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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 574

574 1 File: 541.460.000(9)
C.H. 574

FINAL SAFETY SUBMISSION

for

Chemical Warfare Materiel Investigation/Removal Action At Dunn Field

Former Defense Distribution Depot Memphis, Tennessee (DDMT)

Book 1

Volumes I & II

WP/SSHP

Contract# DACA87-97-D-0006
Delivery Order 0012
January 2000
Prepared For:
U.S. Army Corps of Engineers
Huntsville, Alabama

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EXECUTIVE SUMMARY

The purpose of this Safety Submission is to aid in ensuring worker safety and protect public health during chemical warfare materiel removal actions conducted at the Dunn Field area of the former Defense Distribution Depot Memphis Tennessee (DDMT), herein referred to as the "Depot".

A 500-acre tract of land was purchased from private landowners in May 1941. Construction of base administrative buildings, two rifle ranges and igloo type ordnance magazines began immediately after purchase and the base was activated in January 1942. The areas of concern involve a section north of the main installation known as Dunn Field, as this area is the only area documented where chemical warfare materiel (CWM) activities took place.

During various times, the Depot provided marksmanship training; distribution, filler, and reserve supply functions; served as a staging point for chemical warfare materiel (CWM), incendiary bombs, and hand grenades (smoke); provided testing of flame throwers; and was used as a disposal site for [war trophy] unexploded ordnance (UXO) confiscated from returning WWII soldiers These war trophy UXO were reportedly buried in pits on Dunn Field. Of particular interest, and the root cause of this removal action, is the emergency neutralization and decontamination conducted on 500kg and 250kg sulfur-mustard-filled German bombs at Dunn Field in July 1946; see Figure WP-1-1. These items were in route from Mobile, AL, via railcar, to Pine Bluff, AR when leaks were discovered in three railcars Air dropped chemical munitions are typically thin-cased to permit easy dispersal of the agent. This also increases their susceptible to leakage resulting from aggressive handling and/or container corrosion. The leaking munitions were diverted to the Depot for emergency action. Twenty-nine leaking bombs were discovered. Leaking bombs were drained and the contents were placed in a chlorinated lime slurry pit for neutralization. Subsequently, emptied bomb casings were placed in another pit and detonated using dynamite. At the conclusion of the disposal operations, all suspected contaminated items (i.e. dunnage, wood crates, protective clothing) were placed in the slurry pit and burned. The pit was then filled in. During the mid-1950s, Chemical Agent Identification Sets (CAIS) were also buried in the Dunn Field Area. All decontamination initiatives and burials occurred within the Dunn Field section of the Depot

In addition to CWM and ordnance, various other materials have been destroyed and buried in Dunn Field, though none of these additional materials are known to have been buried in the pits to be excavated for this project. These items include: Impregnite, decontaminating agents--non-corrosive (DANC), paints, acids, herbicides, medical waste, rodentcides, and food stocks.

Under the provisions of the Defense Base Closure and Realignment Act, the Depot was closed on September 30, 1997. The Defense Logistics Agency currently maintains a small contingent of employees at the Depot; the Depot Caretaker Division. This group is under the control of the Defense Distribution Center and the Defense Distribution Depot Susquehanna, Pennsylvania.

Between September 1997 and August 1998, Parsons Engineering Science, Inc, Atlanta, GA. conducted an Engineering Evaluation/Cost Analysis (EE/CA) in areas identified in the EE/CA as Areas A-1, A-2, and B-2 (see Figure WP-1-1 in the work plan). Two specific areas in Area A and one area within Area B were discovered as probable CWM neutralization/burial sites. These areas have been further defined and re-designated to identify the specific areas targeted for excavation. The new designations are:

EE/CA Designation	New (Removal Action) Designation	Site Significance
A-1	24-B	possible burial site of German mustard bombs;
A-2	24-A	chlorinated lime pit used in the neutralization of mustard agent; and
B-2	1	possible burial site for chemical agent identification sets (CAIS).

The EE/CA objectives included: characterization of CWM/Ordnance and Explosives (OE) contamination, analyze risk management alternatives, and recommend feasible CWM/OE risk reduction alternatives. After extensive field studies and document/sampling reviews, the EE/CA concluded, "Excavation and removal of CWM/OE is the only alternative that fully meets the remedial objective, which is to ensure that exposure to any level of chemical agent does not occur in the future when the site is released without land use restrictions."

Planned operations involve three phases: 1) excavation of the pits where neutralization of the contents of the 29 leaking mustard bombs occurred and ensure no CWM hazards remain; 2) excavation of the pit containing remains of detonated bomb casings, test for CWM hazards; and 3) excavation and removal of Chemical Agent Identification Sets (CAIS).

Placement of a vapor containment structure shall be utilized in documented neutralization and burial pit areas. Field monitoring for CWM agents shall be implemented and maintained during excavation of burial pits. Soil samples shall be collected and submitted for analysis as directed by this document. Site restoration shall be performed on areas disturbed by these actions. Continuous air monitoring will be employed to provide early detection in the unlikely event of an agent release. Soil samples will be collected in accordance with the sampling plan to determine if filler agent or decontaminates present a hazard to the environment and if so, determine the extent of migration. Site characterization studies, conducted during the EE/CA, showed no evidence of CWM migration from the pits. Any hazardous waste discovered during excavation will be positively identified, transported to an authorized disposal area and properly disposed of. CWM shall be excavated, packaged, and transported to the interim holding facility (IHF) to await transport off site.

Of the anticipated recovery items at the three investigation sites, only the CAIS materiel falls under the definition of CWM. The anticipated recovery items at Site 23-B and 23-A are not considered CWM, by definition. This is because the German bombs and their filler material were treated and decontaminated as part of the disposal process However, based on the archive search, it is possible that CWM (other than CAIS) could be found or other items, which cannot be immediately assessed as non-CWM, might be found. These items would be placed in the Interim Holding Facility (IHF) until they are verified to be non-CWM.

This Safety Submission is the result of an intensive and coordinated work effort among UXB, and key supporting agencies: U.S. Army Engineering and Support Center, Huntsville (CEHNC), Technical Escort Unit (TEU), Project Manager Non-stockpile Chemical Materiel (PMNSCM), the Memphis Depot Caretaker Division, and Edgewood Chemical Biological Center (ECBC). The plans contained in the Safety Submission address all aspects of the remedial action to ensure that they are executed with the utmost safety for workers, the public, and the environment. This Safety Submission has been organized as follows:

Book 1 Work Plan & Site Safety and Health Plan; and

Book 2 Supporting Agency Plans.

Book 1, the Work Plan, describes the field procedures to be followed during the remediation of the three CWM burial sites at Dunn Field, the quality control requirements for field, laboratory, and general operations, and the documentation requirements.

Book 1, Site Safety and Health Plan, offers the safety and health program that will support the field activities.

Book 2, contains the operating plans for each of the supporting federal agencies and sub-contractors, which will be on-site or providing analytical services. The Interim Holding Facility Plan and Transportation Plan were prepared by PMNSCM to address the proper handling of intact CWM items should they be recovered during excavation activities. The TEU Support Plan was prepared to describe CWM assessment, packaging, and escort responsibilities of TEU. Air monitoring of chemical agent will be performed by ECBC and is described in the Monitoring Plan. To inform City of Memphis, TN residents how public health will be protected and how the Depot will keep residents informed during the remedial action, the Protective Action Plan and Community Relations Plan are also provided .

This Safety Submission was submitted for review and comment to Region IV of the EPA, the Tennessee Department of Environment and Conservation (TDEC-DSF), the U.S. Department of Health and Human Services (DHHS), the U.S. Army Soldier and Biological Chemical Command (SBCCOM), the Department of the Army (DA) Safety Office, the Department of Defense Explosive Safety Board and the U.S. Army Engineering and Support Center, Huntsville (CEHNC). The received comments were incorporated into this document.

TAB

1. Introduction

1.0 Introduction

1.1.0 General

1.1.0.1 UXB International, Inc. (UXB) of Ashburn, Virginia, will perform a Chemical Warfare Materiel Removal Action at Dunn Field, Former Defense Defense Depot Memphis, Tennessee (DDMT) under Contract DACA87-97-D-0006, Delivery Order 0012, for the U.S. Army Engineering and Support Center, Huntsville (CEHNC).

1.1.0.2 The work required for compliance with this Delivery Order's Statement of Work (SOW) falls under the Base Realignment and Closure (BRAC) Program. Chemical Warfare Materiel (CWM) is suspected to exist on this property currently owned by the Department of the Army and managed by Memphis Depot Caretaker Division This CWM removal action will be performed in accordance with the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA); the National Priority List (NPL); the Federal Facilities Agreement (FFA) between the Depot, Environmental Protection Agency (EPA), and the state of Tennessee, and, the National Contingency Plan. CERCLA response actions are exempted by law from the requirement to obtain federal, state and local permits related to any activities conducted completely on site. However, all work will be conducted in compliance with the substantive requirements of all federal and state applicable, relevant and appropriate requirements (ARARs). The provisions of 29 CFR 1910.120 shall apply to all actions taken at this site.

1.2.0 Work Summary and UXB Project Objectives

1.2.0.1 The primary objective of this project is the excavation of three burial pits known as Areas 24-A, 24-B, and Site 1 for the purpose of determining if CWM contamination exists, and to remove any confirmed contaminated soil, UXO, and/or OE from these areas. The burial pit designations are outlined in Table WP-1-1. Actual burial pit locations will be identified and marked prior to project start. All suspect UXO will be positively identified and classified as being CWM or conventional ordnance. Materiel from the burial pits will be tested to identify the presence of CWM contamination or hazardous wastes and disposed of appropriately. A listing will be maintained of all CWM and ordnance related materiel found during the excavations

1.2.0.2 In the event any intact CWM item is located on site, the US Army Technical Escort Unit (TEU) shall take control of the site. UXB will support TEU and notify the Corps of Engineers, Huntsville Center (CEHNC).

1.2.0.3 The Memphis Depot is divided into two areas, the Main Installation and Dunn Field. Dunn Field area is separated from the Main Installation by a two lane public road. For the chemical warfare materiel Engineering Evaluation/Costs Analysis (EE/CA) initiative, Dunn Field was divided into 4 sectors; A, B, C, and D (see Figure WP-1-1). CEHNC has selected three specific sites for excavation. The sites identified for the removal action have been redesigned for more definitive description of the work areas. The new site designations are: 24-A, 24-B and 1. Refer to Table WP-1-1 for specific description of each site.

1.3.0 Location

1.3.0.1 The Depot is located in the central business district of Memphis, Tennessee on Airways Boulevard. It is two miles northwest of Memphis International Airport. Dunn Field, where the intrusive excavation of CWM/OE will be conducted, is located north of the Main Installation. Historical records and documentation, as well as a detailed on-site survey will assist in determining the exact areas to be excavated for this project. See Figure WP-1-1; Site Map.

1.4.0 Topography/Climate

1.4.0.1 The vast majority of Dunn Field is covered with grasses and light brush. The land surrounding the Depot is primarily urban containing single-family homes, apartment complexes, schools and churches. The topography of the Depot is predominantly level with no recognized waterways found on site.

1.4.0.2 The climate at the Depot is typical of that of the south central United States. The annual nominal temperature ranges from -25° C to 41.4°C. Average annual precipitation is 12.2 cm. The area is exposed to southwest prevailing winds

1.5.0 Site History

1.5.0.1 Prior to Department of Defense (DoD) acquisition, the Depot was originally a 500-acre farmstead. It was purchased from two private owners on 22 May 1941. Several other smaller parcels were added up through 1949, bringing the total acreage to 642.11 acres.

1.5.0.2 After DoD procurement, the Depot was used for a variety of purposes. Several pistol ranges were constructed and utilized at the Depot, as well as several igloos, which may have been used for conventional ammunition storage. Early records indicate incendiary bombs were stored at the Depot in Bldg. 229 but were shipped from the Depot after World War II.

1.5.0.3 An historical investigation of CWM operations that occurred at the Depot reveals that the Depot served several purposes. It was used as a general distribution depot, primarily for the receipt and storage of supplies for the Chemical Warfare Section (CWS), which was activated at the Depot in 1942. The CWS was responsible for the safe handling of inert CWS supplies, conventional explosives, chemical ammunition and various other corrosives or toxic solids and liquids. Following WWII the CWS section carried out a variety of missions, which included flamethrower maintenance, CWM storage, and CWM disposal.

1.5.0.4 Available historical records indicate that only the Dunn Field area of the Depot was used to destroy or bury conventional ordnance and CWM. The first known destruction of CWM was recorded in 1946 at Dunn Field. This site was used for the neutralization and destruction of German mustard bombs. The last known disposal of CWM at Dunn Field was the disposal of Chemical Agent Identification Sets (CAIS) sometime in 1955 or 1956. Further investigation of the available documentation reveals that other chemicals associated with CWM were also buried there and may have included food stocks, medical waste, and 'War Trophies' following WWII.

1.5.0.5 Records indicate that in July of 1946, eight railcars containing German mustard bombs were brought to the Depot. Closer examination revealed that some of the bombs were leaking and a decision was made to move the railcars to the Memphis General Depot for further action. Leaking bombs found in these cars were unloaded, drained, detonated and buried after decontamination.

1.6.0 Previous Investigations

1.6.0.1 Previous investigations at Defense Depot Memphis, Tennessee include:

- *Installation Assessment of Defense Depot Memphis, Memphis Tennessee Report No. 191,* U.S. Army Toxic and Hazardous Materiels Agency, Assessment Division (March 1981); and
- *Engineering Evaluation/Cost Analysis for the Removal of Chemical Warfare Materiel Former Defense Distribution Depot, Memphis Tennessee,* Parsons Engineering Science, Inc., June 1999.
- *Archive Search Report Findings, Memphis Defense Depot, Memphis, TN.* Defense Logistics Agency, USACOE, St. Louis District, January 1995.

1.7.0 Project Organization

1.7.0.1 There are seven agencies that will have key roles in implementing the removal activities at Dunn Field. CEHNC, with their contractor UXB, will oversee and direct the removal activities at Dunn Field. ECBC will provide for monitoring for CWM during excavation activities. TEU will support UXB and is responsible for CWM recovery, storage and transportation of CWM on and off site. PMNSCM has responsibility for ensuring that the storage and transportation of recovered CWM is accomplished in a safe, environmentally acceptable manner

1 7.0.1.1 **Memphis Depot Caretaker Division:** The Depot caretaker division is the operating agency of the Depot in Memphis, Tenn. The Depot is ultimately responsible for all site activities conducted under the Installation Restoration Program, the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and under the Base Realignment and Closure program (BRAC). The Depot has retained the services of CEHNC to perform the CWM removal actions at Dunn Field The Depot will act as the main point of contact for the public with support from CEHNC, and will provide information to the public in accordance with the Community Relation Plan (CRP) located in Book 2 of this Safety Submission.

1.7.0.1.2 **U.S. Army Corps of Engineers, Engineering and Support Center Huntsville (CEHNC):** CEHNC is the ordnance and explosives (OE) Center of Expertise (CX) for the planning and execution of site characterization and remediation operations at OE and CWM related sites, and has overall responsibility for the removal activities at Dunn Field. As the life-cycle project manager (LCPM), CEHNC is responsible for all planning, policy implementation, project execution, and coordination of the support agencies. CEHNC will make management decisions based on recommendations from SBCCOM (TEU and ECBC), and UXB. CEHNC will procure the necessary Rights of Entry and Memorandum of Agreements (MOAs) in order to accomplish the project's objectives. CEHNC, in conjunction with UXB, and TEU, will provide for the safety of all project personnel as well as the local community. The public will be protected through the use of engineering controls (i.e., the air containment structure constructed over the excavation sites) and through air monitoring. During operations, a CEHNC Safety Specialist will be on-site to oversee contractor operations and provide overall site control during removal operations. The CEHNC Safety Specialist will coordinate all supporting agencies, monitor the work, and provide feedback to the CEHNC LCPM.

1.7.0.1.3 **U.S. Army Corps of Engineers, South Atlantic Division, Mobile District (CESAM):** CESAM is the geographical USACE district with responsibility for DDMT. CEHNC Safety Specialist or LCPM will advise the CESAM Operations Officer of activities occurring this project. CESAM will coordinate with CEHNC to ensure the safety of the public and all operations personnel.

1.7.0.1.4 **UXB International, Inc. (UXB):** UXB is CEHNC's contractor for the remediation of OE sites in the continental United States, Alaska, and Hawaii. At DDMT UXB will be the contractor performing the intrusive activities at Dunn Field. UXB has the responsibility for excavation activities, health and safety monitoring; soil/debris waste characterization sampling, compliance sample collection, ECBC coordination, and investigation-derived waste management. UXB is responsible for advising the CEHNC Safety Specialist and the CESAM Operations Officer of any operational constraints or safety violations, and will maintain overall control of the work area.

1.7.0.1.5 **Edgewood Chemical Biological Center (ECBC):** ECBC is an agency of the U.S. Army Soldier and Biological Chemical Command (SBCCOM). ECBC is responsible for the development of standard analytical procedures pertaining to chemical operations. At the Depot ECBC will conduct air monitoring for CWM agents during all intrusive operations. UXB personnel will conduct air monitoring for all other chemicals of concern. ECBC will also analyze soil samples for CWM and breakdown products (H, L, TDG, 1,4-dithiane, 1,4-oxathiane) using a Real-Time Analytical Platform (RTAP) and/or the Mobile Environmental Analytical Platform (MEAP). Monitoring will be for specific chemicals of concern at each excavation as indicated in Table WP-1-2.

1.7.0.1.6 **U.S. Army Technical Escort Unit (TEU):** TEU is an agency of the U.S. Army Soldier and Biological Chemical Command (SBCCOM). TEU provides the Department of Defense (DOD) with worldwide capability for responding to, neutralizing, and disposing of chemical agents, munitions, and other hazardous materiels. At the Depot TEU will be responsible for intact CWM hazard containment and neutralization within the exclusion zone during excavation, identification, and recovery operations. TEU will provide support to PMNSCM for the packaging, on-site transport, and storage of recovered CWM. In the event that intact CWM is encountered, or a "ring off" occurs while air monitoring is being conducted, UXB will don the appropriate PPE and continue to excavate until the hazard is identified. If an intact item suspected to be CWM is located, TEU will assume control of the site and will recommend a course of action to the CEHNC Safety Specialist In an emergency situation, TEU will also be the first responders and the appropriate emergency response will be initiated in accordance with the Site Safety and Health Plan (SSHP) and the Protective Action Plan (PAP).

1.7.0.1.7 **Project Manager for Non-Stockpile Chemical Materiel (PMNSCM):** The U.S. Army Program Manager for Chemical Demilitarization (PMCD) is responsible for the destruction for all United States CWM. PMCD is required by regulation to ensure protection of the public through either engineering controls or evacuation The Project Manager for Non-Stockpile Chemical Materiel (PMNSCM) is one of two PMCD program managers. At the Depot, PMNSCM will be responsible for arranging the interim storage and off-site transportation of CWM items recovered at Dunn Field. PMNSCM has program responsibility for ensuring that the storage of CWM at the Depot is done in a safe and environmentally acceptable manner. PMNSCM will coordinate with TEU to transfer any recovered CWM from the excavation site to the Interim Holding Facility (IHF) for temporary storage on-site. Recovered CWM will be escorted off-site in accordance with the IHF and Transportation Plans in Book 2 of this Safety Submission.

1.8.0 Work Plan Outline

1.8.0 1 The SOW requirements, site-specific hazards, and site-specific environmental concerns were analyzed and incorporated into this Safety Submission which promotes the safe, efficient, and effective completion of project objectives. Book 1, the Work Plan, meets the requirements of Data Item Description (DID) OT-005, and includes the following sub-plans:

- **Explosives Management Plan (Section 2.0)** - Details the management of explosives in accordance with applicable federal, state, and local regulations.
- **Intrusive Excavation Plan (Section 3.0)** – Details the approach, methods, and procedures for technical operations.
- **Equipment Plan (Section 4.0)** – Itemizes the procedures to obtain, maintain, control, and secure procured and leased resources.
- **Work, Data, and Cost Management Plan (Section 5.0)** – Details the management of allocated funds and personnel resources.
- **Conventional UXO Plan (Section 6.0)** - Details the handling of conventional UXO.
- **Site-Specific Environmental Protection Plan (Section 7.0)** – Documents site-specific conditions prior to operations, addresses the potential impacts that operations may have on the environment, and proposes measures to protect environmentally sensitive areas.
- **Chemical Data Quality Management Plan (Section 8.0)** – Describes the geophysical equipment capabilities in relation to target anomalies, and establishes the daily equipment calibration and testing requirements.

- **Quality Control Plan (Section 9.0)** – Specifies the policies and procedures for ensuring quality control in all phases of operations.

- **Emergency Response & Contingency Procedures (Section 10.0)**

- **Standard Operating Procedures (Section 11.0)**

- **Sampling Program (Section 12.0)** – Establishes the procedures and control measures required to safely sample for CWM and HTRW hazards on site.

