1.4 To provide an opportunity for Northeast Alabama Regional Medical Center personnel to participate in chemical warfare materiel emergency exercises to be conducted at Fort McClellan prior to start-up of site work at suspected chemical warfare materiel sites. These exercises generally last 2-3 days.

2.1.5 To have on-site during work at suspect chemical warfare materiel sites, a DOT approved ambulance and two Emergency Medical Technicians/Paramedics ready to transport chemical agent casualties (after decontaminated on-site) to the Northeast Alabama Medical Center or to designated pick-up points.

2.1.6 To reimburse the Northeast Alabama Regional Medical Center at usual and customary rates for all charges incurred by U.S. Army Corps of Engineers employees/contractors during their medical treatment for on the job injuries related to work at Fort McClellan.

2.1.7 To take responsibility and accountability for any medical equipment which becomes contaminated with chemical agent until the medical equipment is destroyed by authorized methods or until released by competent authority.

2.2 Northeast Alabama Regional Medical Center personnel hereby agree to the following provisions:

2.2.1 To designate Northeast Alabama Regional personnel (particularly physicians, physician assistants, nurses) to attend required medical training for the treatment of chemical agent casualties and to make those individuals available for participation in the annual refresher training (for the duration of work at chemical warfare materiel sites at Fort McClellan).

2.2.2 To have staff members who have been trained in chemical agent casualty care on duty (Monday through Friday, 0800-1630) when workers at Fort McClellan are working in areas where they could become exposed to chemical agent. Also, to have available at the Northeast Alabama Regional Medical Center, medical supplies for treatment of any chemical agent casualty. These operations are scheduled to start at Fort McClellan in the Spring of 2000 and to continue over a period of approximately 3 months.

2.2.3 To provide required medical care after receiving decontaminated chemical agent casualties at the emergency room or other location designated by the medical center.

2.2.4 Upon consent of the patient or patient's authorized representative, to allow authorized representatives of the Army or contractor full access to any health records or documents initiated during the evaluation or treatment of worker(s) potentially exposed to chemical agent;

2.2.5 Upon examination or treatment of an Army or contractor employee suspected of having been exposed to chemical agent, to provide notification to a designated representative of the U.S. Army Corps of Engineers whenever the individual treated is determined to have been exposed to chemical agent.

3. This Memorandum of Agreement is effective for planning and coordination action on the date of signing and will remain effective until revised or rescinded by mutual agreement. Planning meetings will be conducted annually, or more frequently if necessary, to re-coordinate the provisions of the memorandum.

4. REFERENCES:

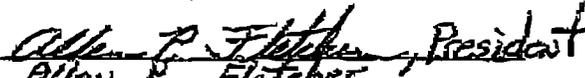
4.1 Department of Army Pamphlet (DA PAM) 50-6, 1 February 1995, Chemical Accident or Incident Response and Assistance Operations.

4.2 Memorandum, SFIL-PMS, 23 November 1992, subject: Medical Support Requirements for Non-Stockpile Chemical Materiel Activities.



J. DAVIS WOODWARD
Colonel, Corps of Engineers
District Engineer

10 March 2000
Date



Allen P. Fletcher
Northeast Alabama Regional Medical
Center

2/17/00
Date

ATTACHMENT 8

INSTALLATION-WIDE WORK PLAN SECTIONS

- **SITE CONTROL**
- **DECONTAMINATION**
- **SITE MONITORING**
- **EMPLOYEE TRAINING**

SITE CONTROL

Site Control

Authorization to Enter

Access to the EZ and CRZ is regulated and limited to authorized personnel. Only persons who have completed the following training and medical requirements will be allowed to enter in this work zone:

- Completion of 40 hours of hazardous waste operations training as defined under 29 CFR 1910.120 or 29 CFR 1926.65
- Completion of the 40-hour hazardous waste operations training within the past 12 months or completion of an 8-hour hazardous waste operations refresher
- Completion of 24 hours actual supervised field training after the initial 40 hours per 1910.120e2
- Certification by a physician of fitness for hazardous waste operations and respirator use within the last 12 months
- Completion and acknowledgement of SHP and SSHP briefing.