- **Appendices**

  A -- Task Order Scope of Work

  B -- Resumes

1.8.0.2 Book 1, Vol. 2 is the Site Safety and Health Plan (SSHP). The SSHP establishes the responsibilities, requirements, and procedures for the protection of personnel and the public during this investigation/removal action Specifically, the purpose of this plan is to provide the field team with a safe working environment during field activities and to prevent and minimize personal injuries/illnesses while preventing damage to equipment, supplies, and property

1.8.0.3 All agency-specific support plans are provided in Book 2. They include the following plans:

- Interim Holding Facility (IHF) Plan. This plan addresses the interim holding measures for CWM items should they be recovered during operations at Dunn Field.
- Transportation Plan. This plan describes how CWM will be transported off-site for proper storage
- TEU Support Plan. This plan discusses the roles and activities of TEU on site, including the assessment, packaging, and escort responsibilities.
- ECBC Monitoring Plan. This plan addresses procedures and protocols to be used to monitor air for the presence of chemical agent.
- Community Relations Plan. This plan describes how DDMT will keep residents informed on the work progress at Dunn Field.
- Protective Action Plan. This plan was prepared to inform local residents of steps to be taken during the investigation/removal action to protect public health and safety.

1.9.0 CWM Chemicals of Concern.

1.9.0.1Table WP 1-2 identifies the chemicals of concern anticipated at each excavation site at Dunn Field, CWM breakdown products are also anticipated at the excavation sites. A list of breakdown products is contained in Table WP 1-3.

1.10.0 Soil Clean Up Standards.

1.10.0.1 Samples shall be taken from excavated soil to determine the contamination levels. Soils containing levels of contaminants that exceed those standards listed in Table WP 1-4 shall be contained and shipped off-site for treatment.

Insert Figure WP-1-1

Area Map

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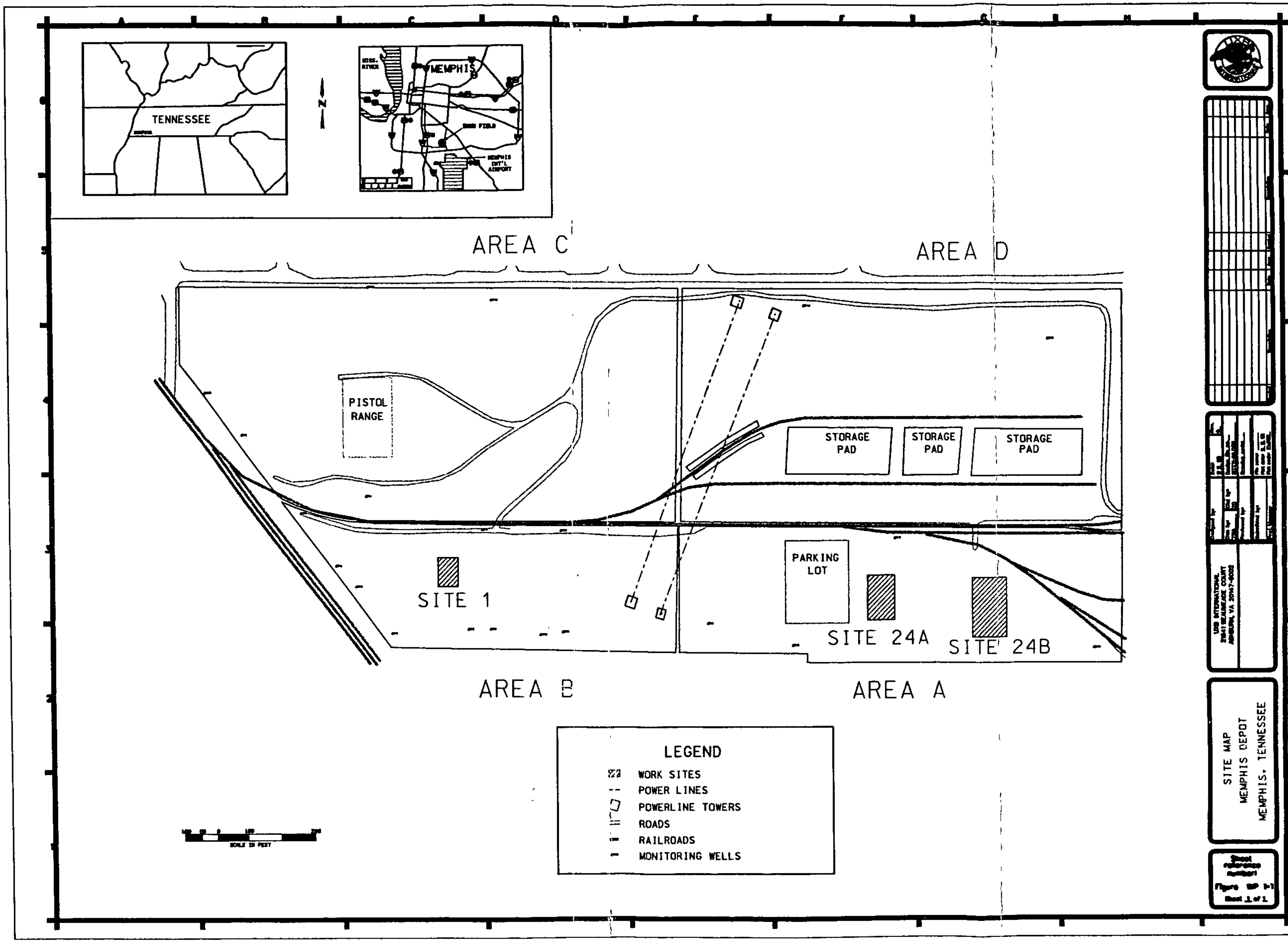

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Table WP-1-1
Priority Investigation Areas

Site	Specifications
24-B	This site was used to neutralize German mustard bombs. Leaking bombs were drained into chlorate of lime slurry pits. There are three chlorate of lime pits included in this site. According to the Archive Search Report the pits are 7 feet wide, 30 feet long, and 12 feet deep. All three pits are to be excavated to determine condition.
24-A	This site was used to dispose of the drained German mustard bomb casings. The 29 drained bomb casings were placed in a shallow pit and counter charged with dynamite. The remains, after detonation, were buried in the pit. This pit will be excavated, the bomb remains removed for proper disposal and the condition of the pit area determined.
1	There are several burial pits located in Area B. The Removal Action is concerned with one pit 30 feet wide, 30 feet long, and 10 feet deep. This pit is identified as "Site #1, Mustard and Lewisite Training Site (6) Burial Site (1955)" on Drawing 1, Dunn Field, Investigative Site Location Map (08-24-95). The Archive Search Report identifies this as a burial location for Chemical Agent Identification Sets (CAIS). NOTE The Archive Search Report also indicates that conventional OE, such as souvenirs brought back from the war, were disposed of on Dunn Field. UXO precaution will be observed during all intrusive operations.

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Table WP-1-2
Chemicals of Concern by Site

Site	Chemical of Concern
24-B (Chlorate of lime pits)	Mustard (H)
	Thiodiglycol (TDG)
	1, 4-Dithiane
	1, 4-Oxathiane
24-A (Bomb casings burial pit)	Mustard (H)
	Thiodiglycol (TDG)
	1, 4-Dithiane
	1, 4-Oxathiane
1 (CAIS burial pit)	Mustard (H)
	Lewisite (L)
	Thiodiglycol (TDG)
	1, 4-Dithiane
	1, 4-Oxathiane
	Chloroform
	Chloropicrin (PS)
	Phosgene (CG)
	Arsenic

There will also be standard TCLP testing done at each excavation site to test for RCRA metals.

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Table WP-1-3
Selection Rationale for Contaminants of Concern at Dunn Field

Analyte	Above EPA Region 3 RBC	Rational
Chemical Warfare Materiel and Related Breakdown Products		
Lewisite (L)	NA	Could potentially encounter CAIS containing this chemical
Mustard (H)	NA	Known to have been on site
Thiodiglycol (TDG)	NA	Breakdown product of mustard
1, 4-Dithiane	NA	Breakdown product of mustard
1,4-Oxathiane	NA	Breakdown product of mustard
Industrial Chemicals		
Chloroform	Unknown	Could potentially encounter CAIS containing this chemical
Chloropicrin (PS)	Unknown	Could potentially encounter CAIS containing this chemical
Phosgene (CG)	Unknown	Could potentially encounter CAIS containing this chemical

Table WP-1-4
Soil Cleanup Goals for Sites 24-A, 24-B, and 1

Contaminants of Concern	Soil Cleanup Goals (mg/kg)
Lewisite	MDL(a)
Mustard	MDL
Thiodiglycol	MDL
1, 4- Dithiane	550(b)
1, 4-Oxathiane	MDL(a)
Phosgene	NA(d)
Chloropicrin	MDL
Chloroform	MDL

(a) MDL indicates that the soil cleanup level corresponds to the method detection limit (MDL) for that compound.

(b) The cleanup goal for 1, 4-dithiane is based on the Region IV Risk-Based Concentration level which conservatively considers all exposure pathways.

(c) Due to lack of toxicity data on 1, 4-oxathiane, the cleanup goal has been set at the MDL.

(d) Because of the highly volatile nature of phosgene (vapor pressure = 1.6 atm) and cyanogen chloride, these will not persist in soil. Thus, although air monitoring will be conducted to be protective of worker safety, no samples of soil will be analyzed for phosgene or cyanogen chloride.

TAB

2. Conventional Explosive Management Plan

2.0 Conventional Explosives Management Plan

2.1.0 General

2 1 0 1 UXB recognizes the critical nature of properly managing the explosives required to perform this Chemical Warfare Material (CWM) removal action at Dunn Field, former Defense Depot Memphis Tennessee (DDMT). The explosives covered in this plan are to be used for the disposal or demilitarization of conventional UXO discovered during excavation operations. This Explosives Management Plan details the procedures to manage the explosives for this project in accordance with the following policies and federal, state, and local laws and regulations:

- UXB Corporate Explosives Management Plan
- Bureau of Alcohol, Tobacco, and Firearms Publication (ATFP) 5400.7 (ATF - Explosives Law and Regulations)
- Department of Defense (DOD) 6055.9-STD (DOD Ammunition and Explosives Safety Standards)
- Department of Transportation (DOT) Regulations
- Army Regulation (AR) 190-11 (Physical Security of Arms, Ammunition, and Explosives)

2.2.0 Licenses/Permits

2.2.0.1 UXB will maintain a copy of the following documents on-site. Both documents will be made available, upon request, to any authorized federal, state, or local authority.

- Bureau of Alcohol, Tobacco, and Firearms (ATF) User of High Explosives license; License number 1-VA-054-33-1K-11586 (expiration date: October 1, 2001)
- A letter signed by an authorizing official of UXB designating on-site personnel who are authorized to receive, access, and use explosives

2.3.0 Acquisition

2.3.1 Description and Estimated Quantity of Explosives

2.3.1.1 The initial explosives supply requirement for this project is based on not more than 20 items being found that require demilitarization/destruction. Estimated quantities are:

- 40 electric blasting caps.
- 120 feet of detonating cord.
- 120 inches of copper sheathed shape charge for demilitarization operations.
- 5 one-half pound booster charges for disposal operations.

2.3.1.2 If possible, UXB will have any needed explosives delivered as required for use. This will eliminate storage and transportation requirements. If this cannot be done, the procedures in paragraphs 2.5.0 through 2.12.0 apply.

2.3.2 Acquisition Source

2.3.2.1 Demolition material normally is Government Furnished Equipment (GFE). However, there will not be GFE demolition material for this project.

2.3.2.2 Table WP-2-1 provides a bidding analysis and an indication of the best-value explosives vendor for the required materials.

2.4.0 Initial Receipt

2.4.1 Procedures for Receipt

2.4.1.1 The Senior UXO Supervisor (SUXOS) will designate a UXO Supervisor as the Demolition Supervisor. The Demolition Supervisor will inventory, initiate, and maintain all documentation concerning the demolition material upon receipt. The Demolition Supervisor, by signing the receipt documents, will assume accountability of the explosive material. Figure WP-2-1 provides the procedures to be followed upon receipt of explosives. The Magazine Data Card (UXB Form 1.0039) will be placed in the explosive holding facility to indicate the actual quantity on-hand of each type of explosives

2.4.2 Procedures for Reconciling Discrepancies Upon Receipt

2.4.2.1 The Demolition Supervisor will conduct a 100% inventory of the explosives. The quantities annotated on the receipt document will match the quantities reflected in the inventory. If these quantities do not match, the SUXOS will contact the originator of the receipt document. The Demolition Supervisor will only sign for the actual quantity of material received, as reflected by the inventory. The receipt document will be changed to reflect the proper quantities. Actual quantities must be properly annotated on the shipping document prior to accepting delivery. This procedure will be conducted for each receipt of explosive materials.

2.5.0 Storage

2.5.1 Explosive Storage Facility

2.5.1.1 Demolition materials will be stored in standard construction (ATF type II), portable explosive storage magazines or in the standard earth covered magazines already on site. If the portable explosive storage magazines are to be used the location will have to be determined and an explosive sighting done prior to use of the magazines.

2.5.1.2 Using the references listed in paragraph 2.1.0, the SUXOS and the Demolition Supervisor will verify the condition of any proposed storage location prior to their use for the storage of explosives.

2.5.2 Physical Security

2.5.2.1 If used, the portable storage magazines will be placed inside a fenced area at the Depot. The Demolition Supervisor will verify the condition of the fence daily. Access to these magazines will be limited only to those UXB personnel necessary to conduct demolition activities, as indicated in Paragraph 2.7.2.

2.5.2.2 UXB will secure the fence (for the portable magazines) and the doors to the storage magazines with UXB locks. The Demolition Supervisor will maintain key control for the fence and the storage magazines.

2.6.0 Transportation Procedures

2.6.0.1 During transportation of explosive material, safety is the primary concern. The most obvious requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases.

Vehicle operators will be UXB employees, licensed, trained, and informed of the explosive hazards of the cargo.

2.6.1 Transport from Storage Facility to On-Site Disposal Locations

2.6.1.1 UXB will segregate the material identified for transport by type and load it into a vehicle meeting the regulations of 49 CFR and applicable state laws. UXB personnel will block, brace (as required), and transport only the quantity of demolition material required for the disposition of UXO.

2.6.1.2 Prior to movement, the driver will visually inspect the explosive laden vehicle to ensure the load is properly secured and safe to move; the Demolition Supervisor will provide oversight during loading. The cargo will be checked to ensure containers are loaded, blocked, braced, tied down, or otherwise secured to the vehicle body to prevent movement. If using a vehicle with an open body, a closed container to contain the explosives will be secured to the bed of the vehicle.

2.6.1.3 The Demolition Supervisor will ensure that the following general safety precautions are observed during transport operations:

- Blasting caps and high explosives will remain separated at all times by means of either transporting these items in separate vehicles, or by using an IME22 container for the blasting caps if transporting the items in the same vehicle.
- Explosives will remain covered in accordance with 49 CFR, except when loading or unloading.
- Explosives will not be transported in the passenger compartment of a vehicle.
- Explosive laden vehicles will not be left unattended.
- No person is permitted to ride on, or in, the cargo compartment.
- Smoking in and around vehicles transporting explosives is prohibited.
- Refueling of vehicles will be accomplished without the explosive cargo.
- Vehicles will not exceed the posted speed limit. If a prudent speed is less than the posted speed limit, the operator may not exceed a safe and reasonable speed.

2.6.2 Vehicle Requirements for Transporting Explosives

2.6.2.1 Transportation vehicles will be designated and inspected to ensure they are suitable and properly equipped for movement of explosives. The inspections and findings will be recorded on the Daily Truck Inspection Log (UXB Form 1.0041).

2.6.2.2 UXB will properly placard the transport vehicles to warn personnel and furnish specific guidance to fire fighters and other personnel who may be responding to an emergency involving the vehicle. Driving on public roads will be in accordance with applicable federal and state regulations, to include driver testing and licensing.

2.7.0 Receipt Procedures

2.7.1 Procedures

2.7.1.1 UXB will initially receive the demolition material from a commercial vendor identified in Table WP-2-1.

2.7.1.2 The Demolition Supervisor will issue demolition material to members of the Demolition Team with the Demolition Material Accountability Form (UXB Form 1.0032). These forms will be maintained at the UXB site office.

2.7.1.3 As demolition materials are expended, the Demolition Supervisor will annotate the appropriate Magazine Data Card to reflect the quantity used and the quantity remaining.

2.7.2 Authorized Individuals

2.7.2.1 An authorizing official of UXB, as stated in the UXB Corporate Explosives Management Plan, will sign a letter designating those personnel who are authorized to purchase, receive, access, and use explosives; a copy of this letter will be maintained on-site. The authorized positions are: LCPM, SUXOS and Demolition Supervisor. The SSHO and QC personnel will only be granted escorted access in order to perform their respective duties.

2.7.3 Certification of Use of Explosives

2.7.3.1 The Demolition Material Accountability Form certifies that explosives were expended, as intended, in the UXO disposal process.

2.7.4 Procedures for Reconciling Receipt Documents and Proposed Intervals

2.7.4.1 The Demolition Team member receiving the explosives from the Demolition Supervisor will conduct a 100% inventory of the issued material. The quantities annotated on the Demolition Material Accountability Form will match the quantities reflected in the inventory. If these quantities do not match, the Demolition Team member will immediately bring this to the attention of the Demolition Supervisor. UXB personnel will only sign for the actual quantity of material received. Documentation will be changed to reflect the actual quantities received. This procedure will be conducted for each receipt of explosive materials.

2.8.0 Inventory

2.8.0.1 As a minimum, UXB personnel will perform a weekly physical inventory of the stored explosives to reconcile the actual quantities with the quantities annotated on the corresponding Demolition Material Accountability Forms (UXB Form 1.0032) and Magazine Data Cards (UXB Form 1.0039). Any discrepancies will be immediately reported to the SUXOS, who will initiate an audit to determine the cause of the discrepancy.

2.9.0 Lost, Stolen, or Unauthorized Use of Explosives

2.9.0.1 Upon discovering lost, stolen, or unauthorized use of explosives, the Demolition Supervisor will report the circumstances to the SUXOS and the LCPM, who will notify the UXB Program Manager. The SUXOS or the LCPM will notify the:

- Contracting Officer via telephone within 1 hour of discovery - (256) 895-1150

- Memphis Depot Security - (901) 544-3109
- ATF – Memphis Office - (901) 544-3489
- UXB Director of Quality - (703) 724-9644
- Contracting Officer in writing within 24 hours
- Appropriate local law enforcement authorities in writing within 24 hours

2.10.0 Return to Storage of Unexpended Explosives

2.10.0.1 The Demolition Supervisor will return unexpended explosives to storage at the end of the work day and record the transaction as a receipt on the appropriate Demolition Material Accountability Forms (UXB Form 1 0032) and Magazine Data Cards (UXB Form 1.0039).

2.11.0 Disposition of Remaining Explosives at the End of Site Activities

2.11.0.1 During operations, UXB will maintain a minimum explosives inventory. At the end of field operations, UXB will perform an economic analysis to determine a cost-effective method to manage the remaining explosives. This information will be forwarded to the UXB Program Manager and the CEHNC Project Manager for disposition instructions. The alternatives include:

- Return unopened containers to the commercial vendor for credit.
- Transfer of stocks to another UXB project.
- Transfer of stocks to another USACE project.

2.12.0 Forms

2.12.0.1 UXB will obtain and retain a permanent file (in accordance with the UXB Corporate Explosives Management Plan) of all applicable demolition records, including permits, Magazine Data Cards, training records, inspector reports, and any applicable waste manifests

Figure WP-2-1
Procedures for Receipt of Explosives

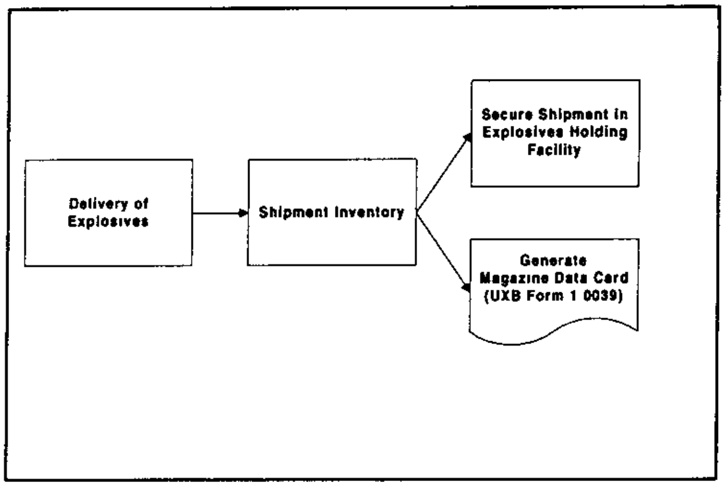


Table WP-2-1
Explosives Material Supply

Vender	Material	Cost
Omni Distribution Inc. Explosives and Firearms Memphis, TN	Detonating Cord, 120ft	**Awaiting Bid**
	Electric caps, 40ea	
	120 inches copper sheathed shape charge	
No other vender for on call delivery available.	Detonating Cord, 120ft	
	Electric caps, 40ea	
	120 inches copper sheathed shape charge	

TAB

3. Intrusive Executive Plan

3.0 Intrusive Excavation Plan

3.1.0 Introduction

3.1.0.1 This Intrusive Excavation Plan describes the excavation and related activities that will be implemented at Dunn Field at excavation sites 24-A, 24-B, and 1 to satisfy the removal action objectives for this project (refer to Section 1.2.0 of this Work Plan)

3.1 0.2 Due to the inherent dangers of chemical warfare agents to both those directly involved in the investigative actions at the work site and to the general public, it is imperative that clear work standards be established and safeguards are strictly followed. It is not reasonable to assume that every possible contingency is addressed in this plan Should unforeseen circumstances arise, the technical approach and methodologies defined in this plan may require alteration. The UXB Project Manager and the Corps of Engineers Project Manager must approve any deviation to this plan.