Personnel not meeting these requirements may enter the designated support zone only. The SSHO will maintain a list of persons authorized to enter EZ and CRZ work areas, and only personnel on the authorized persons list will be allowed within the EZ and CRZ. No work activity will be permitted within an EZ unless a minimum of 2 employees are involved. The buddy system will always be enforced during any ES operation regardless of the PPE level required.

Site-Specific Orientation

No person shall be allowed on any field site without first being given a site-specific H&S orientation. This orientation will provide training on the potential H&S hazards and procedures specific to the site, and will discuss the provisions of this SHP and SSHP attachments. All personnel will acknowledge their attendance by signing the SHP Acknowledgement Form. Shaw subcontractors must also acknowledge and sign the form in Attachment II, Subcontractor Certification.

Documentation of Certificates

Personnel entering the EZ and CRZ to work will have satisfied the medical and training requirements of 29 CFR 1910.120 or 29 CFR 1926.65. The site coordinator is responsible to

maintain copies of certificates documenting status for all on-site personnel at the site office. Personnel not entering the EZ or CRZ zone need not meet the requirements in Section 6.1. The PM will accommodate requests from representatives of regulatory agencies to review documentation. All visitors must present documentation of current training and medical status before being granted authorization to enter the EZ or CRZ zone.

Entry Log

The site coordinator shall keep a daily roster of all on-site personnel. As compiled on the Daily Tailgate Sign-In/Attendance Roster for Level C and above PPE requirements in an EZ, a record will be maintained of the personnel, time of entry, and exit from the EZ.

DECONTAMINATION

Decontamination

The site/project areas will be divided into three work zones: the EZ, a CRZ, and an SZ. The SSHO will be responsible for designation of the work zones. The EZ is the area where contamination does or could occur. The EZ for a nonchemical agent suspect site will be in an approximate 20-foot radius around the drill rig or heavy equipment operation or a 10-foot radius around sampling locations and will be marked with barrier tape or other means to warn personnel of the hazards.

Only Shaw personnel and authorized visitors who have met the requirements of Section 6.1 and who are wearing the required PPE will be allowed within a site CRZ or EZ.

Immediately adjacent to the EZ, a decontamination area/CRZ for equipment and personnel will be established. This area will also be delineated with traffic cones and/or barrier tape.

The remainder of the Shaw project area will be designated as the SZ. No special markings or warning labels are required for this area other than those specified in the Ordnance and Explosives Management Plan (OEMP) for anomaly avoidance.

Personnel Decontamination

A modified decontamination procedure will be used for sampling activities (only) where Level D and/or Modified Level D protection are used. Specifically, personnel will be advised to wash their hands and face following sampling activities. Appropriate gloves will be worn while sampling media (i.e., soil, sediment, and groundwater). Personnel should be required to wash hands and face prior to eating, drinking, or smoking.

All personnel working in Modified Level D, Level C, or Level B in the EZ must undergo personnel decontamination prior to entering the support zone. The personnel decontamination area shall consist of the following stations.

Station 1. Personnel leaving the EZ will remove the gross contamination from their outer clothing and boots. If the site is a chemical agent suspect site, a 5 to 10 percent bleach solution (Clorox[®]) will be used to wash off contamination from gloves, boots, and protective clothing. If confirmation of chemical agent monitoring determines the presence of a chemical agent, the Anniston Fire Department will be contacted to perform additional chemical agent decontamination. Any site work which requires the use of chemical agent monitoring equipment

(as specified in Figure 1-1, Evaluating OE/UXO/CWM Hazards if Support of HTRW Activities) and the respective site-specific H&S plan, must have suitable equipment and bleach solution on site to deal with a decontamination event.

Station 2. Equipment for this station may include a plastic-lined waste receptacle, chair, clean damp cloths or paper towels, and plastic bags. At Station 2, personnel will remove their disposable coveralls and outer gloves and deposit them in plastic bags. Personnel will wipe their respirators (if used), hard hats, and boots with clean, damp cloths and then remove those items. Those items are then hand carried to the next station. Inner gloves will be removed.

Station 3. Equipment for this station may include a wash basin with soap and water and respirator sanitation station. At this station, personnel will thoroughly wash their hands and face before leaving the decontamination zone. Respirators will be sanitized, dried, and then placed in a clean plastic ziplock bag.