3.1.0.3 Chemical warfare materiel is the primary health and safety hazard of this effort, however, unexploded ordnance (UXO) is also a concern The historical uses of the Depot include, short term storage of small-arms ammunition, live fire rifle range, and explosive disposal services for ordnance (war trophies) confiscated from returning WWII soldiers. The possibility of recovering a "live" (containing explosives) UXO must be considered. Because of the UXO threat, only UXO qualified personnel will be permitted to perform intrusive activities.

3 1.0.4 ECBC will provide continuous air monitoring for CWM and will immediately notify workers of any indication of a CWM release. UXB shall provide non-CWM monitoring for oxygen levels, carbon monoxide, dust, and noise.

3.1.0.5 The close proximity to a populated area demands an exhaustive effort to prevent the release of toxic materiel into the atmosphere. To prevent a potential for release of CWM vapors, the work area will be encapsulated by a negative-pressure containment structure. Large exhaust fans provide a continuous negative-pressure and continuous renewal of air within the structure. Exhausted air passes through one of four transportable carbon filter systems (TCFS) meeting OSHA specifications for toxic environments

3.1.0.6 This section has been organized chronologically as follows:

- Field Work Flow (Section 3 2.0)
- Mobilization (Section 3.3.0)
- Pre-Operational Exercises (Section 3.4.0)
- Engineering Controls (Section 3 5.0)
- Maximum Credible Event (Section 3.6.0)
- Soil/Debris Waste Characterization Sampling/Decontamination (Section 3.7.0 – 3.14.0)
- Excavation Activities (Section 3.15.0)
- Excavated Materials Handling, Packaging, and Temporary Storage (Section 3.17.0)
- Roll-Off Staging Procedures (Section 3.18.0)
- Air Monitoring (Section 3.19.0)

- Excavation Equipment Decontamination (Section 3.20.0)
- Survey Program (Section 3 21.0)
- Backfill Operations (Section 3 22.0)
- Site Restoration (Section 3.23.0)
- Demobilization (Section 3.24 0).

3.1.0.7 In addition, this section summarizes general site safety and air monitoring procedures that will be implemented to protect the health and safety of site workers. (Refer to the Site Safety and Health Plan of this Safety Submission, for a detailed discussion of safety procedures.)

3.1.0.8 Intrusive excavation will begin only after approval of the Safety Submission Operations will be conducted in a manner that will minimize the hazards and the lengths of time site personnel are exposed to the hazards. The personnel required to implement the operations associated within the filtered air containment structure are identified in Table WP 3-1. Only personnel trained in unexploded ordnance (UXO) and CWM handling will be involved in the actual excavation. Specific training requirements are detailed in the Safety and Health Plan (SSHP). Personnel not absolutely necessary to the excavation activities will be prohibited from being within the filtered-air containment structure during excavation activities. This will not exclude official visits by safety, quality control, or inspection personnel.

3.2.0 Field Work Flow

3.2.0.1 Figures WP 1-1 thru 1-3 show the anticipated project layout during the remediation activities at Dunn Field. Three sites have been identified for excavation. Each site is unique in size, prior use, and contents. The following paragraphs briefly describe each excavation site:

- 24-B: According to Archive Search Reports, the dimensions of this pit is 30'LX7'WX12'D. 29 leaking mustard bombs were drained into the chlorate of lime slurry pit where the contents were neutralized Protective clothing and dunnage used during the neutralization operation were also placed in this pit and burned
- 24-A: This site has a suspected dimension of 30'LX6'WX6'D. The pit contains the remains of the 29 empty CWM bomb casings. After the bomb casings were emptied in to Site 24-B, the casings were placed in a shallow trench (pit) and counter-charged with dynamite. Once detonations were complete the remains of the bomb casings were buried.
- 1: Is one pit with a dimension of 30'LX30'WX10'D. Site 1 presents the greatest probability of encountering CWM materiel. Chemical Agent Identification Sets (CAIS) were placed in this pit and buried. The kits contain diluted "live agent" sealed in glass vials. In undisturbed environments, glass vials offer an excellent storage medium. Due to the fragile nature of the CAIS, mechanical excavation will be limited and supplemented with hand excavation.

3 2.0.2 Figure WP 3-1 shows a typical placement of the containment structure over an excavation site. This arrangement should allow for excavation of the pits at Site 1 and 24-A without the need for moving the structure. In the event pit dimensions are greater than anticipated, the structure will be appropriately repositioned over the next area to be excavated.

3.2.0.3 The precise location of the chlorate of lime pit is unknown The site, 24-B, is a grid square of approximately 90 feet by 150 feet. It is thought that the location of the chlorate of lime pit is somewhere within this grid square. In order to try to locate the chlorate of lime pit, a series of trenches will be dug throughout the grid square. The trenches will be dug so that no area within the grid, of a size large enough to contain the pit, is not bisected by at least one trench. Due to the limitations imposed by the size and shape of the containment structure, and the size and shape of the grid, the structure will be moved several times to allow for complete coverage of excavation activities. All excavations will take place within the containment structure. A diagram of the placements of the structure for site 24-B and the proposed placement of trenches can be seen at figure WP 3-3 and 3-4.

3.2.0.3.1 Each time a containment structure is placed in Area 24-B, a series of trenches will be dug in an attempt to locate the chlorate of lime pit. The procedures to be taken are as follows

1 Containment structure will be moved a maximum of 6 times in Area 24-B.
2. A line will be marked, dividing in half, the area covered by the structure from east to west
3. A series of parallel trenches will be dug on the northern half of the area. Each trench will be 2' wide by 13' deep and extend from the center line out to 10' from the edge of the containment structure.
4. Each trench will have a unique identification number assigned to it. As the soil from the trench is removed it will be segregated, staged and sampled IAW the sampling plan.
5. After each trench is excavated it will be backfilled with clean fill to grade.
6. When all 9 trenches have been backfilled on the north side, the trenching will be repeated on the south side.
7. As the structure is moved, the above process will be repeated except in areas of overlap. In overlap areas the area already trenched does not need to be trenched again.

3 2 0.4 Refer to Figures WP 3-2, WP 3-2A, and WP 3-2B for a series of flow diagrams of project operations associated with intrusive excavation activities Figures WP 3-2, WP 3-2A, and WP 3-2B identify the specific actions that will occur for each of the actions.

3.3.0 Mobilization

3.3.0.1 Mobilization of the field team to the Depot will consist of the following activities:

- Setup of office and storage trailers
- Establish staging areas
- Improve existing utility road with the placement of gravel
- Establish a temporary work pad to the east of the filtered-air containment structure
- Acquiring of rental equipment
- Connection of utilities
- Spotting of port-a-potties.

3.4.0 Pre-Operational Exercises

3.4.0 1 Prior to the start of intrusive activities, onsite personnel will participate in two pre-operational exercises: a Table Top Exercise and a Pre-Operational Survey.

3.4.1 Table Top Exercise

3.4 1.1 U.S. Army Corps of Engineers Huntsville (CEHNC) will coordinate a "Table Top Exercise". The Table Top Exercise is conducted to evaluate emergency plans and procedures, and to resolve questions of coordination and assignment of responsibility Participants will include all agencies with emergency management responsibility, including local emergency response personnel and the Memphis Shelby

County Emergency Management Agency. The Table Top Exercise will take place in a meeting room, and will include a discussion of various simulated emergency situations in a non-threatening format to test the efficiency of the SSHP and Protective Action Plan (PAP) The exercise shall be conducted in accordance with DA PAM 50-6.

3.4.2 Pre-Operational Survey

3.4.2 1 Prior to the start of intrusive activities, all emergency response personnel shall participate in a "Pre-Operational Survey" to be conducted by the Department of the Army (DA) Safety personnel (involvement of DA Safety personnel in this project is limited to this pre-operational survey). The pre-operational survey is a formal review and assessment of a project that has the potential for CWM exposure. The intent of the survey is to confirm that:

1) all provisions of the Safety Submission and Army regulations are complied with

2) all appropriate monitoring equipment, emergency response procedures, and 11-IF readiness procedures are in place, and,

3) operator efficiency is demonstrated prior to commencement of intrusive activities.

The survey will include:

- Review of pertinent documents
- Inspection of equipment and facilities
- Verification of employee training and procedures
- Witnessing selected systems testing and operations

3.4.2.2 Emergency scenarios will be played out utilizing all safety gear and monitoring equipment. These training exercises will ensure that all UXB, TEU, and emergency response personnel are familiar with the proper procedures to follow in the event of an emergency. The SSHO will observe the exercises and complete a safety inspection checklist form. Intrusive activities will not begin until DA Safety and the panel of subject matter experts are satisfied all safety procedures and equipment are in place and familiar to all personnel. This survey shall be conducted in accordance with DA PAM 385-6 1 All team members shall participate. CEHNC, as required by ER 385-1-92, shall coordinate and host the dry run pre-operational survey.

3.5.0 Engineering Controls

3 5.0.1 It is the policy of UXB to provide site personnel with a work environment free of uncontrolled safety and health hazards. To meet this goal, and to comply with OSHA 29 CFR 1910.134(a) and 1910 120(g), engineering controls will be used whenever feasible to control personnel exposures to chemical and physical hazards which exceed the OSHA PEL or other published exposure limit. To ensure compliance with these standards, and to provide the most feasible means of controlling personnel exposures, UXB will implement the use of a filtered-air containment structure.

3.5.0.2 The containment structure selected for this project is a freestanding, metal frame, circular structure enclosed by a synthetic chemical-resistant covering. The structure will measure approximately 70 feet in diameter and 32 feet high. The structural support for the enclosure comes from a series of aluminum beams that form a skeleton over which the covering is placed. A negative-pressure air filtration system is incorporated into the structure. Refer to Attachment WP 3-1 of this section for a detailed discussion of this structure, cubic footage information, and louver specifications. This structure is intended to protect the public from the inadvertent release of CWM, it is not intended as a barrier to explosive hazards. Refer to chapter 6 of this work plan for procedures on dealing with conventional ordnance.

3 5 0 3 The initial location of the structure will be over the pit in site 1. To assure that the containment structure can be placed in contact with the ground at all areas of the circumference, material may be added to level the ground surface. Once excavation operations have been completed, the structure will be moved to permit excavation of the pit in site 24-A The SBCCOM trailer and real time monitor will also relocate with the structure In order to minimize operational downtime, the containment structure may be relocated once samples reveal the pit is free of CWM. Backfill operations will be delayed until sample results have been received. Removed soil will remain under plastic in the roll-off container until cleared by laboratory analysis. See Figure WP-3-1 for typical work area layout

3 5 0 4 Prior to starting excavation activities, all doors to the structure will be secured, the air filtration system operating, and all air monitoring measures in place and operating.

3.5.0.5 For the structure specified in paragraph 3.5.0.2 , UXB will use a filter system with a 10,000 CFM capacity. The design and configuration is as specified in Attachment WP 3-2 It will consist of four (4) individual filtration units, each with a 2,500-CFM capacity, and will meet or exceed the required number of air changes per hour.

3.5.0.6 The configuration of this filter assembly was chosen to meet the design requirements specified by the Department of Army (DA PAM 385-61) when the potential exists of encountering neat [pure] agent The filter assembly configuration chosen along with the containment structure meets all of the DA requirements.

3.5.0.7 Refer to Attachment WP 3-2 to this section for a detailed discussion of this filter assembly. Barneby & Sutcliffe Corp. have designed the filter assembly for this project in accordance with the specifications outlined in Attachment WP 3-2. BSC, inc. is an experienced company with a proven record of producing similar filter assemblies.

3.6.0 Maximum Credible Event

3.6.1 Definition of Maximum Credible Event

3.6.1.1 The maximum credible event (MCE) is the most serious public safety hazard scenario that is reasonably possible as the result of an accidental occurrence during intrusive operations. The magnitude of the potential hazard depends upon the type and quantity of CWM released and the meteorological conditions. The MCE, used as an aid in determining how best to protect the public, is calculated for each project which has the potential for recovering CWM. The event must be realistic with reasonable probability of occurrence.

3.6.2 Determination of the MCE

3.6.2.1 The MCE is determined during the initial planning stages of the project. The MCE for excavation activities at Dunn Field is based on the known or suspected CWM/UXO items reportedly buried at the specific excavation sites. Because the contents of Site 1 differ from Sites and 24-A, and 24-B, individual MCEs are assigned to each area of excavation:

- Sites 24-A and 24-B: 5 gallons of Mustard
- Site 1: Two (1" x 9") vials (40 ml) of phosgene, based on 951 and 952 type Chemical Agent Identification Sets (CAIS).

3.6.3 Use of the No Significant Effects (NOSE) Distance

3.6 3.1 The NOSE distance is the distance beyond which the public would not experience any significant health effects in association with a chemical agent release. The NOSE distance is used to design contingency plans and to determine the evacuation areas around the site. A computer model is used to predict the NOSE distance based on the MCE, and considers such things as the types of chemical or high explosive hazards most likely to be encountered, meteorological data, any measures taken to mitigate the threat at the source, and the nature of the work to be performed.

3 6.3.2 The use of a filtered-air containment structure (as described in paragraph 3.5.1.) reduces the NOSE distance to within the containment structure. The nearest public area consists of private residences and businesses surrounding the Depot. Information regarding the protection of the public is contained in the Protective Action Plan (Book 2 of this Safety Submission).

3.6.3.3 During the planning process for this project consideration was given to proceeding with operations without use of a containment structure. The calculation for potential effects of a release of agent with no containment structure were prepared and it was determined not to proceed with the project without the use of a filtered-air containment structure. These calculations are shown in WP Table 3-5.

3.7.0 Soil/Debris Waste Sampling and Characterization

3 7.0.1 Sampling programs to be conducted as part of the removal action at Dunn Field include·

1) Soil/Debris sampling for CWM;

2) Investigation-derived waste compliance (verification) sampling,

3) HTW characterization of intact non-CWM items (if encountered); and

4) Identification/characterization of intact CWM items (if encountered)

3.7.0.2 The rationale for each sampling program and the data quality objectives are presented in Table WP 12-1. For reference, a summary-level sampling schedule indicating the samples anticipated to be collected during the remedial action is presented in Table WP 12-2. Note that soil samples collected during the remedial action will be analyzed for Lewisite (L), mustard (H), thiodiglycol (TDG), 1, 4-dithiane, and 1, 4-oxathiane by ECBC in accordance with the listed chemicals of concern by site (Table WP 1-3) prior to being transported off-site for additional analyses

3.7.0.3 Soil/Debris sampling for CWM procedures. Continuous air monitoring for CWM will be maintained during all excavation activities. In the event a positive indication is received, personnel will depart the structure and TEU will take command and control of the incident.

3.7.0.4 UXB shall segregate soil, UXO, CWM/CWM-related material, and wood/metal debris during excavation UXO will be investigated for explosive hazards. UXO with an explosive filler or components will be removed from the containment structure and explosively destroyed on-site. CWM munitions containing live agent will be turned over to TEU.

3.7.0.5 HTW sampling and characterization will be conducted to support and coincide with RI sampling requirements UXB will support CH2M HILL personnel in this effort when possible. CH2M Hill personnel shall not be permitted to collect soil samples until the excavation site has been cleared of UXO and monitors reveal no evidence of CWM

3.7.1 Soil/Debris Waste Characterization Program Rationale

3.7.1.1 Characterization sampling of the soils/debris to be excavated will be performed to ensure that proper waste disposal practices are followed in accordance with the State of Tennessee and the Environmental Protection Agency environmental regulations. Waste management activities are described in detail in Section 11.0 of this Work Plan (Waste Management Plan).

3.7.1.2 Additional characterization samples will be collected of soil/debris prior to shipment for off-site disposal if the following circumstance occurs:

- The nature of the excavated soils/debris changes based on either visual observations (i e., the presence of broken glassware, stained soils, etc) or monitoring equipment data.

3.7.2 Soil/Debris Waste Characterization Sampling Locations and Rationale

3 7 2 1 All soil samples taken during the intrusive excavation will be identified for future reference. A geographical reference point will be established prior to intrusive excavations and will serve as a "bench mark" for locating all sampling points. Samples will be identified using Tennessee State Plane Coordinates – NAD 83.

3.7.3 Waste Characterization Sampling Equipment and Procedures

3.7.3.1 If an unknown or suspect item is found, the anomaly will be removed by TEU and/or UXB. If an item is excavated that is determined to be "unsafe" to move, final disposition of the item(s) will be determined by consultation between UXB, CEHNC and/or TEU. TEU will have the final decision on all suspect CWM items. The U.S. Army EOD unit from Ft. Campbell will provide emergency EOD services for UXO, as needed. UXB will collect all soil that has been in contact with the anomaly if there is the appearance of contamination. Soil samples will be taken from sufficient locations surrounding the anomaly and at various depths to provide information on the characteristics of the surrounding soil Soil samples will be composited from at least two locations and will include soil from depths of at least 1 foot below the anomaly (after it has been removed from the burial location). In each case, these materials will be segregated from the previously excavated soil/debris, and containerized separately until analytical results are received.

3.7.3.2 UXB will collect additional waste characterization samples from the suspect materiel at a frequency dependent on the volume of soil/debris removed. Typically, this would be one two-part composite for every 500 cubic feet of soil (approximately equivalent to the volume of soil that could be contained within a single 20-yard roll-off container). The suspect materiel would then be transported and disposed of based on its waste characteristics. If the waste profile does not differ from that of the initial waste characterization samples, the suspect soil/debris will be containerized with the previously excavated material.

3.7.3.3 If agent is detected during excavation, composite samples may be collected from individual roll-off containers and analyzed for CWA and their associated breakdown products. This is necessary in order to document the concentrations of agent breakdown products in soil which may be transported off-site for disposal at the receiving landfill.

3 7.3.4 Waste debris potentially associated with CWM containers (such as scrap metal from bomb bodies or broken glass fragments from chemical agent identification sets [CAIS] bottles) will be monitored by ECBC for the presence of the chemical agents H and L. Scrap metal items will be heated to 70 degrees Fahrenheit and monitored for the presence of chemical agent. If the debris is contaminated with agent at concentrations above the airborne exposure limit (AEL) established by the Department of Health and Human Services (DHHS), (0.003 mg/m^3 for H and L), the item may be decontaminated on-site by UXB (see procedures outlined in Section 3.17.) in accordance with guidance provided by the State of Tennessee, prior to being transported off-site for disposal.

3.7.4 Additional Soil Sampling and Characterization

3.7.4.1 Additional characterization samples will be collected from the suspect materiel at a frequency dependent on the volume of soil/debris removed.

3.7.4.2 Each sample must contain a quantity adequate to support three separate analyses:

- One for on-site off-gas headspace readings to insure H and/or L are not present (testing dependant on chemicals of concern for specific excavation areas, see Table WP 1-4).

- One for on-site analysis of CWA and associated degradation products
- One for off-site analysis for contaminants of potential concern for health based and land disposal requirements.

3.7.4 3 Each field sample will be assigned a unique sample designation that identifies the excavation area and the type of sample (i.e. compliance, characterization, etc.). To properly identify and track each sample, the unique sample designation will be recorded on the sample label, affixed to the sample container, and recorded on the chain of custody form. Sample labeling, handling, custody, and shipping are discussed in detail in Section 3.13

3.7.4.4 Each sample designation will consist of three alphanumeric sections set apart by hyphens. The first alphanumeric section of the sample number will identify the site name for this project, "24-A 1-1 (-1 denotes pit number one)1". The second alphanumeric section will refer to the sample type (e.g., "SDC" for soil/debris characterization). The third alphanumeric section will refer to the numeric order in which the sample was collected. An example of a sample number for the second soil/debris characterization sample would be "24-A 1-1-SDC-1". An anticipated sample schedule for the removal action is provided in Table WP 12-2.

3.7 4.5 Quality control (QC) samples will be submitted along with the environmental samples to assess the precision, accuracy, and representativeness of sampling and analysis. The types of QC samples are described in Section 8 9 of the CDQMP (Section 8 of this Work Plan). Quality control samples will be designated based on their type. Blind replicate samples will be submitted with a fictitious sample number to prevent the laboratory from recognizing any replicate sample. All acronyms used to name blind replicates will be recorded in the field logbook. Each matrix spike/matrix spike duplicate (MS/MSD) sample will have the same designation as its associated environmental sample, except that "MS/MSD" will be added to the sample identification number (e.g., "24-B-WC-2-MS/MSD"). Typical QA/QC sample designations are also listed in Table WP 12-2.

3.7.4.6 Characterization samples will be analyzed for those parameters necessary to ensure proper disposal at a RCRA licensed disposal facility. As stated previously, characterization soil samples will be analyzed on-site by ECBC for H, L, TDG, 1, 4-dithiane and 1, 4-oxathiane in order to analytically detect quantities of chemical agents in the soil that are below the detection range of field monitoring instruments. Monitoring, soil sampling, and testing will be performed in accordance with this section, Section 8.0 (Chemical Data Quality Management Plan), and ECBC SOPs

3.7.4.7 Once it has been confirmed that no detectable concentrations of CWA are present in the soil samples, the characterization samples will be shipped off-site to the Contract Laboratory for analysis of those contaminants of potential concern which are not classified as CWA (refer to Table WP 12-1). In addition, each characterization sample will be analyzed for the toxicity characteristic based on metals constituents, and for the characteristics of corrosivity, reactivity, and igniteability.

3.7 4.8 The analytical methods to be used to gather this data are also identified in Table WP 12-1.

3 7.4.9 If agent is detected in the characterization samples or during monitoring activities two-part composite samples shall be collected from individual roll-off containers and analyzed for CWA in order to document the concentrations of CWA and associated breakdown products that may be transported and disposed of off-site.

3.8.0 Sampling Program For Intact Non-CWM Items

3.8.0.1 During excavation activities, specifically at Site 1, intact bottles or containers of unknown liquids or solids (i.e., bottles that have no labels, identifiable markings, or distinguishable physical characteristics) may be encountered. When such an "unknown" is encountered, TEU will assess the item as per work plan section 12.2.

3 8.0.2 Once the non-CWM item(s) has been returned to UXB control, the contents will be analyzed for the presence of HTRW (See Fig WP 3-2B) and disposed of IAW applicable state and federal directives.

3.9.0 Compliance (Verification) Sampling Program

3.9.1 Compliance Sampling Program Rationale

3.9.1.1 After the contents of the disposal trench within the limits of the containment structure are completely excavated and all monitoring, geophysical surveying, and visual observations indicate that the contaminated soil/debris has been removed, compliance samples will be collected by UXB from the floor and walls of the excavation. Additional soil samples may be collected to verify that all evidence of chemical contamination has been removed Should a sample confirm the absence of chemical agent, no additional soil will be removed from the excavation or collected. Once analytical results from the mobile lab indicate that the soil contains no residual chemical agent, the filtered containment structure may be moved.

3.10.0 Investigation-Derived Waste Sampling Program

3.10.1 IDW Sampling Program Rationale

3.10.1 1 Samples will be collected of equipment and personnel decontamination wastewater to ensure that proper waste disposal practices are followed. Wastewater from the decontamination of equipment will be pumped from the temporary decontamination pad sump into drums and analyzed for those parameters identified in Table WP 12-1. The IDW would then be transported and disposed of based on its waste characteristics. Waste disposal will be performed in accordance with TSCA and RCRA regulations, the project SSHP, and other applicable local, State, and Federal regulations.

3.10.1.2 Disposable personal protective equipment (PPE) used on-site during the removal action will be drummed and the headspace monitored for the presence of CWAs L and H to ensure the PPE has not been contaminated by CWM. All non-CWM contaminated PPE will be disposed of with the excavated soil. If contaminated, the PPE must be decontaminated by UXB in accordance with Section 13.0 of the SSHP (Book 2 of this Safety Submission) prior to removal from the exclusion zone for off-site disposal.

3.10.2 IDW Sampling Locations and Rationale

3.10 2.1 One grab sample will be collected for every 10 drums of wastewater generated (this is approximately equivalent to one sample for every 500 gallons of wastewater). The total number of samples collected over the project will be dependent on the total volume of wastewater generated.

3.10.3 IDW Sampling Equipment and Procedures

3.10.3.1 Decontamination water samples will primarily be rinsate water from heavy equipment, sampling equipment, PPE, and personnel decontamination activities. In order to characterize the drum contents for disposal, waste profiling samples are to be collected by following procedure:

- Remove the top of the drum to be sampled. Waterproof outer gloves will be worn outside chemical resistant liners (in addition to standard Level D PPE).
- If the decontamination water has an oily sheen, a disposable bailer will be used to sample the drum. The bailer should be inserted down through the center of the drum contents to obtain a representative sample of its contents.
- If the decontamination water is homogeneous, the water may be sampled by collecting the sample with a clean (decontaminated) glass beaker.

- The sample is then decanted into the appropriate sample jar(s) for the analyses requested.
- Securely replace and re-seal the top of the drum.

3.10.4 IDW Sampling Frequency, Designation, and Analysis

3.10.4 1 Each sample designation will consist of three alphanumeric sections set apart by hyphens. The first alphanumeric section of the sample number will identify the site location for this project. (e.g., "24-A;"). The second alphanumeric section will refer to the sample type. (e.g., "IDW" for investigation-derived waste). The third alphanumeric section will refer to the numeric order in which the sample was collected. An anticipated sample schedule for the remedial action will be determined prior to excavation and will be provided in Table WP 12-2. The analytical methods to be used to gather this data are identified in Table WP 12-1 At this time, it is expected that the only contaminants of potential concern that would persist in decontamination waters would be total arsenic and the characteristic of corrosivity.

3.11.0 General Sampling Guidelines

3.11.0.1 The following represents general sampling guidelines that will be followed during each of the sampling programs described above:

- Samples are regarded as perishable and will be collected, handled, and transported prior to analysis in a manner that safeguards the integrity of the particular constituents or properties to be examined.
- A single sample will neither be so large as to mask the effects of significant variability within the sample, nor be so small as to be influenced by the inherent variability between small portions of any bulk material.
- Actual sample locations will be reflected on the site map of the area for reference, and recorded in the field logbook.
- Number of samples collected will be recorded in the field logbook.
- Samples will be kept at their in ground temperature, or lower, by placement in a cooler with ice until received by the laboratory. Storage of samples at 4 ^{0}C, in most cases, will reduce chemical degradation.
- Exposure to direct sunlight will be avoided.
- The following types of sampling and monitoring equipment will be available on-site at all times
- Sterile Glass Jars and Lids
- Labels
- Stainless Steel Mixing Bowls, Spatulas, and Spoons
- Shovel
- Appropriate PPE
- Bleach
- De-ionized Water

- Liquid Dish Detergent
- Field Logbook
- RTAP
- MEAP
- LEL/O_2/CO/CO_2 Direct Reading Instrument
- Sampling equipment will be decontaminated in accordance with the contracted laboratory after each sample is taken in order to prevent cross contamination.
- If heavy equipment is used for excavation, personnel are to remain at least 20 feet away from the mechanical equipment until the operator secures all moving parts and authorizes approach through confirmed oral communication.
- If sampling requires that personnel enter the excavation, all necessary precautions will be taken to protect the safety of the workers. Under no circumstances will personnel enter an unshored, vertical walled excavation over 4 feet deep.

3.12.0 Sample Labeling, Handling, Custody and Shipping

3.12.0.1 The following standard protocols for sample labeling, handling, custody, and shipment apply to all four of the sampling programs described above in Sections 3.1, 3.2, 3.3, and 3 4.

3.12.1 Sample Containers

3.12 1 1 Samples will be collected in laboratory-provided containers appropriate for the specified analytical method The containers will conform to the requirements of volume, container and lid material, and preservative as specified in the Sampling Plan, Section 12 of the Work Plan, Table WP 12-3. Appropriate measures will be taken by UXB field personnel to ensure that a sufficient number of containers are available for the project prior to the initiation of any sampling activities. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants Once the sample has been collected, each glass container will be wrapped with tape so as to prevent loss of the sample should the glass break.

3.12.2 Sample Labels

3.12.2.1 A sample label will be affixed to each soil and/or water sample container prior to transport to the laboratory. In most cases, sample labels will be affixed in the field by UXB field personnel during sample collection, rather than prior to the initiation of the sampling event. This will minimize the time spent finding the appropriate container for a given sample when any container with appropriate preservatives could be used. These labels may be supplied by either the Contract Laboratory or by UXB. Each sample label will be marked in waterproof ink with the following required information:

- Project name and location
- Date and time of sample collection
- Sample identification number
- Type of preservative, if applicable
- Analyte(s) requested (method number if more than one method is available)

- Initials of sampling personnel

3.12 2.2 To assure that the samples are representative of the environment from which they are collected, chain of custody records will be used as control documents for ensuring that samples are handled properly and sample custody is maintained An example chain of custody record is shown in Figure WP 8-1 of the CDQMP. The chain of custody form includes project identification, project location, sample designation and requested analyses In addition, there are spaces for entry of the sample collection date and time, sample depth, and sample matrix. The chain of custody record will be initiated by the field sampling personnel upon collection of a sample, and will accompany each sample cooler. The chain of custody will be signed by each individual who has the samples in his/her possession. A copy of the custody record will be retained by UXB prior to release to the courier. UXB will in turn provide a copy to the Project Chemist. Shipping receipts for samples shipped to the HTRW Contract Laboratory will also be retained as evidence of custody transfer between the sampler and the courier.

3.12.2.3 A sample register will also be generated in the field by the UXB Field QC Supervisor. The function of the sample register is to provide a comprehensive record of collected samples to be used for shipment tracking, tracking receipt of analytical data, and to provide a foundation for information management All information will be recorded daily in indelible ink. Daily entries will include information on the date and time sampled, sampling location, headspace readings, sample identification number, sample type, matrix type, laboratory destination, date shipped, shipment tracking number, and associated QAIQC samples.

3.12.3 Sample Preservation and Holding Times

3.12.3 1 Appropriate measures will be taken by UXB field personnel to ensure that storage requirements with respect to temperature are maintained in the field and during transport to the HTRW Contract Laboratory. All samples will be placed on ice immediately after sample collection and cooled in ice chests to approximately 4 degrees Celsius (°C) pending on-site analysis or shipment off-site.

3 12.3.2 Upon receipt at the HTRW Contract Laboratory, the laboratory will record both the temperature and condition of the samples at the time of receipt on the cooler receipt form and on the chain of custody record. Samples whose temperatures are within the range of 2 to 6 °C will be accepted by the Contract Laboratory. Samples with temperatures between 6 and 19 °C, or less than 2 °C, will be analyzed and the temperature deviation noted within the case narrative of the Certificate of Analysis The Project Chemist will be notified and new samples may be collected and resubmitted for analysis.

2.12.3.3 At the laboratory, samples will be stored in controlled, locked refrigerators at 4 °C until analyzed. The Contract Laboratory will follow the procedures specified in SW-846 to ensure that storage requirements are maintained at the laboratory and that documentation is available to support the maintenance of these requirements. Deviations to these temperature guidelines will be considered by the Project Chemist on a case-by-case basis.

3.12.4 Sample Shipping

3.12.4.1 Samples will be shipped to the HTRW Contract Laboratory at the end of each day of work. The handling and shipment of samples to the Contract Laboratory will be performed according to the Department of Transportation (DOT), EPA, and U.S. Army regulations, such that damage to, loss of, or unacceptable deterioration of samples is prevented International Air Transportation Association (IATA) regulations will be adhered to when shipping samples using air courier services. Transportation methods will be selected to assure that the samples arrive at the laboratory in time to permit testing in accordance with established holding times and project schedules. No samples will be accepted by the receiving laboratory without a properly prepared chain of custody record and properly labeled and sealed shipping container(s). Prior to shipment, samples will be certified free of airborne agent above AELs in accordance with U.S. Army Pamphlet (DA PAM) 385-61. In addition, the Laboratory shall be notified that the samples are from a suspect CWM site, and that they have been analyzed for agent prior to shipment.

3 12 4 2 Procedures for packaging and transporting environmental and QC samples to the laboratory are described below:

- An ice chest of sturdy construction will be used as the shipping container. In preparation for shipping samples, the drain plug will be taped shut from the outside. Approximately 1 inch of packing material, such as vermiculite or bubble wrap, will be placed in the bottom of the cooler.

- Each sample will be wrapped separately in "bubble-wrap" or other protective material Sufficient packing material will be used to prevent sample containers from making contact during shipment If brass or stainless steel tubes are used, bubble wrap is not required.

- Samples will be cooled to 4 °C with ice during shipment. The ice will be contained such that water will not fill the cooler as the ice melts.

- The COC record will be placed inside a plastic bag, sealed, and taped to the inside of the cooler lid if a carrier (e.g., Federal Express or UPS) is used

- The cooler will be closed and taped shut with strapping tape (filament type) around both ends.

- Two custody seals consisting of security tape will be placed on the cooler (one over the front and one on the side, overlapping the strapping tape if possible). The initials of the sampler and the date will be written on each custody seal. The seals will be placed such that they must be broken to gain access to the contents. Additional seals may be used. If the sampler and shipper think more seals are necessary. Custody seals will be placed on each cooler prior to their release to a second or third party (i.e., shipment to the laboratory).

- The cooler will be handed over to the overnight carrier, typically a cargo-only air service, for shipment to the Contract Laboratory within 24 hours of sample collection. This transportation method was selected to ensure that the samples arrive at the laboratory in time to permit testing in accordance with established holding times and project schedules. The airbill will be filled out before the samples are handed over to the carrier.

- The Contract Laboratory will be contacted immediately upon shipment, or as soon as possible thereafter, and notified of the date and method of shipment, number of ice chests, and any additional instructions.

3.12.4.3 The HTRW Contract Laboratory will be required to acknowledge sample receipt within 48 hours either by fax or by telephone. At that time, the Contract Laboratory will notify the UXB LCPM of any handling problems such as broken sample containers, insufficient sample volumes, missed holding times, etc.

3.13.0 Sampling Equipment Decontamination

3.13.0.1 All hand equipment and tools used inside the exclusion zone will be staged in the contaminant reduction zone and decontaminated prior to leaving the contaminant reduction zone. Decontamination of hand-held tools/equipment will as a minimum receive a three stage wash and rinse in accordance with the procedures outlines in Section 13 of the SSHP. The first stage is a wash solution based on the contaminant of concern (refer to Table WP 1-3). The second stage is a wash consisting of hot soapy water. The third step involves rinsing the item in clean water. After this three-stage wash/rinse cycle, hand tools/equipment can be reused or removed from the contaminant reduction zone upon inspection and approval by the SSHO.

3.13 0.2 Prior to excavation, characterization samples may be collected and analyzed in accordance with the requirements of Section 12 (Sampling Programs) and Section 8 (Chemical Data Quality Management

Plan) of this Work Plan. Characterization samples will only be taken prior to the start of excavations if site conditions indicate that information effecting the excavation process would be gained.

3.14.0 Excavation Activities

3.14.1 Site Reconnaissance

3.14.1.1 A visual surface reconnaissance and review of previous geophysical surveys will be conducted to identify physical hazards, suspected hazards, underground utilities, and unknown buried objects by position. Subsurface anomalies will be located in the field and marked with a wooden stake, however all site personnel must recognize that unidentified hazards may also be present at the excavation site.

3.14.2 General Project Safety Requirements

3 14.2.1 The following are general excavation safety requirements for this project, also refer to the Site Safety and Health Plan, Book 1, Volume 2 of this Safety Submission:

- Prior to commencing the excavation operations, the Senior Site Supervisor will review this work plan to ensure compliance.
- Employees will be protected from cave-ins by an adequate protective system. The Field QC Supervisor must inspect excavations less than 4 feet in depth. Excavations greater than 4 feet constitute a confined space. In the highly unlikely event where entry into the excavation is required that may result in confined space entry operations, work will be halted until confined space entry procedures outlined in Appendix C to the SSHP are implemented. If the excavation exceeds 5 feet in depth, the banks will be shored or sloped to provide protection to personnel from moving ground or cave-ins.
- Unknown physical and chemical hazards may exist at the excavation sites at Dunn Field Personal Protective Equipment (PPE) standards must be complied with, as outlined in the SSHP. Site personnel shall be protected with appropriate PPE for the protection of head, eyes, respiratory organs, hands, feet, and other parts of the body. Personnel will be equipped with respirators appropriate to the hazard present or suspected to be present
- Personnel working in the general area of mechanical excavation equipment will wear high-visibility coveralls, unless required to wear a higher level of PPE. High visibility safety vests will be worn over PPE as long as the vests do not interfere with the proper operation of the PPE.
- Personnel are not to come within 25 feet of mechanical excavation equipment until the operator has secured all moving parts and authorizes approach through positive verbal communication.
- Stop logs, barricades or hand signals will be used if mobile excavation equipment is utilized or allowed adjacent to an excavation and the operator does not have a clear and direct view of the edge of the excavation.
- Personnel will not work on the sloped or benched excavations at levels above other employees.
- Personnel will not work under loads that are handled by lifting or digging equipment.
- Sites that will raise hazardous dust, gases, fumes, mists, or toxic atmospheres deficient in oxygen, will cause personnel to don the appropriate apparatus.
- Personnel will approach the excavation from the front or rear for the purposes of observation and investigation. Sidewall inspections may be authorized after donning of full body harness and safety line, and only with a stand-by safety observer.

- Samples will be collected by removing the soil from the excavation with the backhoe bucket, and collecting the soil sample directly from the bucket contents.
- Explosives will not be subject to heat, shock or friction, and movement of unexploded ordnance is to be avoided Movement of "FUZED" or damaged munitions may cause functioning (i.e , may explode), and movement of a CWM item may potentially result in leakage.
- Materials or equipment that might fall or roll into an excavation must be kept at least 2 feet from the edge of excavation unless a retaining device is provided.

3.14.3 Excavation Procedures

3.14.3 1 As outlined in Table WP 3-1, the excavation team will consist of three personnel; one UXO supervisor, one UXO specialist as an equipment operator, and one TEU Technician to guide the equipment operator and visually inspect the pit after each bucket load. Personnel protection for this task, and all others, is specified in Section 6, Table SSHP 6-3. Training requirements for site personnel are specified in Section 6, Table SSHP 6-2 of the SSHP.

3.14.3.2 The excavation will commence at the perceived edge of the trench furthest from the air filter assembly Personnel will position themselves between the excavation and the primary personnel entrance/exit. The excavation will progress from the far end of the structure towards the opposite end, with personnel working with the primary entrance/exit at their back to allow personnel to exit the area safely in an emergency. This working arrangement will also maximize the work performed on stable ground as well as minimize the requirement for personal entry into the excavation. Also, with the filter assembly positioned at the far end of the containment structure, any contaminated air would be removed away from the workers and the exit, as opposed to over the workers.

3.14.3 3 UXB will excavate using either a backhoe or a bobcat. Due to the size of the area to be cleared and the size of the items expected to be encountered, mechanical excavators will be utilized as much as possible. If a suspect CWM item is encountered, TEU will conduct an assessment of the item to determine proper disposition, as indicated in Figure WP 3-2B Figure WP 3-2A details the procedures for other materials. Mechanical excavation then may resume as described below.

3.14 3.4 UXB will maintain a buffer zone between the edge of the excavation and the excavation equipment At site 1, the edges of the excavation will be sloped for ease of entry and exit. At sites 24-A and 24-B, trenches will be dug to 13 feet deep and personnel will not be permitted to enter these trenches. When the excavation extends below 4 feet, appropriate actions will be taken as directed in Appendix C to the SSHP.

3 14.3.5 The following procedures will be followed by personnel conducting excavation operations:

- Stage equipment within the filtered-air containment structure (the interior of the structure will be considered the Exclusion Zone).
- Establish and/or initiate the remote video system (observation of activities inside the structure is provided by a video camera that is connected to a television and video machine placed in the project office).
- Perform radio communications check with the Site Safety and Health Officer (SSHO). The SSHO will normally remain outside of the structure; the SSHO is capable of donning the appropriate PPE and entering the structure as the situation or conditions warrant such action.
- Secure the equipment and the boom to the ground prior to allowing entry of personnel to investigate the excavation.
- Inspect PPE prior to use to ensure PPE standards are conforming to Section 8 0 of the SSHP.

- Determine wind direction by positioning of streamers
- Place perimeter monitoring apparatus as required per ECBC Monitoring Plan (Book 2) and the Air Monitoring Plan (Section 9 of the Work Plan)
- Stage the personnel performing excavation and shaker-table operations (shaker table will be used at Site 1, but will be available for the other excavation sites), between the primary personnel exit and the excavation site; the excavation will commence at the perceived edge of the trench nearest the air filtration assembly and progress backwards towards the primary personnel exit (see Figures WP 3-1 and WP 3-1A). All equipment that is required to be within the containment structure will be placed so as to require a minimal amount of moving to accommodate the excavation. The actual locations of all equipment will be determined by the SUXOS.
- Conduct air monitoring of exposed surface, excavated soils, and the breathing zone of investigating teams
- Position personnel to the rear of excavation equipment for observation; personnel can be no closer than 25 feet from operating heavy equipment.
- Extend boom to the maximum length and position bucket to scrape surface with teeth extended down.
- An observer will visually watch the excavation process for any suspect materiel that may be encountered. The individual will immediately halt operations when a closer look or sampling must occur. Revalidate the position of subsurface materials and sweep clear the area for additional contacts that may result from movement of sub-grade material.
- Mark the position of subsurface items that cannot be positively identified and alert equipment operator to the approximate depth, size, and orientation of the item
- Account for the position of excavation team personnel prior to resuming excavation procedures.
- Advancement of the excavation may require the addition of sloping procedures
- Stockpile the excavated material in the vicinity of the shaker table (if used); or continue placing soil and materials into designated containers. Excavated material will be staged no closer than 2 feet from the excavation, and will be placed in an area where it poses neither hazard nor obstruction to the excavation operation
- Continue excavation operations until the conclusion of all removal/sampling activities.