Equipment Decontamination

A centrally located decontamination station shall be established for washing drilling, digging, and/or sampling equipment. Gross contamination that may become loose and fall off equipment during transit to the central decontamination station shall be removed in the EZ or CRZ, or provisions made to cover gross contaminated materials while in transport. Note: In the event of chemical agent contamination, the Anniston Fire Department will perform deliberate equipment decon.

PPE Decontamination

Where and whenever possible, single-use, external protective clothing shall be used for work within the EZ or CRZ. This protective clothing shall be disposed of in marked containers. Depending upon subsequent analysis, this protective clothing may require disposal as hazardous waste.

Reusable protective clothing will be rinsed at the site with detergent and water. If ring off occurs on a chemical agent suspect site, bleach will be used to rinse protective clothing. The rinsate will be collected for possible disposal as hazardous waste. A MSDS must be present on site for any hazardous chemicals used during decontamination procedures (see Attachment V).

Respiratory protective equipment will be wiped with a damp cloth and bagged while in the CRZ. After the respirator has been removed from the CRZ, it will be thoroughly cleaned with soap and

water. The respirator face piece will be cleaned, sanitized, and dried at the end of each work shift.

SITE MONITORING

1 **Site Monitoring**

3 **Air Monitoring**

5 **Hazardous and Toxic Wastes.** Monitoring will be performed by the SSHO, qualified task
6 geologist or qualified sampling technician during the performance of invasive operations. A
7 calibrated FID (i.e., OVA 128 or equivalent) or PID (i.e., HNu, Microtip or equivalent) organic
8 vapor analyzer will be utilized to monitor the wells and breathing zones, to determine if any
9 organic material may be present that would necessitate upgrading of protection level.

11 Invasive operations include installation of monitoring wells, well developing, pump testing,
12 hydropunch sampling, surface and subsurface sampling, soil boring, and collection of water
13 samples.

15 Noninvasive operations that do not disturb existing materials include site setup, surveying
16 exterior of test wells, decontamination, and miscellaneous SZ activities.

18 If flammable vapors are suspected at the site (i.e., methane), a combustible gas/oxygen analyzer
19 will be used to detect percent lower explosive limit (LEL) and percent oxygen.

21 Based on the nature and location of the site activity and the potential for respirable
22 contamination, respirable dust monitoring may be employed. Sites where inorganic
23 contamination has been identified or highly likely could result in the addition of both real-time
24 aerosol monitoring and integrated air sampling. Additional air monitoring requirements will be
25 evaluated by the health and safety manager and discussed in site specific safety and health plan
26 attachments. In the event of excessive airborne dust, as determined by visual observation by the
27 SSHO, dust suppression should be implemented.

29 All air monitoring activities shall be documented on the Shaw Real Time Air Monitoring Log or
30 Field Activity Daily Log form.

32 **Chemical Agents.** In accordance with ER-385-1-92, and the Shaw site-specific evaluation of
33 OE/UXO/CWM hazards in support of HTRW activities, a chemical warfare agent specialist will
34 be responsible for providing low level, real-time monitoring on sites in which chemical warfare
35 agents may be present. Specific hazard control methodologies will be evaluated and selected in
36 an effort to minimize potential accidents or injuries associated with chemical warfare materials.

1 The decision logic for the hazard evaluation and controls will be integrated into the SSHP. For
2 any discovery of CWM, the instructions detailed in Attachment VIII will be followed:
3 Transition Force SOP for Responding to suspected CWM.

4
5 **UXO.** UXO safety will be achieved by employing UXO specialists to ensure that field
6 personnel do not come into contact with UXO. In areas where UXO is suspected to exist, the
7 UXO specialists will perform the following field UXO avoidance operations. Additionally,
8 “Safety Concepts and Basic Considerations for UXO Operations” can be found in Appendix E of
9 the SAP, as provided by U.S. Army Engineering and Support Center, Huntsville. Appendix F of
10 the SAP includes “Standard Operating Procedures for UXO Avoidance.”

- 11
12 • **Area UXO Surveys Using Magnetometers.** During this operation, UXO on
13 the surface will be detected and marked for avoidance during field operations.
- 14
15 • Metal objects just below the surface will also be marked to indicate the potential
16 hazard.
- 17
18 • **Safety Escort.** UXO specialists will escort field personnel in UXO suspect
19 areas to ensure that none are accidentally disturbed during field activities such as
20 soil sampling.
- 21
22 • **Downhole UXO Surveys.** UXO specialists will perform downhole mag-
23 netometer surveys to detect metal objects in the path of the boring apparatus until
24 undisturbed soils are reached. The boring location will be moved if subsurface
25 metal objects are detected.