3.14.4 Shoring or Sloping

3.14 4.1 Excavation of trenches where field personnel will be in danger from sliding ground or potential cave-in, shall be guarded by the proper sloping or shoring technique. Excavations below 20 feet are not anticipated. Sloping of excavated trenches is the preferred method for exploratory trenching Sloping shall be accomplished in accordance with EM 385-1-1, dated 3 Sep 96, Section 25C. The maximum slope shall be 34° measured from the horizontal (1-1/2 horizontal to 1 vertical.) In excavation areas where field crews may have to enter, the excavated materials will be stored no closer than two feet from the nearest sloped edge. Materials will not be stored any higher than half the depth of the excavated site. Shoring is not anticipated; however, the employment of shoring techniques shall be in compliance with OSHA regulations.

3.15.0 Safe Access

3 15.0.1 Protection will be provided to prevent personnel, vehicles, and equipment from falling into the excavation. Protection shall be provided as outlined in the U S Army Corps of Engineers Manual 385-1-1 (EM 385-1-1) *Safety and Health Manual* A Class H protection system will be utilized until the excavation exceeds 4 feet in depth. This consists of warning barricades or flagging placed at a distance not closer than 6 feet from the edge of the excavation and the display of adequate warning 3 to 4 feet above the ground level. Class III protection consisting of warning barricades or flagging placed no closer than 6 inches or more than 6 feet from the edge of the excavation. When the excavation exceeds a depth of 4 feet, and personnel are required to enter, an appropriately-sized ladder will be provided.

3 15.0.2 The heavy equipment to be used inside the filtered-air containment structure during excavation activities at Dunn Field includes a backhoe, bobcat, and a shaker-table (sifter). Refer to the following sections of the SSHP for particular safe work practices

- Material and Equipment Handling (Section 11.6)
- Vehicle Safety (Section 11.15)
- Equipment Safety (Section 11 14)

3.15.0.3 Exhaust fumes from mechanized equipment within the structure may pose a hazard to personnel. UXB intends to minimize this potential hazard by installing MINE-X® Exhaust Gas Purifiers onto the heavy equipment that will routinely operate inside the structure. The use of a MINE-X® Exhaust Gas Purifier will provide benefits by reducing:

- carbon monoxide by more than 90 percent
- hydrocarbons and diesel odor by up to 90 percent
- volatile organic fraction of particulate matter by up to 80 percent.

13.5.0.4 The MINE-X Exhaust Gas Purifier accomplishes the above reductions through catalytic conversion of carbon monoxide, hydrocarbons, soluble organic fraction (combustion particulate matter) and nitrogen oxides to form carbon dioxide, nitrogen, and water. The catalyst is a y-alumina-ceria washcoat impregnated with a proprietary formulation, typically comprised of precious metals such as platinum, palladium, or rhodium The y-alumina is a high surface area substance that provides microscopic pores for active catalyst sites. Ceria in the washcoat helps prevent sintering of the washcoat. The catalyst promotes an oxidation/reduction reaction causing nitrogen oxides to lose oxygen and carbon monoxide as well as hydrocarbons and soluble organic fraction to gain oxygen thus producing nitrogen and carbon dioxide with a further byproduct of water

3.16.0 Excavated Materials Handling, Packaging, And Temporary Storage

3.16.0.1 The following section describes the procedures for handling materials excavated from sites 1,24-A and 24-B, including miscellaneous construction debris, conventional ordnance, chemical ordnance, unknowns, and contaminated soil.

3.16.0.2 Figures WP 3-2, WP 3-2A, and WP 3-2B provide detailed process flow diagrams for the procedures outlined in this section of the work plan. Initial Visual Screening During Excavation/Shaker-Table Operation (Site 1)

3.16.1.1 The backhoe/bobcat operator will deposit excavated material into a sifting device located adjacent to the excavation (large drums and debris will be removed prior to this step).

3.16.1.2 This sifting device is a government furnished Shaker Buddy Model XL3O that is capable of processing approximately 1.5 yards of material per minute. The XL3O (powered by a John Deere 3009D, 20 horsepower diesel engine) measures 7 5 feet wide,15 feet long, and 8 feet high. The Shaker Buddy will be outfitted with a Mine-X Exhaust Gas Purifier.

3.16.1.3 The sifting device will allow the workers to safely and gently sift the excavated material through two wire screens; the first screen will capture items larger than 1 ½" in size while the second screen will capture items larger than 7/8" in size. The sifter will capture debris from the soil and allow appropriate identification and retrieval of all waste types

3.16.1.4 The design of the sifter directs all products (items captured by both screens and the resulting fines) in the same direction, down and out the front of the sifter. UXB will place a small roll-off container (6 — 9 yards in size) up against the front side of the sifter in order to capture all these products. The roll-off container will protect the ground that surrounds the excavation from contact with the excavated material thereby preventing incidental contamination

3 16.1.5 Workers will inspect the material coming from the sifter before it drops into the roll-off. In order to do this, UXB will fabricate a wooden working platform that will be placed over the roll-off so that workers can access the materials coming off of the sifter A gap will exist between the working platform and the sifter so that the materials can drop into the roll-off.

3.16.1.6 Workers will closely inspect debris for ordnance and explosives and take precautions not to break glass objects. UXB personnel will identify those items that are suspected of being CWM items. TEU will then conduct an assessment of the item to determine proper disposition (refer to Figure WP 3-2B).

3.16.1.7 Recovered debris suspected of contamination will be placed into a 6 mil plastic bag and secured to allow vapor build-up for monitoring. Soil suspected of contamination will be placed directly into the roll-off container and covered to allow vapor build-up. The soil and debris vapors will be monitored for CWM contamination according to Section 12 (Sampling Plan).

3.16 1 8 UXB will assist TEU, as needed, in the packaging of recovered metal drums, glassware, and containers identified as CWM. TEU will then transport these packaged items to the interim holding facility (IHF).

3 16.1.9 If CWM monitoring of soil and/or roll-off containers indicates CWM contamination; one composite characterization sample per roll-off container shall be collected and provided to ECBC for analysis. The sample will be large enough to split for disposal characterization analysis, and will be used as such pending the confirmation of the absence of chemical agents.

3.16.1.10 Debris which exhibits detectable CWM concentrations will be decontaminated. Once the decontamination is complete, the debris will be monitored and the decontamination procedure repeated until contamination is no longer detected (refer to Figure WP 3-2B). Once this is accomplished, the debris will be placed in the containers with the soil characterized as hazardous and disposed of at a RCRA permitted facility. Construction debris that does not exhibit detectable CWM concentrations will be containerized with other non-hazardous waste debris for disposal at a solid waste landfill.

3.16.2 Conventional Ordnance

3.16.2.1 UXB personnel will identify, remove, and dispose of all ordnance and explosives located in accordance with procedures outlined in the Conventional Ordnance Handling Plan, Section 6 of this Work Plan. Ordnance and explosive operations (to include intrusive excavations) will be conducted in accordance with the U.S. Army Corps of Engineers Technical Letter 385-1-1, Basic Concepts and Safety Considerations for Unexploded Ordnance Operations, dated February 16, 1996.

3.16.3 Chemical Warfare Materiel

3.16.3 1 Chemical warfare materiel (CWM) includes chemical munitions, chemical agent identification sets (CAIS), and V- and G- Series nerve agent, H- and HN- series blister agent, and lewisite in other than munitions configurations. CWM does not include riot control agents; chemical herbicides, smoke or flame; producing items, or soil, water, debris, or other media contaminated with chemical agent In the event that an intact or suspect CWM is recovered, UXB will turn over the item to TEU for assessment. If the item is determined to be CWM, TEU will package the item and transport it to the IHF. If determined not to be CWM, TEU will return the item to UXB for further action.

3.16.4 Unknowns

3.16.4.1 During excavation activities, intact bottles or containers of unknown liquids or solids (i.e., bottles with no labels, identifiable markings, or distinguishable physical characteristics) may be encountered When such an "unknown" is encountered, TEU will be asked to assess whether this item could be a CWM-related item. If the item is CWM-related, the item will be removed for packaging and transport to the IHF by TEU If it is determined that the anomaly is definitely not CWM but is still unknown, UXB will screen the item under engineering controls such as a glove box or a remote access device to verify that, if present, the chemical agents and industrial chemicals are below their respective actions levels. This screening will be conducted inside the filtered-air containment structure, concurrent with intrusive operations. Once cleared by ECBC and the UXB SSHO, samples from the item will be transported to an off-site laboratory for hazardous waste characterization.

3.16.5 Processing CWM-Contaminated Soil and Debris

3.16.5.1 If CWM-contaminated soil or debris is detected during excavation, UXB will remove and segregate the contaminated material. Soil samples will be taken from the excavation in accordance with Section 12, (Sampling Programs) of this Work Plan, to determine the extent of remediation necessary. Soil will be removed only to the extent necessary to remove CWM contamination. All encountered debris will be removed.

3.16.5.2 The decontamination of soil and debris exceeding the AEL will occur as outlined below·

- Contaminated soil and debris will be segregated, placed in hazardous waste drums, and covered to prevent the spread of contamination.
- Prior to use, UXB will line hazardous waste drums with plastic liners. The drums will be pre-positioned inside the containment structure. The drums will be moved as necessary to accommodate UXB's excavation activities.
- A pre-mixed decontamination solution consisting of a 5% bleach solution will be available for use.
- Decontamination solution will be added to the container of contaminated material until monitoring confirms a level below the AEL has been reached.

All soil and debris decontamination activities will occur within the containment structure.

3.16.5.3 All decontaminated soil and debris will be disposed of as hazardous waste IAW state and federal regulations.

3.17.0 Roll-Off Staging Procedures

3.17.0.1 A series of small roll-offs will be used during this project to collect the fines from the shaker table, as well as for the holding of debris. One roll-off will be positioned at the shaker table in order to collect the products resulting from sifting operation. Empty roll-offs will be placed inside the filtered-air containment structure in such a manner to facilitate the easy replacement of a full roll-off with an empty roll-off. If necessary, the bobcat can move the roll-offs within the filtered-air containment structure while excavation operations are underway.

3.17.0.2 At the end of both the AM and PM work shifts, full roll-offs confirmed to be below the AEL will be covered and removed from the filtered-air containment structure and transported to the staging area. Empty roll-offs will replace the full roll-offs that were removed from the filtered-air containment structure. A forklift will move these small roll-offs in and around the project site

3.17.0.3 Within the roll-off staging area, roll-offs shall be segregated depending upon their specific status·

- waiting soil sample collection
- pending results of soil sample analysis
- awaiting transportation to the proper disposal facility
- empty—waiting return to the containment structure.

3.18.0 Air Monitoring

3.18.1 Introduction

3.18.1.1 Monitoring will be conducted by UXB and ECBC in accordance with ECBC's Monitoring Plan (Book 2 of this Safety Submission) This plan contains the specifics for ECBC's monitoring procedures and protocols. Air monitoring will assist on-site personnel in the evaluation of hazards to determine personal protection measures required, safe work practices, and appropriate control measures.

3.18.1.2 Excavations where oxygen deficient or gaseous conditions are possible (as determined by the SSHO), will require air monitoring. An LEL/O_2 meter will be used. Operations will cease if monitoring reveals flammable gases are present at concentrations of 10% of the Lower Explosive Limit (LEL) for methane or greater. All ignition sources will be removed prior to the resumption of operations. This is an unlikely scenario given the air flow in the structure resulting from the six air changes per hour; if this situation arises, consult the CIH.

3.18 1.3 ECBC will monitor for CWM during excavation Detection of CWM will require personnel to cease operations to determine if additional controls and re-evaluation of PPE standards are required.

3.18.2 Identification of Equipment

3.18.2.1 The following air monitoring equipment will be used during the removal action:

- Miniature Continuous Air Monitoring System (MINICAMS). This device is a continuous air monitor (low level, near real time) which will be used for mustard (H) and lewisite (L) detection, dependent on excavation site It is a gas chromatograph which draws an air sample through a sample line. The air sample is then heated to a predetermined temperature setting (burned). Different agents emit different amounts of light as they burn. The MINICAMS will measure this light emittence and determine if H or L is present MINICAMS will be used for monitoring inside the structure, and also to monitor the filter banks on the filter systems Refer to ECBC's Monitoring Plan (Book 2 of this Safety Submission) for further information concerning this piece of equipment.
- Colorimetric Tubes. These colorimetric tubes (a.k a Dreager tubes) are used to detect a chemical vapor presence/concentration based on a reaction of absorbent media within the tube. These tubes will be used inside the containment structure. A vapor sample is drawn into the tube using a hand-held sampling pump. The vapor then reacts with the media within the tube (different tube types are required for different compounds). A detectable concentration is indicated by a color change in the

tube media. The degree of color change approximates the concentration. Colorimeteric tubes will be utilized on this project to detect, chloropicrin (PS) a CWM and hydrogen chloride (HCl) a non-CWM.

- Auto Step Plus This device is a continuous air monitor that will be used to monitor for the presence of the industrial chemical phosgene (CG) in the ambient air. The Auto Step Plus contains a chemical tape, calibrated at the factory, that advances every four minutes Air is collected at a flow rate of approximately 1 liter per minute (l/min). This device will be used inside the containment structure. An electronic eye reads the tape and rings an alarm if CG is detected by the tape.

- Depot Area Air Monitoring System (DAAMS) Tubes. DAAMS tubes are used to collect time-weighted samples at specific locations. DAAMS tubes will be used for the detection of H and L, depending upon the excavation site. The tubes are connected to a battery-operated pump which draws air into the tube and across a sampling media at a given flow rate. The tubes are changed every two hours and analyzed using the RTAP DAAMS tubes will be used inside the containment structure. Refer to ECBC's Monitoring Plan (Book 3 of this Safety Submission) for further information concerning this piece of equipment.

- PDM-3 MINIRAM. This device is a light scattering aerosol monitor that detects the concentration of airborne particulate (dust) in the air Air passes freely through an open aerosol sensing chamber via convection, circulation, ventilation, and personnel movement (no pump is required). A continuous readout (updated every 10 seconds) is provided on the LCS screen. Particulate concentrations are indicated in the units of milligrams per cubic meter (mg/m^3). The instrument detection range is from 0 01 mg/m^3 to 100 mg/m^3.

- Noise Dosimeter. This device continuously monitors noise levels using an omni-directional microphone to detect sound over a period of time. In accordance with OSHA requirements, it can be set to use an A-frequency waiting network with flow meter response. The display provides readings of exposure dose percentage, an average down pressure level (in decibels), based on the selected threshold level. This device will be used to determine if and when hearing protection will be required

3.18.3 Excavation Monitoring

3.18.3 1 Prior to beginning excavation activities, ECBC personnel will perform first entry monitoring procedures of the filtered-air containment structure The filter unit will be started and ECBC personnel will monitor using a combination of DAAMS Tubes and a Real Time Monitoring Device; these devices will be placed both before the filter assembly and mid-bed of the filter assembly. The appropriate detection device will be used to detect the presence of CWAs L and H and industrial chemicals phosgene (CG) and chloropicrin (PS). MINICAMS will be used for continuos monitoring of CWAs H and L. Once the monitoring has verified that the excavation is free of CWM, excavation may begin. In the event detectable concentrations of agent are noted, the MINICAMS and/or other monitoring devices will be used to identify the affected soil and/or debris. UXB personnel (attired in Level A PPE) will remove this material from the excavation for immediate decontamination. Decontamination (treatment) procedures are described in the SSHP, Section 13 Negative pressure will be maintained at all times (24 hours per day) until the area is cleared for back filling.

3.18.3.2 A MINICAMS sampling line will be continuously monitored for H and L within the excavation. In the event concentrations exceed 0.003 mg/m^3, all personnel will immediately evacuate the area and assemble at the Hot Line (Section 13.4 SSHP). Verification of positive readings will be confirmed as described in paragraph 3.18.3.3 using the DAAMS tube collected near the MIINICAMS sampling line. If the second cycle is below 0.003 mg/m^3, the operator will attempt to verify the reading through the third cycle. A second MIINICAMS or RTAP sampling line will also be positioned for use at the sifting/packaging area for each excavation.

3.18.3 3 In addition to the real time monitoring listed above, a combination of DAAMS and Draeger tubes will be used to monitor for H, L, and PS, during the excavation process. This placement of tubes will provide a "point" reading in the excavation as well as one upwind and two downwind locations (relative to the airflow in the structure). Each of the DAAMS stations will have two DAAMS tubes. One tube will be used to screen for the presence of L or H. If a positive response is obtained during the screening process, the second tube will be analyzed for confirmation of the initial screening result The samples in these tubes will be collected at 0.2 liter/minute for two hours or 0.1 liters/min for four hours. The Bios International, dry cell flow cell (a primary standard) is used to measure the flow rate through the sample collection tubes These samples will be analyzed as soon as practical after collection Analysis of the tubes will continue throughout the workday.

3.18.4 Chemical Warfare Materiel Monitoring

3 18.4.1 CWM monitoring will be conducted for each soil sample collected for laboratory analysis. For each environmental sample collected, an additional sample will be collected (i e , a replicate) and placed in a plastic bag. Each of these samples will be placed in a heater box, if necessary, and heated to approximately 80^{0}F for a period of fifteen minutes The headspace of the sample will then be analyzed for H and L using DAAMS and/or MINICAMS. Soil samples will not be removed from the exclusion zone unless these analyses indicate that vapor concentrations of are below the AEL of 0.003 mg/m^3. If H or L vapors are above the AEL, the source area of the soil sample will be identified and monitored, and the contaminated soil shall be treated as described in Section 3.10.6.

3.18.5 Soil and Debris Monitoring Prior to Transportation

3.18.5.1 As indicated in previous sections of this document, CWM-related materiel will be segregated from other soil and debris utilizing a sifting device. The sifted soil (fines) and debris will be collected in roll-off containers and covered with a plastic sheet. Representative samples of soil and debris will be removed and sealed in separate plastic bags for monitoring. Prior to monitoring, the bagged soil and debris will be allowed to heat to approximately 80^{0}F for a period of fifteen minutes by means of a hot box. ECBC shall utilize DAAMS tubes to detect the presence of CWM under the plastic cover and inside the plastic bag containing debris (procedures are detailed in Section 3 3 of ECBC's Monitoring Plan [Book 3]). The frequency of monitoring will be based on the work rate. At a minimum, the roll-off container will be monitored prior to the lunch break and at the end of the day. In the event agents are detected, the soil and debris (or the affected soil and debris, if distinguishable) will be decontaminated

3 18.5.2 Scrap items that are determined to be from CWM operations will be placed in a sealed box or container by UXB and heated to 70^{0}F; SBCCOM will collect and analyze air samples If the item contains any solid or liquid residue, a sample shall be collected and analyzed in accordance with the Sampling Plan, Section 12 of this Work Plan). If results of the air, soil, and residue sampling indicate no contamination, the scrap will be containerized with the excavated soil and debris. For scrap that is agent contaminated, UXB will decontaminate the scrap prior to transporting the material for off-site disposal

3.18.6 Mobile Area Monitoring

3.18.6.1 The SSHP specifies the PPE by task for this project. Mobile area monitoring will be required to identify potentially hazardous work environments, to assist in determining the need to upgrade PPE, and to document worker exposure to contaminants. DAAMS tubes and MINICAMS will be used to monitor for the presence of L and H. The sampling pump/tube assembly for DAAMS tubes will be worn by one worker at each work area inside the exclusion zone and the tube replaced at a frequency of every two hours. The tubes will then be analyzed by the RTAP. The flow rate on the sampling pump will be set at approximately 0.2 liters/min. In the event that either of the monitoring devices detect an L and H concentration of 0.003 mg/m^3 or greater, personnel will be sent for medical evaluation and more monitoring will be conducted.

3.18.6.2 In the event readings at or above the action level are encountered, work will cease and workers shall immediately egress the work area. An increase in PPE shall be instituted until corrective action is completed or readings return to safe levels. Readings at or above the action levels will be relayed to the SSHO and the CIH. UXB's certified industrial hygienist (CIH) may be reached at 703-724-9600, pager 703-233-4785.

3.18.7 Monitoring for Airborne Dust

3.18.7.1 Soil removal activity is the major source of dust at the work site Engineering controls, such as wetting, will be used to suppress suspension of dust particles The use of wetting increases the concerns for run-off control as well as the dangers associated with slips, trips, and falls. The decision to use wetting, as an engineering control, will be based on these concerns.

3.18.7.2 UXB will conduct monitoring for dust to assist in controlling dust levels generated as a result of the removal activities. The MINIRAM will be used for continuous airborne particulate matter monitoring during soil removal activities UXB's SSHO or designee will calibrate the MINIRAM daily in accordance with manufacturer's instructions. The preliminary action level is 2.5 mg/m^3 in the breathing zone at which point, dust suppression using water may be implemented. All personnel in the work area and the equipment operator will don half or full face respirator with HEPA filter at 5 mg/m^3 in accordance with OSHA. If analytical data indicates a lower action level for dust protection be set, the CIH will amend the procedures specified in the SSHP.

3 18.7.3 UXB will perform baseline monitoring for a period of three days once excavation operations start This baseline monitoring will monitor for silica, dust, and arsenic. This baseline monitoring is further discussed in the SSHP.

3.19.0 Excavation Equipment Decontamination

3 19.0.1 Excavation equipment must be decontaminated after excavation has been completed, before being used to collect samples, and before being removed from the exclusion zone for any reason. Refer to the SSHP for a discussion of this topic. Wastewater generated by decontamination activities will be sampled and analyzed for waste characteristics in accordance with paragraph 3.11.

3.19.0.2 Project closeout will commence once all parties have been satisfied that all contractual obligations have been met. Specifically, this is when all burial pit contents have been removed and compliance sampling indicates that no contamination is present in the soils remaining within the excavation.

3.20.0 Survey Program

3.20.0 1 The final excavation shall be surveyed so the location of confirmatory samples and excavation limits can be documented for future reference. All confirmation sampling locations will have been marked with a wooden stake (or other suitable means) labeled with the sample's unique identifier. A registered land surveyor will be used to determine the elevations and horizontal coordinates of the excavation. The horizontal control for each measurement will be within ±0.1 foot and will be reported in Tennessee State Plane Coordinates. The vertical control for each measurement will be within ±0.1 foot using the National Geodetic Vertical Datum of 1929. Sufficient horizontal and vertical coordinates shall be determined so the excavation shape and dimensions can be accurately depicted on a site map that will be prepared for the Remedial Action Report. Because the excavation may have an irregular shape, the actual number and location of points to be surveyed will be determined by the Operations Officer, CEHNC representative, and the surveyor, once the excavation shape is known. All survey information will be part of the permanent project file.

3.21.0 Backfill Operations

3.21.0.1 Once analytical data from the confirmation sampling has been received and it has been determined that the remedial action objectives have been met, the excavation will be back filled with any excavated material that meets the definition of "clean" fill and that does not contain construction waste or debris. Additional imported clean fill material will be obtained to make up any shortfalls in backfill material resulting from compaction, debris removal, or soil removal. To prevent sinkholes, backfill soil will be compacted using the weight of excavation equipment and will be approved by CEHNC.

3.22.0 Site Restoration

3 22.0.1 Refer to Section 7.5 of the Environmental Protection Plan (Section 7.0 of this Work Plan)

3.23.0 Site Demobilization

3 23.0.1 At demobilization, the following activities will occur:

- Returning of office and storage trailers
- Return of rental equipment
- Disconnection of utilities
- Returning of port-a-potties
- Re-establishing the integrity of any disturbed fencing
- Removing gravel
- Reseeding of excavated area.

Figure WP 3-1
Typical Site Layout

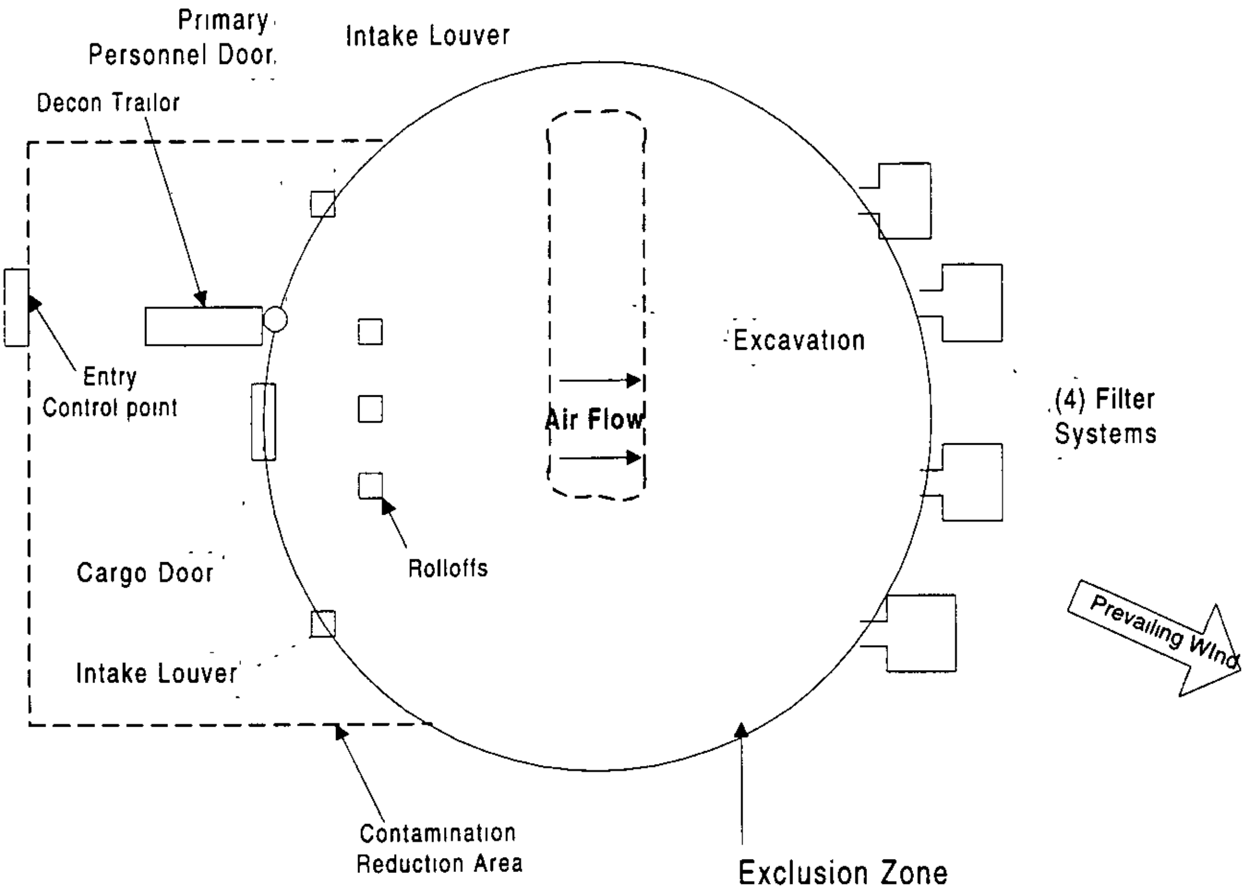


Figure WP 3-2

Site 1 Flow Diagram

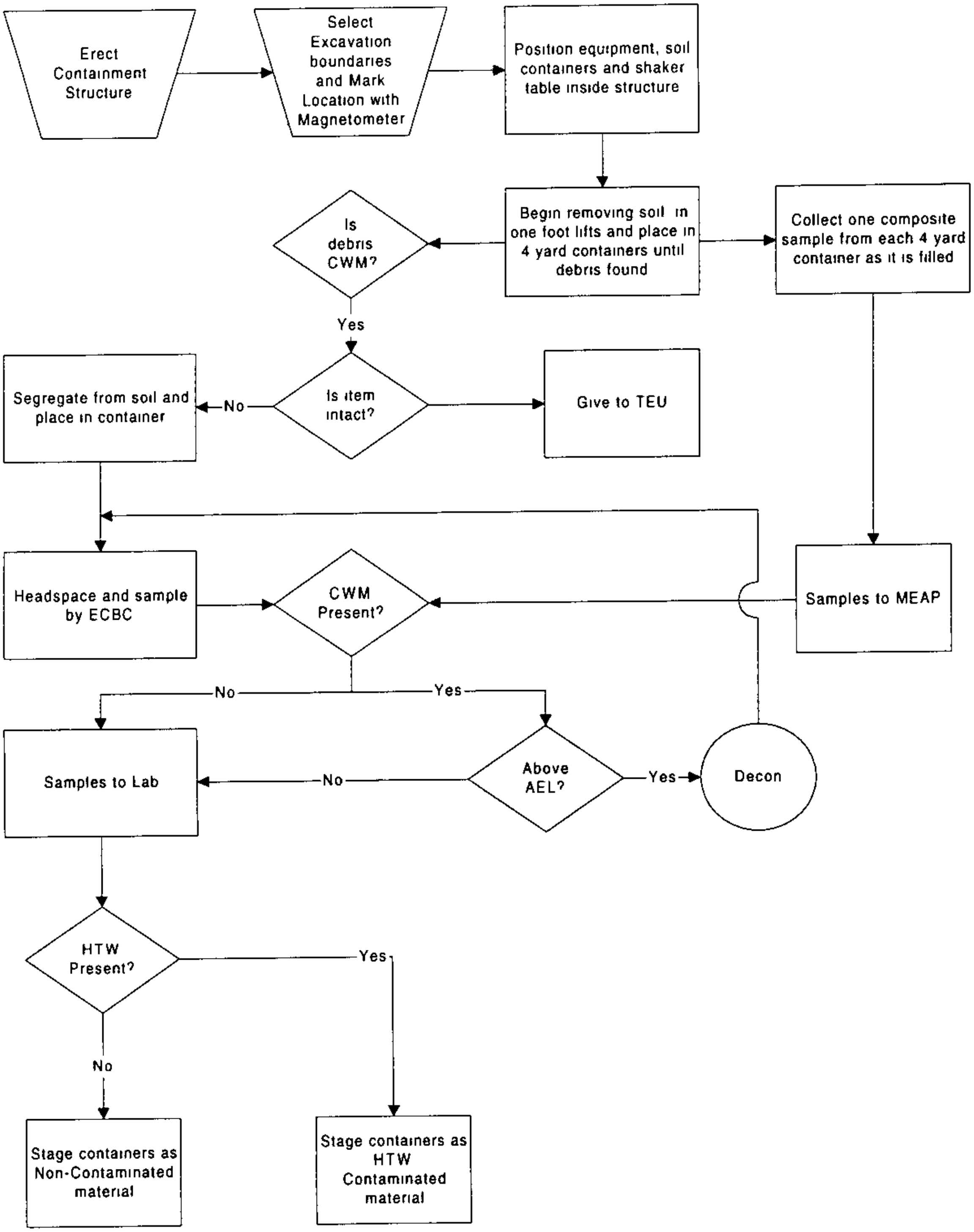


Figure WP 3-2A

Site 24A Flow Diagram

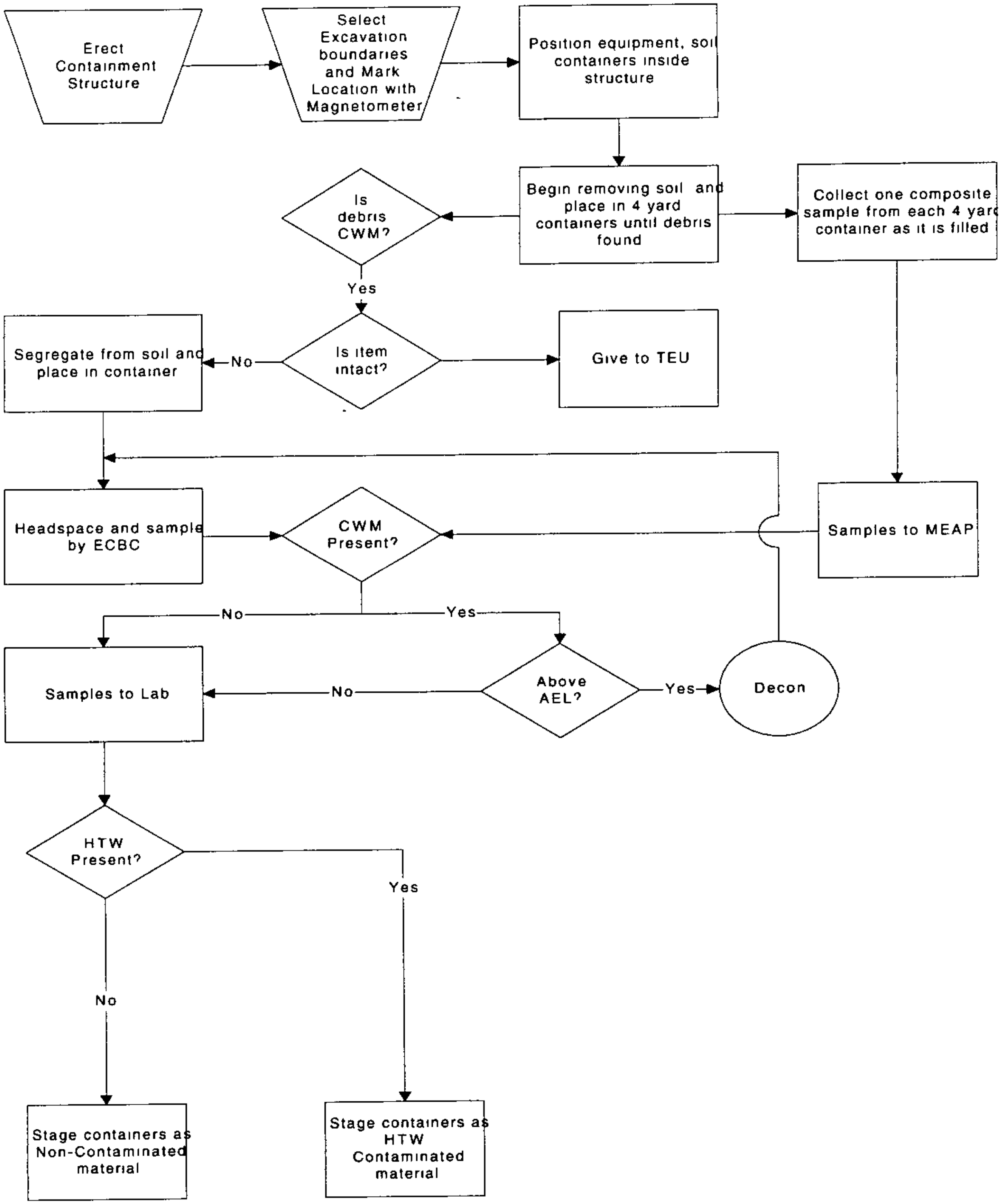
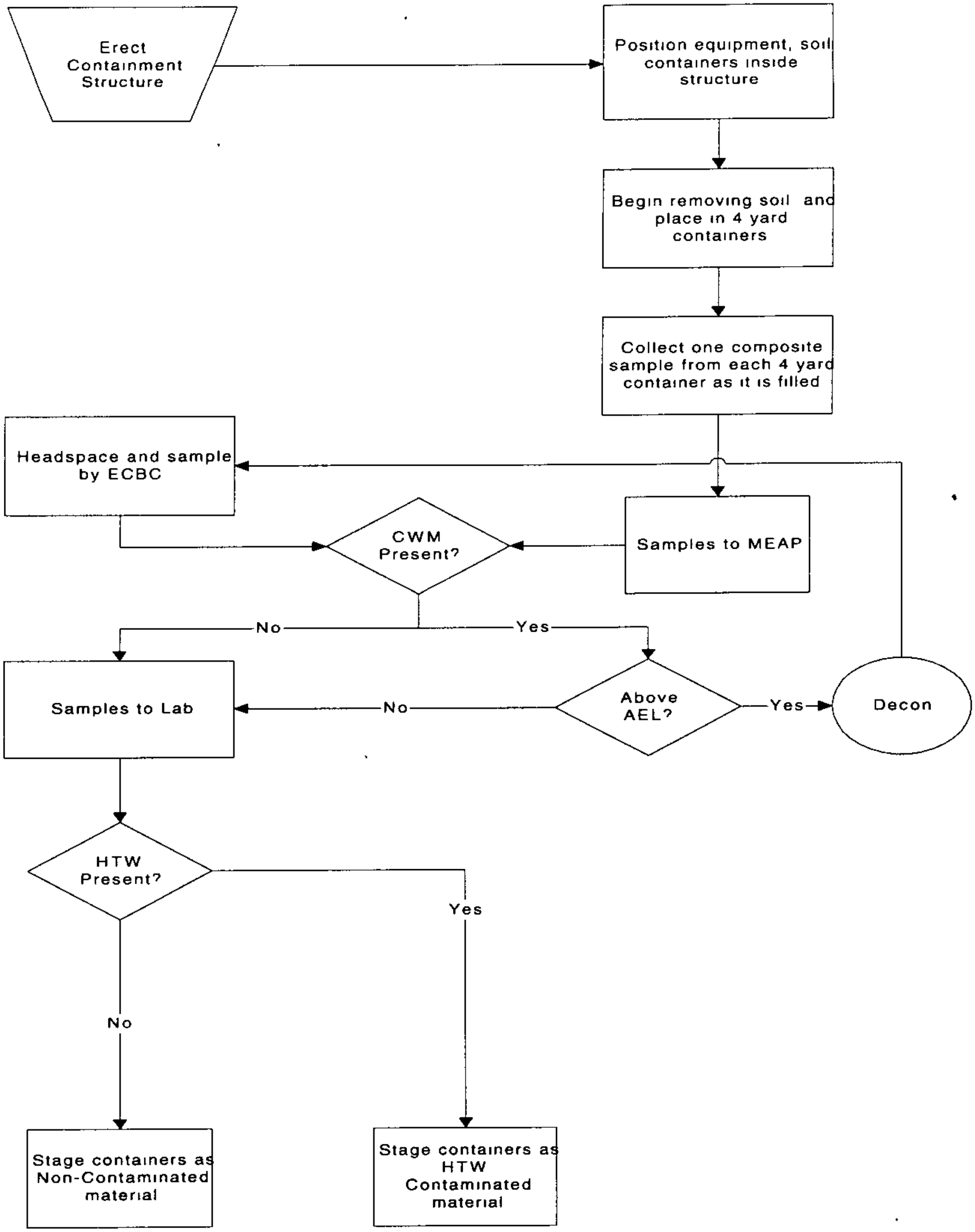
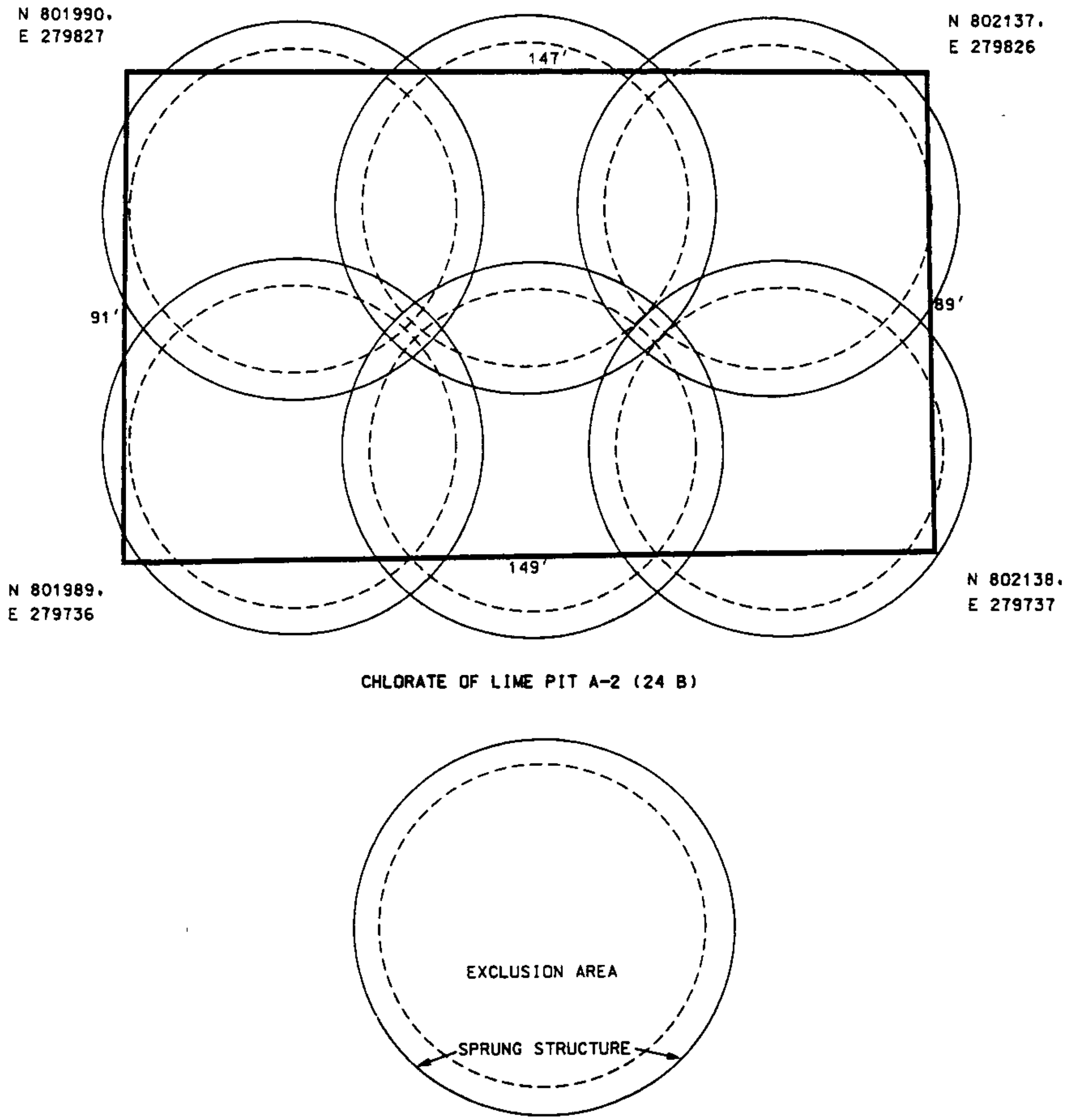
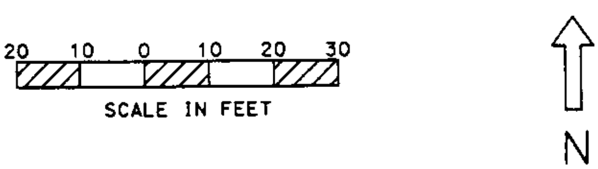