26
27 **If UXO is encountered and UXO is positively identified, (“conventional” [not chemical]),**
28 **contact Ron Levy (see FTMC project emergency contact). Maintain a safe distance of the**
29 **UXO, do not leave the vicinity of the UXO until it is certain the area has been secured. If**
30 **UXO is not positively identified and/or is chemical UXO, contact Ron Leavy and Lee Coker**
31 **(see FTMC Project Emergency Contacts). Ensure the area is evacuated and secured**
32 **immediately.**

33
34 The action level for airborne contaminants is provided in Table 1. The action levels for chemical
35 agents that would be established if work involving typical monitoring of potential agent
36 exposures would be conducted are listed in Table 2.

37
38 All air monitoring results will be provided to the USACE upon request, as these results become
39 available.

Table 1
Action Levels
Fort McClellan, Calhoun County, Alabama

(Page 1 of 2)

When in Level B Personal Protective Equipment (PPE)

Analyte	Action Level	Required Action ^a
Volatile organic compounds (VOC)	25 parts per million (ppm) above background in breathing zone (BZ)	Stop work, evacuate work area
Oxygen	≥ 20%, <23% < 20%, >23%	Normal operations Stop work, evacuate work area
Flammable vapors	≥ 10% lower explosive limit (LEL) < 10% LEL	Stop work, evacuate work area Continue operations, monitor for VOCs

When in Level C PPE

Analyte	Action Level	Required Action ^a
VOCs	10 ppm above background in BZ	Stop work, evacuate work area, upgrade to Level B ^b
Oxygen	≥ 20%, <23% < 20%, >23%	Normal operations Stop work, evacuate work area
Flammable vapors	≥ 10% LEL < 10% LEL	Stop work, evacuate work area Continue operations, monitor for VOCs

Table 1
Action Levels
Fort McClellan, Calhoun County, Alabama

(Page 2 of 2)

When in Level D Modified/D PPE

Analyte	Action Level	Required Action ^b
VOCs	5 ppm above background in BZ	Stop activities, suspend work activities for 15 to 30 minutes, if readings are sustained then upgrade to Level C PPE.
Oxygen	≥ 20%, <23% < 20%, >23%	Normal operations Stop work, evacuate work area
Flammable vapors	≥ 10% LEL < 10% LEL	Stop work, evacuate work area Continue operations, monitor for VOCs

NOTE: Sites evaluated and determined to need chemical agent monitoring will require chemical agent specialist. If chemical agents are encountered, if "ring off" occurs, or if airborne concentrations of mustard gas or lewisite approach ceiling limits of 0.003 milligrams per cubic meter (mg/m³), site personnel will don escape/egress air supply pack and evacuate the site immediately. Employees will decontaminate using bleach solution. If confirmation of chemical agent monitoring determines the presence of chemical agents, contact the Fire Department for additional decontamination. The site safety and health officer must follow notification procedures in Attachment VI. Also, notify the health and safety (H&S) Manager, project manager, and the Mobile District U.S. Army Corps of Engineers.

When in Support Zone

Analyte	Action Level	Required Action
VOCs	1 ppm above background in BZ	Evacuate support zone and re-establish perimeter of exclusion zone.

^a Four instantaneous peaks in any 15-minute period or a sustained reading for 5 minutes in excess of the action level will trigger a response.

^b Contact with the H&S manager must be made prior to continuance of work. The H&S manager may then initiate perimeter/integrated air sampling along with additional engineering controls.

No one is permitted to downgrade levels of PPE without authorization from the H&S manager.