Figure WP 3-2B

Site 24B Flow Diagram







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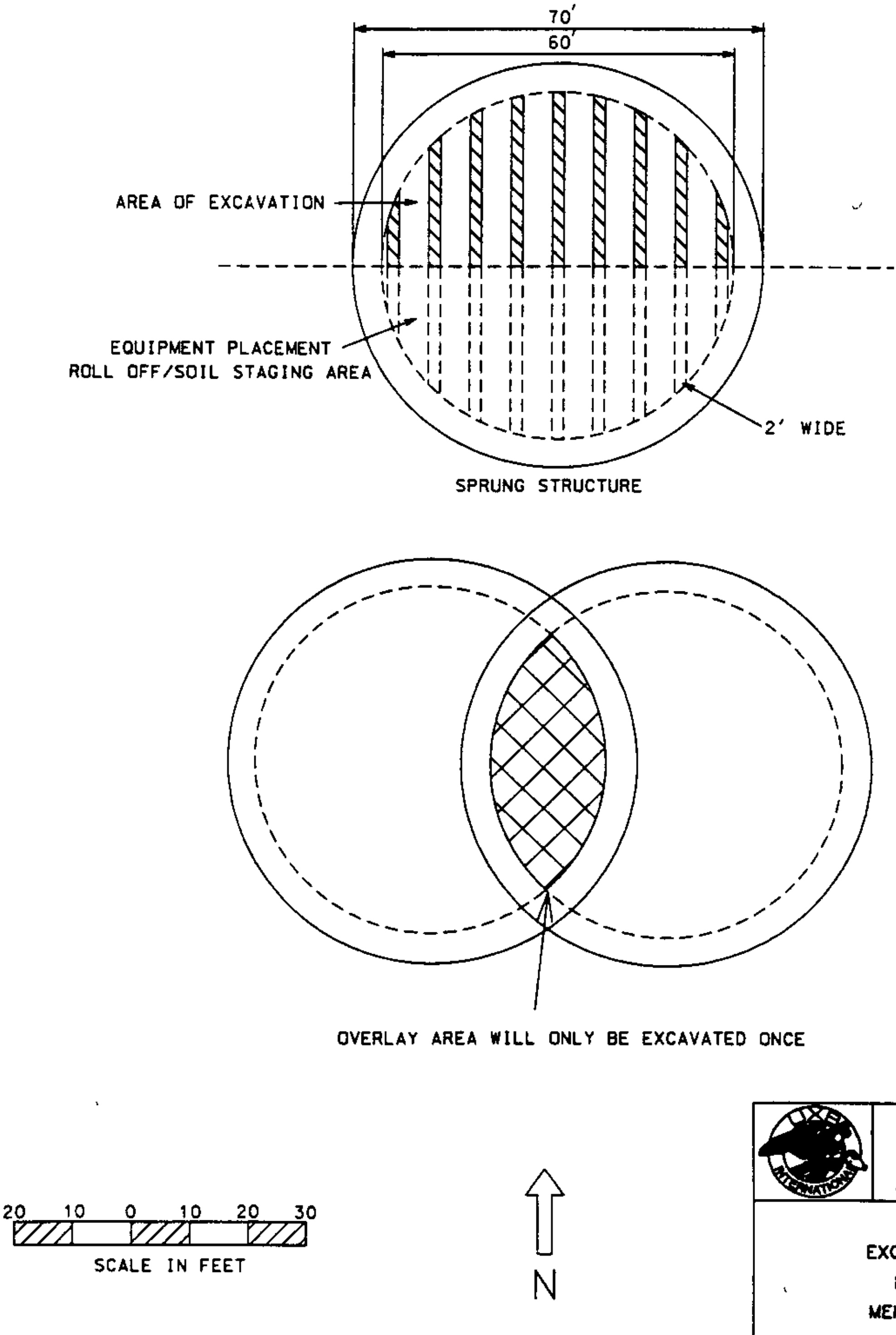
Ashburn, VA 20147-6002

SITE 24B STRUCTURE PLACEMENT
AND EXCAVATION APPROACH
MEMPHIS DEPOT
MEMPHIS, TENNESSEE

Scale: 1" : 30' | Figure WP 3-3



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SITE 24B

EXCVATION APPROACH

MEMPHIS DEPOT

MEMPHIS, TENNESSEE

Scale: 1" = 30'

Figure WP 3-4

TABLE WP 3-1
PERSONNEL REQUIREMENTS FOR OPERATIONS CONDUCTED WITHIN THE FILTERED-AIR CONTAINMENT STRUCTURE

Operation	Personnel Requirements
Site Management	1 Project Manager 1 Senior UXO Supervisor 1 Site Safety and Health Officer (SSHO) 1 Quality Control (QC) Specialist
PDS*	1 UXO Supervisor 1 UXO Specialist
EPDS*	1 UXO Specialist
(Emergency Rescue/Backup)	1 UXO Specialist/EMT
Excavation Operations*	1 UXO Supervisor 1 UXO Specialist (Equipment Operator) 1 TEU Technician (Observer/Spotter_
Screen/Shaker Table Operations*	1 TEU Technician 1 UXO Specialist
Scrap Management	1 UXO Specialist 1 Laborer
Support Operations	1 Material/Logistics Specialist 3 Security Guards

**To enhance operations and crew sustainability, personnel will be rotated through these positions, commensurate with personal qualifications and capabilities.*

EMT	Emergency Medical Technician
EPDS	Emergency Personnel Decontamination Stations
PDS	Personnel Decontamination Station
TEU	Technical Escort Unit (there will be 5 TEU personnel on site rotated through these positions.)
UXO	Unexploded Ordnance

Table WP 3-2
Site Monitoring/Schedule Action Plan

Contaminant/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibiliy	Monitoring Frequency	ActionLevel	Actions to be Taken
Mustard (H)	MINICAMS	SBCCOM	Continuous monitoring during intrusive soil or earth moving operations, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up.	0.003 mg/m^3	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B
	DAAMS Tubes	SBCCOM	Tubes changed each hour, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up	0 003 mg/m^3	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B.
Lewisite (L)	MINICAMS	SBCCOM	Continuous monitoring during intrusive soil or earth moving operations, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up	0.003 mg/m^3	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B.

Contaminant/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibiliy	Monitoring Frequency	ActionLevel	Actions to be Taken
	DAAMS Tubes	SBCCOM	Tubes changed each hour, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up	0.003 mg/m^3	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B
Phosgene (CG)	Auto Step Plus	SBCCOM	Continuous monitoring during intrusive soil or earth moving operations, TEU assessment, soil decontamination, unknown identification, and project set-up.	0 05 ppm	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B.
Chloropicrin (PS)	Draeger Tube	SBCCOM	Tubes changed each hour, TEU assessment, soil decontamination, unknown identification, and project set-up.	0 1 ppm	Evacuate the area and report reading to CEHNC Follow procedures outlined in Tables 3-2, 3-2A, and 3-2B
Organic Vapors	Direct reading FID	SSHO	One per each compliance Sample (Work Plan 3.12 8)	>5 ppm in BZ for more than 5 minutes	Evacuate area and evaluate PPE Inform CIH to evaluate sampling

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Contaminant/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibiliy	Monitoring Frequency	ActionLevel	Actions to be Taken
LEL/ Oxygen/ Carbon Monoxide	Combination Combustible Gas Indicators (CGI)/Oxygen Monitor/ Carbon Monoxide/ H_2S	SSHO	During intrusive work, TEU assessment, soil decontamination, unknown identification, and project set-up.	Any alarm	Evacuate area and evaluate PPE Inform CIH to evaluate sampling
Dust	MINIRAM	SSHO	Continuously during soil moving operations	2 5 mg/m^3 5 0 mg/m^3	Dust suppression using water Increase PPE to Level C with HEPA filter
Noise	Noise Dosimeter	SSHO	During operation of machinery or heavy equipment	85 dBA, 8 hr TWA	Wear issued hearing protection

Z breathing zone
CIH certified industrial hygienist
TBD to be determined
TWA time-weighted average

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Table WP 3-3
HAZARD EXPOSURE MONITORING REQUIREMENTS BY TASK

Task	Chemical or Hazard to be Monitored	Monitoring Equipment	Monitoring Responsibility
Site Preparation	Heat/Cold Stress	Thermometer	SSHO
Sprung Structure Installation	Heat/Cold Stress	Thermometer	SSHO
Filter Assembly – Install, Move, Remove	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
Filter Assembly – Exchange Filter Elements	Heat/Cold Stress	Thermometer	SSHO
Set-up of Shaker Table	Heat/Cold Stress	Thermometer	SSHO
Site Management	Heat/Cold Stress	Thermometer	SSHO
Glove Box Sampling	Mustard (H) Lewsite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress	MINICAMS/DAAMS MINICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM
Soil Sampling	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress Dust	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer MINIRAM	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO SSHO
Intrusive Excavation	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor	SBCCOM SBCCOM SBCCOM SBCCOM SSHO

Task	Chemical or Hazard to be Monitored	Monitoring Equipment	Monitoring Responsibility
	Heat/Cold Stress Dust Noise	Thermometer MINIRAM Noise Monitor	SSHO SSHO SSHO
Sifting Operations	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress Dust Noise	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer MINIRAM Noise Monitor	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO SSHO SSHO
Field Monitoring	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
Segregation of CWM	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
Emergency Response/Personnel Rescue	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) LEL/O_2/ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
HazCAT	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS)	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube)	SBCCOM SBCCOM SBCCOM SBCCOM

Task	Chemical or Hazard to be Monitored	Monitoring Equipment	Monitoring Responsibility
	$LEL/O_2/$ CO Heat/Cold Stress	Combustible Gases Combination Monitor Thermometer	SSHO SSHO
Monitoring of Investigative Waste, Soil, and Debris, and Scrap Metal	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) $LEL/O_2/$ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
Pretreatment of Investigative Waste, Soil and Debris, and Scrap Metal	Mustard (H) Lewisite (L) Phosgene (CG) Chloropicrin (PS) $LEL/O_2/$ CO Heat/Cold Stress	MINICAMS/DAAMS MINNICAMS/DAAMS Auto Step Plus Colorimeteric (Draeger tube) Combustible Gases Combination Monitor Thermometer	SBCCOM SBCCOM SBCCOM SBCCOM SSHO SSHO
Disposition of Investigative Waste, Soil, and Debris, and Scrap Metal	Heat/Cold Stress	Thermometer	SSHO
Personnel Decontamination Station	Heat/Cold Stress	Thermometer	SSHO
Excavation Backfill	Heat/Cold Stress	Thermometer	SSHO
Conventional UXO Disposal	Heat/Cold Stress	Thermometer	SSHO
Disposal of UXO and Related Scrap	Heat/Cold Stress	Thermometer	SSHO
Transportation of Explosives	Heat/Cold Stress	Thermometer	SSHO
Transportation of UXO	Heat/Cold Stress	Thermometer	SSHO
Project Close-out/Demobilization	Heat/Cold Stress	Thermometer	SSHO

TABLE WP 3-4
DECONTAMINATION SOLUTIONS FOR SAMPLING EQUIPMENT

CONTAMINANT OF CONCERN	FIRST WASH	SECOND WASH
Mustard (H)	5% Bleach Solution	Hot Soapy Water
Adamsite (DM)	5% Bleach Solution	Hot Soapy Water
Phosgene (CG)	Hot Soapy Water	Hot Soapy Water
Choropicrin	5% Bleach Solution	Hot Soapy Water
All Others	Hot Soapy Water	Hot Soapy Water

WP Table 3-5

Calculation With No Filtered Shelter

Locaton	Hight Mix Layer	Type Munition	Agent	Type of Release	Stability	Windspeed MPS	Source Strength	Temp (DF)	Type of Surface	Time of Evap (min)	1% Lethality (M)	No Deaths (M)	No Effects (M)
NDF	750	Non	HD	Evp	D	1	5 Gal	DF70	Gravel	30	2	4	71
NDF	750	Non	HD	Evp	D	1	5 Gal	DF75	Gravel	30	3	5	82
NDF	750	Non	HD	Evp	D	1	5 Gal	DF80	Gravel	30	4	6	93
NDF	750	Non	HD	Evp	D	1	5 Gal	DF85	Gravel	30	5	8	106
NDF	750	Non	HD	Evp	D	1	5 Gal	DF90	Gravel	30	6	10	121
NDF	750	Non	CG	Ins	D	1	40 ml	DF70	Gravel		16	18	132
NDF	750	Non	CG	Ins	D	1	40 ml	DF80	Gravel		16	18	132
NDF	750	Non	CG	Ins	D	1	40 ml	DF90	Gravel		16	18	132

NOTES:

1. 1 MPS equals 2 2 mile per hour windspeed
2. The site MCE (Maximum Credible Event) is 5 gallon HD with a evaporative release over a period of 30 minutes or 40 milliliters of CG with instantaneous release.
3. The No Significant Effects Distance (NOSE) for this site is 121 meters for HD and 132 meters for CG.

Stability factor of D is a neutral condition in atmospheric activity. This, coupled with a wind speed of 1 meter per second, will generally constitute the least favorable weather conditions for daylight operations.

Attachment WP 3-1

Intrusive Excavation Plan

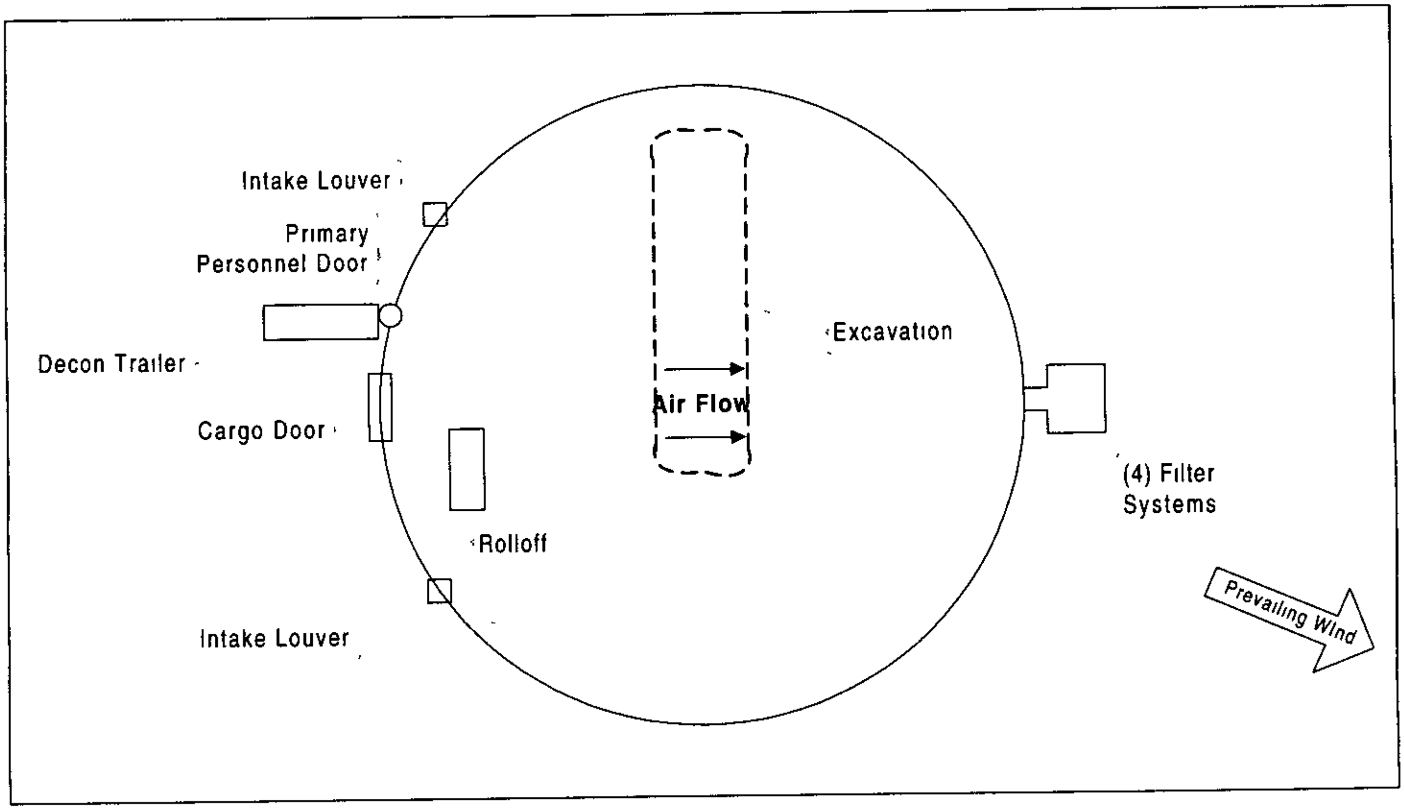
Filtered-Air Containment Structure Specifications

A.1.0 Introduction

A.0.1.1. For this project, UXB will use a structure manufactured by Sprung Instant Structures, Inc. (Sprung). Sprung has a proven record in providing structures for similar projects. The structure will measure 70' in diameter and 32' in height in order to provide adequate working areas under the structure. Refer to **Figure 1** for a drawing of this structure. The required air-flow for this structure can be supported with four filter assemblies containing 24 filter banks.

Figure 1

70' Round Structure



A.0.1.2. This approach requires the movement of the structure in order to ensure coverage over the entire burial trench. To assure that the containment structure can be placed in contact with the ground at all areas of the circumference, a limited amount of soil and debris removal will be performed. The materials to be removed have previously been moved by another contractor using mechanical equipment.

Therefore, the materials should pose no threat of CWM release UXB will perform the removal operations in preparation for containment set-up in modified level D. All CWM and industrial chemical monitoring will be performed during this operation as indicated in the SSHP. After excavating the first siting of the structure, excavation can commence in subsequent sittings as the previous excavation is backfilled

A.0.1.3. The ultimate size of the structure is predicated on the number of filter banks within the filter assemblies required to provide six air changes per hour of the volume within the structure The goal is to maximize the size of the work area inside the structure while minimizing the number of filter assemblies required to move the air within the structure. Refer to Appendix B of Section 2.0 for a detailed discussion pertaining to the filter assembly that will be used for this project.

A.1.1. Calculations

A.1.1.1. The process of determining the number of required filter banks requires three calculations. These calculations involve determining the:

- Total volume of the structure.
- Required air flow in the structure.
- Number of filter banks.

A.1.1.1.1. Volume of Structure

A.1.1.1.1.1. In simplistic terms, the volume of the proposed structure is calculated by adding the volumes of a cylinder and a cone. The volume of the structure is measured in cubic feet (ft^3). This calculation is shown below. However, this calculation is complicated due to the construction and configuration of the structure. As designed by Sprung, the 70' round structure has an air volume of 73,000 ft^3.

Volume of Cylinder = $\Pi \times radius^2 \times height$

Volume of cone = $\underline{\alpha\Pi \times radius^2 \times height}$

Volume of structure

A.1.1.1.1.2. Air Flow

A.1.1.1.1.2.1. The required air flow inside of the structure is calculated based on the volume of the structure. The required air flow is measured in cubic feet per minute (CFM).

$$CFM = \frac{\text{volume of structure}}{10}$$

(where 10 = 60 minutes divided by 6 air changes per hour)

A.1.1.1.1.3. Number of Filter Banks

A.1.1.1.1.3.1. The number of filter banks required is calculated based on the required air flow within the structure. The number of filter banks is rounded up to the nearest whole number.

$$\text{Number of filter banks} = \frac{\text{CFM}}{417}$$

(where 417 = the required CFM capacity of one filter bank)

A.1.3. Table 1 summarizes the relevant technical information pertaining to this structure.

Table 1

Summary of Technical Specifications

Criteria	Specifications
Dimensions (L x W x H)	70' x 32'
Assembly Time (days)	4
Disassembly Time (days)	2
Volume (cubic feet)	73,000
Required Air Flow (CFM)	7,300
Filter Configuration	4 – 3x6, providing 7,506 CFM
Ground Area (square feet)	3,848
Moves Required to Complete Excavation	Minimum of 4; Maximum of 5
Total Time Required for All Movements (days)	5
Delay Required for Backfilling Prior to the Final Excavation Session	None

A.2.0 Structural Members

A.2.1. The structural members of the filtered-air containment structure are 5" x 8" I Beam sections that are manufactured of Alloy 6351. Alloy 6351 is a heat-treatable aluminum-silicon alloy to which manganese has been added to improve its fatigue and impact properties. Alloy 6351 is the most widely used alloy for structural shapes, having good mechanical properties, corrosion resistance, and extrudability. It finds use in general structures, architectural items, road vehicles and railway rolling stock, ships, pipelines for air, water, oil, and gasoline.