Table 2

**Action Levels for Selected Chemical Agents
for Workers in Modified Level D
Fort McClellan, Calhoun County, Alabama**

Analyte	Action Level	Required Action ^a
HD	0.00225 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact Site Safety and Health Officer (SSHO) and USACE
L	0.00225 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
GB	0.000075 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
VX	0.0000075 mg/m ³ (0.75 TWA)	Stop work, evacuate work area, contact SSHO and USACE
CG (phosgene)	0.075 ppm (0.3 mg/m ³)	Stop work, evacuate work area, contact SSHO and USACE
CK (cyanogens chloride)	0.225 ppm (0.45 mg/m ³)	Stop work, evacuate work area, contact SSHO and USACE

1 ***Air Monitoring Frequency***

2 Air monitoring frequency and location is provided in Table 3. The SSHP attachments will also
3 have frequency and location specific to the work site. The air monitoring frequency for any
4 chemical agent monitoring will be continuous and will be further defined in the SSHP pertinent
5 to the agent(s) of interest in the Chemical Agent Monitoring Plan.
6

7 ***Air Monitoring Equipment***

8 A FID, PID, and LEL/oxygen meter or equivalent will be available for on-site use. All equip-
9 ment shall be maintained in such quantity and condition to adequately monitor and assess all site
10 operations. Additionally, the need for further equipment will be evaluated on a site by site basis
11 and discussed in the SSHP.
12

13 ***Monitoring Equipment Maintenance and Calibration***

14 All air monitoring equipment will be calibrated in accordance with the manufacturer's spec-
15 ification. Preventive maintenance and repairs will be conducted in accordance with the respec-
16 tive manufacturer's procedures.
17

18 All direct reading instrumentation calibrations should be conducted under the approximate
19 environmental conditions the instrument will be used. All air monitoring equipment calibrations
20 and maintenance activities shall be documented on the Shaw Real Time Instrument Calibration
21 Log or Field Activity Daily Log. All completed H&S documentation/forms shall be maintained
22 by the SSHO in project central files for review by the H&S manager.
23

24 If an instrument is found to be inoperative or suspected of giving erroneous readings, the SSHO
25 shall be responsible for immediately removing the instrument from service and obtaining a
26 replacement unit. The specific Shaw or subcontractor operation for which this equipment is
27 essential shall cease until an appropriate replacement unit is obtained. The SSHO shall be
28 responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the
29 defective equipment.
30

31 When applicable, only manufacturer-trained and/or authorized Shaw personnel will be allowed
32 to perform instrument repairs or preventive maintenance.
33

34 ***Other Hazardous Conditions***

35 If unknown chemicals or contamination are encountered, operations will cease until the situation
36 is evaluated. The SSHO will contact the H&S manager to evaluate any potentially hazardous
37 situations, or any situation with elevated contamination levels. The H&S manager or site

Table 3

**Air Monitoring Frequency and Location
Fort McClellan, Calhoun County, Alabama**

Work Activity	Instrument	Frequency	Location
Staging equipment	OV Monitor	Initially for area	Breathing zone (BZ) of employees
Drilling and installation of monitoring wells and/or extraction wells	OV Monitor and O ₂ /LEL	Initially, then periodically (with each 5- to 10-foot depth)	BZ of employees Support zone
Sampling (groundwater and soil)	OV Monitor	Initially for location	BZ of employees Support zone
Soil gas survey	OV Monitor and O ₂ /LEL	Initially for location	BZ of employees Support zone
Abandonment of monitoring wells	OV Monitor	Initially, then periodically	BZ of employees Support zone
Pilot-scale SVE test	OV Monitor	Initially, then periodically	BZ of employees Support zone
Installation of piezometers	OV Monitor and O ₂ /LEL	Initially, then periodically (with every 5- to 10-foot depths)	BZ of employees Support zone

OV = Organic vapor.
O₂/LEL=Oxygen and lower explosive limit.
SVE - Soil vapor extraction.

1 supervisor shall contact the project manager who will notify the USACE. Operations will only
2 be resumed if they can be accomplished in a safe manner.

3 4 **Noise Monitoring**

5 Noise monitoring will not be conducted because previous noise monitoring during similar
6 drilling and heavy equipment operations has characterized noise levels greater than 85 dBA
7 within a 5-foot radius around the rear end (motor side) of heavy equipment and drill rigs.
8 Hearing protection is mandatory for all employees in or when working near/adjacent to operating
9 heavy equipment or drill rigs. Noise monitoring will occur when new heavy equipment is
10 brought on site and when new tasks are started that have not previously had their noise levels
11 characterized.

12 13 **Monitoring Records**

14 The SSHO shall ensure that site monitoring records are complete and incorporated into the
15 project file. Any personnel or area air monitoring results will be incorporated into the Shaw
16 H&S files. The H&S manager will be responsible for establishing, maintaining, and forwarding
17 to other Shaw offices (as necessary) all the following required monitoring information for
18 placement in individual employee files:

- 19
- 20 • Employee name, social security number, and employee number
- 21
- 22 • The date, time, pertinent task information, and exposure information
- 23
- 24 • Weather conditions (wind direction, precipitation, temperature, etc.)
- 25
- 26 • Description of the analytical methods, equipment used, equipment identification
27 number, and calibration data
- 28
- 29 • Type of PPE worn
- 30
- 31 • Engineering controls used to reduce exposure.
- 32

33 **Notification of Personal Monitoring Results**

34 Within 5 working days after receipt of monitoring results, the project H&S staff and the host
35 office H&S staff will ensure that each employee is informed in writing of the results that
36 represent that employee's exposure. Monitoring results representative of an employee's exposure
37 shall be reported to the affected employee on the Shaw Employee Notification of Industrial
38 Hygiene Monitoring Results Form from Shaw Policy HS104.

1 Whenever the results indicate that the representative employee exposure exceeds the PEL, the
2 Employee Notification of Industrial Hygiene Monitoring Results Form shall state that the PEL
3 was exceeded, and shall provide a description of the corrective action taken to reduce exposure
4 to a level below the PEL.

5
6 Shaw will provide industrial hygiene monitoring results to subcontractor companies if the
7 exposure of subcontractor employees to airborne contaminants is elevated. Notification of
8 subcontractor personnel of industrial hygiene monitoring results is the responsibility of the
9 subcontractor.

EMPLOYEE TRAINING

Employee Training

General

All on-site project personnel performing HTRW activities shall have completed at least 40 hours of hazardous waste operations training, as required by 29 CFR 1910.120 and 29 CFR 1926.65. In addition, all field employees shall have received a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Those personnel who completed the 40-hour training more than 12 months prior to the start of the project shall have completed an 8-hour refresher course within the past 12 months. Supervisors shall have completed an additional 8 hours of relevant H&S training. Subcontractor personnel must meet these training requirements when working on HTRW sites. Documentation of Shaw and subcontractor training shall be maintained with the project files.

Site-Specific Orientation

All personnel, before performing any work at the site, are required to go through a site-specific H&S orientation. This orientation will provide training on the potential H&S hazards and procedures specific to the site, and will discuss the provisions of this SHP and SSHP Attachments. All personnel will acknowledge their attendance by signing the SHP Acknowledgement Form. Additionally, subcontractors must acknowledge the Subcontractor Certification Form in Attachment II.

Tailgate Safety Meetings

The SSHO shall conduct a tailgate safety meeting at the beginning of each shift or whenever new employees arrive at the job site once the job commences. The topics discussed at the tailgate safety meeting will include H&S considerations for the day's activities, necessary protective equipment, potential for encounters with biological hazards, problems encountered, and new operations. UXO safety concerns will be discussed by senior UXO personnel during the tailgate safety meeting. Attendance records and meeting notes will be maintained with the project files.

Site Workers' Basic Course

The following is a list of the topics covered in Shaw's 40-hour training course:

- General site safety

- Physical hazards (fall protection, noise, heat stress, cold stress)
- Names and titles of key personnel responsible for site H&S
- Safety, health, and other hazards typically present at hazardous waste sites
- Use of PPE
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements including recognition of symptoms and signs that might indicate overexposure to hazards
- Worker right-to-know (Hazard Communication OSHA 1910.1200)
- Routes of exposure to contaminants
- Engineering controls and safe work practices
- Components of the site H&S program
- Decontamination practices for personnel and equipment
- Confined-space entry procedures
- Emergency response plan.

Supervisors' Course

Management and supervisors must receive an additional 8 hours of training that includes:

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

First-Aid and Cardiopulmonary Resuscitation

At least two employees current in first aid/cardiopulmonary resuscitation (CPR) will be assigned to the work crew and will be on the site whenever operations are ongoing. First aid and CPR training courses are offered to all Shaw employees. Annual refresher training in CPR and triannual refresher training in first aid is required to maintain the currency of the certificate.