A.2.2. Assembling the structure is relatively easy using a scissors-type lift, a crane, and specialized hand tools (supplied by Sprung). Under the supervision of a Sprung technician, a crew of nine can assemble the structure (I Beams and skin) at the rate of 2,000 square feet per day.

A.3.0 Fabric

A.3.1. A polyester scrim mesh and blackout layer are sandwiched between two layers of PVC. The sandwich effect produces an opaque fabric that is utilized as the skin of the structure (UXB will provide artificial lighting for the interior of the structure.) The skin is attached to the outside of the I Beams by means of integral roping that is held in place by fabric retainers bolted to the I Beams. Fabric also covers all interior metal structural members. In the event the fabric becomes contaminated, it will be disposed of as contaminated waste at the completion of the project.

A.3.2. Sealing the structure is accomplished with a series of sand bags and base plates that will hold the skin to the ground at the base of the structure.

A.3.3. **Table 2** provides technical specifications of the fabric. **Table 3** details various fire and toxicity ratings of the fabric.

A.4.0 Personnel Doors

A.4.1. The main personnel entrance/exit will consist of a set of double personnel doors which are fitted with weather stripping and a rubber sweep at the sill. Doors are equipped with panic hardware and compression door closure fixtures. The structure will also contain 3 emergency exit doors equipped with the same features as the main personnel doors. Each door measures 3 feet wide and 6'8" tall and is constructed of 20 gauge galvanized steel. Doors will be fitted into an aluminum frame that is attached to the structure's fabric with a channel frame which completes the seal of the structure.

A.5.0 Cargo Door

A.5.1. The structure will contain a double side sliding cargo door that will provide access for oversize equipment such as the backhoe. Each cargo door will measure 9'6" wide and 10' tall The door frame slides on a horizontal track at the top and along wheels along the bottom. Once closed, a neoprene seal completes the overall seal with the structure.

A.6.0 Intake Louvers

A.6.1. The structure will contain two standard Sprung intake louvers that will provide fresh air for the inside of the structure Both louvers will measure 2 feet tall and four feet in width and will be located approximately one diameter from the filter assembly intake. UXB will ensure that the intakes will remain clear of obstacles and that no fume producing equipment will operate in the vicinity of the louvered intakes. The louvers will seal shut if the air filtration system shuts down or is turned off. Two pictorial presentations for a standard louver are included at the end of this appendix

Table 2

Fabric Specifications

Base – Type	Polyester
Finish Coated Weight; Method 5041/F.S. 191	+2 18 – 1 oz/square yard
Surface Protection	Acrylic Top Coating
Tear Resistance – (8" x 10"); Method 5134	85/90 pounds
Abrasion Resistance (Cycles to Zero Tensile); Method 5304	30,000
Grab Tensile; Method 5100	260/250 pounds
Adhesion – pounds 2"	15
Hydrostatic Resistance; Method 5512 (Average)	383 psi
Thickness – Mils (0.001"); Method 5030	25
Cold Crack; Method 5874	Pass -30°F
Resistance to Fungus and Microbial Attack; Method ASTM-6-21-75	Pass
Resistance to UV and Weathering; Method QUV	Pass 1,000 hours
Flame Resistance; Method 5903	Pass 2 second flameout California Fire Marshal Registration UL214.NFPA-701

Table 3

Fire and Toxicity Ratings

Agency	Method	Result
California Fire Marshal	Small & Large Scale	Pass (Registration #F-365.01)
National Fire Protection Association – 701	Small & Large Scale	Pass
Underwriters' Laboratories	214	Pass
Canvas Products Association International	84	Pass
Federal Standards 191	5903	4.0 sec. Max./4.5 in. max.
ASTM (Burn Rate)	D653	Zero Burn Rate
ASTM (Smoke Density)	D2843	39
ASTM (Self Ignition Temp)	D1929	840 F
U.S. Testing Co. Combustion Toxicity Procedure		Slightly less toxic than red oak
ULC S109		Pass
UBC 31-1		Pass

A.7.0 Filter Assembly Opening

A.7.1. The structure will contain an opening through which the filter assembly can be attached. This opening will consist of upper and lower spreader bars as well as flashing and sealing that will provide a weather and air tight seal. The filter assembly will contain a manometer to determine the negative pressure within the filter structure and containment structure. The manometer will be inspected and the reading logged at least 3 time per day. The filters will be changed in accordance with the manufacturers instructions to maintain proper negative pressure and residence time.

A.8.0 Lifting Hooks

A.8.1. Two lifting hooks are required for each full arch, one hook for each end of the arch. Each lifting hook is fully attached around the I-beam, thus providing lifting points to move the structure.

Attachment WP 3-2

Intrusive Excavation Plan

Specifications for Transportable Carbon Filter System

1.0 Introduction.

1.1 The Transportable Carbon Filter System (TCFS) shall include an inlet damper, transition, pre-filter section, HEPA filter section #1, carbon filter section #1, Mini Cam sample port section #1, carbon filter section #2, Mini Cam sample port section #2, HEPA filter section #2, transition, outlet damper, and fan set. The entire assembly shall be skid mounted, designed for a low profile, minimum size and minimum weight, and be configured for ease of transportation by a prime mover for field use.

1.2 The system shall be sized for 2500 cfm operation. The complete system specified in this document shall not exceed 27 feet in length, 76 inches in height, and 60 inches in width. Figure 1 gives an example of how the system may look.

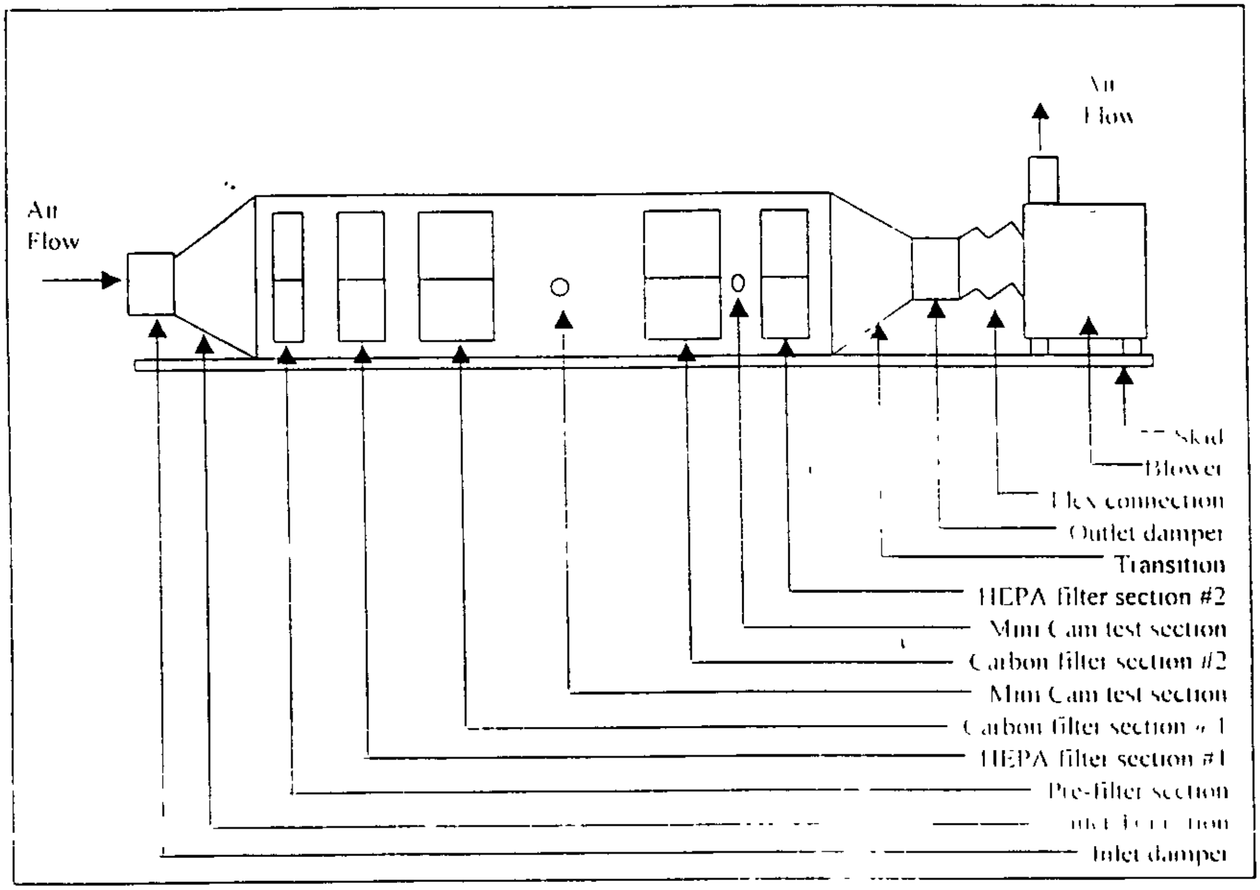


Figure 1 – Filtration System Example

1.3 Source power for the TCFS will be 3ϕ, 220 VAC.

1.4 Inlet and outlet damper specifications are as per section 2. Filter housing and transition specifications are as per section 3 Carbon filter specifications are as per section 4. Pre filter specifications are as per section 5 HEPA filter specifications are as per section 6. Fan set specifications are as per section 7

2.0 Inlet and outlet damper specifications.

Dampers shall be a positive seal, isolation type and shall not exceed a leakage rate of .015 cfm/inch of circumference of blade at 10 inches water gage. The design pressure of the damper shall be 10" water gage. Damper housings shall be cylindrical and constructed of 10 ga , T-304 stainless steel. Blade shall consist of two 10 ga. T-304 stainless steel plates with a silicon seal gasket between them Blade seal shall occur when the silicon gasket seals against the inside of the 10 ga Housing wall Blade seal to be field adjustable and replaceable. The damper shall be all weld design. All pressure retaining weld joints and seams shall be continuously welded. As a minimum, all weld joints and seams shall be wire brushed and/or butted to remove heat discoloration, burrs and sharp edges All welding procedures, welders and welder operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX

Standard Construction

Flanges: Minimum of 1 ½ " wide. Factory drilled bolt holes (1/10 " diameter) shall be no more than 4" apart as recommended in ERDA 76-21 "Nuclear Air Cleaning Handbook"

Frame: 10 ga. (minimum) T-304 stainless steel.

Shaft and Linkage Components: All components of the blade are manufactured from 300 Series stainless steel. Shafts are ¾ " diameter (minimum) stainless steel rod with self-lubricating TFEE lined filament wound bearings mounted external to the damper frame with o-ring shaft seals

Manual: Manual actuator shall be a ¼ turn worm geared actuator with handwheel. Actuator has aluminum base and cover. Rated output torque shall be 2,000" pounds with a gear ratio of 30:1. Actuator shall be fully lubricated and self locking to hold in any position.

Damper shall be manufactured under a quality assurance program that addresses the requirements of ANSI/ASME NOA-1 "Quality Assurance Program Requirements for Nuclear Facilities. All production welds shall be visually inspected per BSC's standard procedure number "Visual Inspection of Welds", which incorporates the workmanship acceptance criteria described in sections 4 and 5 of AWS D9.7., "Specification for Welding of Sheet Metal". The damper blade shall be tested in the closed position at 10" water gage by the "Pressure Decay Method" in accordance with ANSI/ASME N-510-1980, "Testing of Nuclear Air Cleaning Systems". Blade shall not exceed leakage rate of 0.015 cfm/inch of circumference of blade. The complete pressure boundary (damper housing) shall be tested the same as the blade, except the maximum leak rate shall be 0.005 cfm/sq. ft. of housing surface

3.0 Filter housing and transition specifications.

The top and bottom panels shall be manufactured from minimum 14 ga. Type 304 stainless steel with 2-B mill finish. The front and back panels shall each be constructed from a single piece of minimum 12 ga. type 304 stainless steel with 2-B mill finish. Each housing shall be a side servicing bank-type arrangement. All seams and joints shall be welded and free of any sharp edges. All welds and welders shall be qualified in accordance with section IX of the ASME boiler and pressure vessel code. Welding procedures and personnel qualification reports shall be submitted to insure compliance with the requirement in accordance with section IX of submitted to insure compliance with the requirement in accordance with section IX of the ASME boiler and pressure vessel code. Welding procedures and compliance with the requirement in accordance with section IX of the ASME boiler and pressure vessel code The filter housings shall be reinforced to withstand +/- 10" w.g.

The pre-filters, HEPA filters and carbon adsorbers shall be contained in bag-in/bag-out housings which shall be designed and constructed in accordance with the intent of ANSI-N509-1980

Housings with two or more filter elements per tier shall have a filter removal rod to draw the filters toward the opening to facilitate bagging-out. The filter removal rod shall be operated through the filter change-out bag

All mechanical components of the filter-locking mechanism shall be stainless steel except for a brass travel nut. The locking mechanism shall be located downstream of the filter elements. Filter elements are secured in place with top and bottom locking mechanisms, which are spring loaded to exert a sealing force of 1400 lbs. per filter element, applied as an even uniform load along at least 80% of the top and bottom of each filter element frame.

The housing shall have a removable access door for each tier of HEPA filters, carbon absorbers and a separate access door for the pre-filter. There shall be four access door retainers which secure the door in place.

<u>Static Pressure Ports</u>

Static pressure ports shall be located on top of the filtration system: upstream and down stream of each bank of filter elements. Static pressure ports shall be ¼" NPT coupling with plug. Static pressure ports shall be of the same type material as the filtration system construction.

<u>DOP/Freon Test Ports</u>

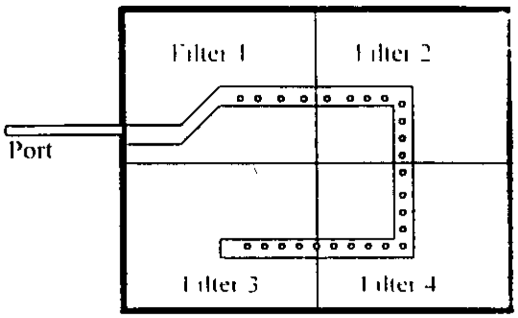
DOP/Freon test ports shall be ¾" NPT coupling with plug. One DOP/Freon test port shall be located on top of the filtration system, upstream of the filter bank, for upstream sampling. Two additional DOP/Freon test ports shall be provided for field installation into the duct work. One port will be used for DOP/Freon injection and one port will be used for downstream sampling. DOP/Freon test ports shall be of the same type material as the filtration system construction.

<u>Mini Cam Test Ports</u>

Mini Cam test ports shall be located on the side of the filtration system. The first sample line will be located between the first and second carbon filter banks. The second will be located between the second carbon filter bank and the second set of HEPA filters.

The test ports shall be made of a stainless steel tube that extends 2" out of the TCFS. The section outside the filtration system shall have a ¼ " O.D

The section of tube inside the TCFS shall have a ½ " O.D. (also made of stainless steel). The tube will be perforated on the upflow side with 1/16" holes, centered on the tube, spaced ½ " apart, for the entire length The tube shall be situated as to allow for sampling of all filters' throughput. Figure 2 illustrates an example of this:



Cross section of filtration system

Figure 2 – Mini Cam Sample Port Example

The port shall be removable (for example, tapped and threaded), with a plug to allow for the use of the TCFS without the sampling port in place.

Magnehelic Gauge

Magnehelic gauges shall be located on top of the filtration system and connected to the static pressure ports upstream and downstream of each bank of filter elements. For outdoor applications the Magnehelic gauges shall be mounted in enclosed panels.

Filter Element Changeout Table

A filter element changeout table shall be provided. It shall be adjustable and attach to the access door retainers after the door has been removed.

Reinforced and Drilled Flanges

The upstream and downstream flanges of the filtration system shall be reinforced to a minimum thickness of ¼". 7/16" diameter holes shall be drilled in the upstream and downstream flanges of the filtration system with a maximum spacing of 4" center

Minimum Leak Test

The filtration system pressure boundary and filter element sealing surface shall undergo factory testing per ANSI-N510-1980 to 10" w.g. as specified in table 4 5 of ERDA 76-21, Nuclear Air Cleaning Handbook. Construction: all welded man entry steel housing. Maximum permissible leak rate (percent hosing volume per hour): 0.2%.

Bagging Ring

Each tier of filter elements shall have a bagging ring located behind the access door. The bagging ring shall be hemmed on its outer edge and have two continuous ribs around the perimeter.

Bag-Out Bags and Straps

One bag-out bag shall be provided for each bagging ring located on the filter system. Each bag shall be amber in color, .008 inch thick PVC, with an elastic retaining cord located at the mouth. The stock number of the specific bag shall be located at the retaining cord. Glove sleeves are incorporated into the bag to facilitate filter elements removal One black nylon security strap and one black nylon holding strap shall be provided for each bagging ring located on the filtration system.

Equipment Labels

The filtration system shall have an aluminum, painted label which lists pertinent information, as well as reordering information.

Testing

Housing will be factory tested by the pressure decay method in accordance with ANSI-N510-1980 to 10" w.g. as specified in ANSI-N509-1980, Table 4-4. Each filter position shall be fitted with a blank filter and the filter-to-housing seal shall be tested by the pressure decay method in accordance with ANSI-N-510-1980 to 10" w.g. as specified in ANSI-N-509-1890, Table 4.4.

Lifting Eyes

Lifting eyes shall be provided as necessary on top of the housing The lifting eyes shall be constructed of ½" diameter rod which will be of the same type of material as the filtration system construction

Weather Cover

Weather covers, which will be of the same type material as the filtration system construction, shall be provided on top of each system. Weather covers shall be intermittently welded and sealed with silicone sealant

Test Housing

The filtration aerosol test housings shall be manufactured from minimum 14 ga. Type 304 stainless steel with 2-B mill finish. Each housing shall be designed and constructed in accordance with the applicable sections of ANSI-N509-1980. Housings shall be side servicing bank type arrangement. All seams and joints shall be welded and free of any sharp edges. All welds and welders shall be qualified in accordance with section IX of ANSI/ASME boiler and pressure vessel code. Welding procedures and personnel qualification reports shall be submitted to insure compliance with the requirement in accordance with section IX of the ANSI/ASME boiler and pressure vessel code. The test housing shall be designed and constructed to allow efficiency testing of each filter element and its supporting framework per ANSI/ASME-N510-1980. While in the test position and at 1,000 CFM per filter element, the resistance across each aerosol test housing shall not exceed 20"; in direction of air flow.

Certification of Operation

The manufacturer shall provide a certified test report, from an independent testing organization, that the aerosol test housings provide efficiency testing of each filter element and its supporting framework per the intent of ANSI/ASME-N510-1980.

Bag-Out Housing Welding Specification

All "pressure retaining" joints and seams shall be continuously welded; "non-pressure retaining" joints such as exterior stiffening may be intermittently welded. As a minimum, all weld joints and seams shall be wire brushed/or buffed to remove heat discoloration, oxidation, all burrs, and sharp edges. All welded joints and seams that are a portion of any gasket setting surface, i.e., duct connecting flanges adjacent base metals. All weld joints shall be visually inspected for cracks, crater pits, underfill, incomplete fusion, overlaps, surface porosity, gas pockets, crevices and depressions. All welders, welder operators and welding procedures shall be qualified in accordance with ASME BPV Section IX.

4.0 Charcoal filter specifications.

Carbon modules shall be filled with Type CG11 (Cooperite), 12 x 30 mesh carbon for the removal of military agents and in accordance with ASCZM-TEDA. The manufacturer shall have passed the DMMP test procedures described in of Annex A, Section 7.3 DMMP Breakthrough Life, for four filters in sequence within the past two years for 24" x 24" x 18" filters.

Adsorber cell frame shall be 24" x 24" x 18". The adsorber cell shall be in accordance with Institute of Environmental Sciences, IES-RP-CC-008-84, as modified in Annex A, dated 3 March 1997. Each charcoal filter will provide a resonance time of 0.25.

5.0 Pre-filter specifications.

The pre-filter shall have an average efficiency of 80 to 85%. Flow capacity at 500 cfm shall have a resistance of 0 14" w g. and at 1000 cfm have a resistance of 0.34" w g

The perimeter should be constructed of high strength, corrosion resistant galvanized steel, to which the filter pack is sealed on all sides.

6.0 HEPA filter specifications.

Each filter shall be individually tested and certified by the manufacturer's Q107 penetrometer (or equivalent) to have an efficiency of not less than 99.97% when tested with 0.3 micron thermally generated DOP smoke. Testing to leak-free scan requirements and resistance to air flow are performed per Federal Std. 209-latest issue at nominal rated capacity (CFM). Test results shall be recorded on each filter Clean filter static pressure drop shall be no greater than 1.3" w g. when operated at rated capacity (500 fpm).

Filter media shall be composed of a high alpha, modified matrix, 100% microglass media, waterproofed to withstand a 100% RH factor and shall not contain asbestos. Filters shall be factory constructed using shallow fluted aluminum separators. Adhesive sealers shall be fire retardant flexible urethane

The media pack shall be permanently sealed with a frame of 16 ga., Type 304 stainless steel.

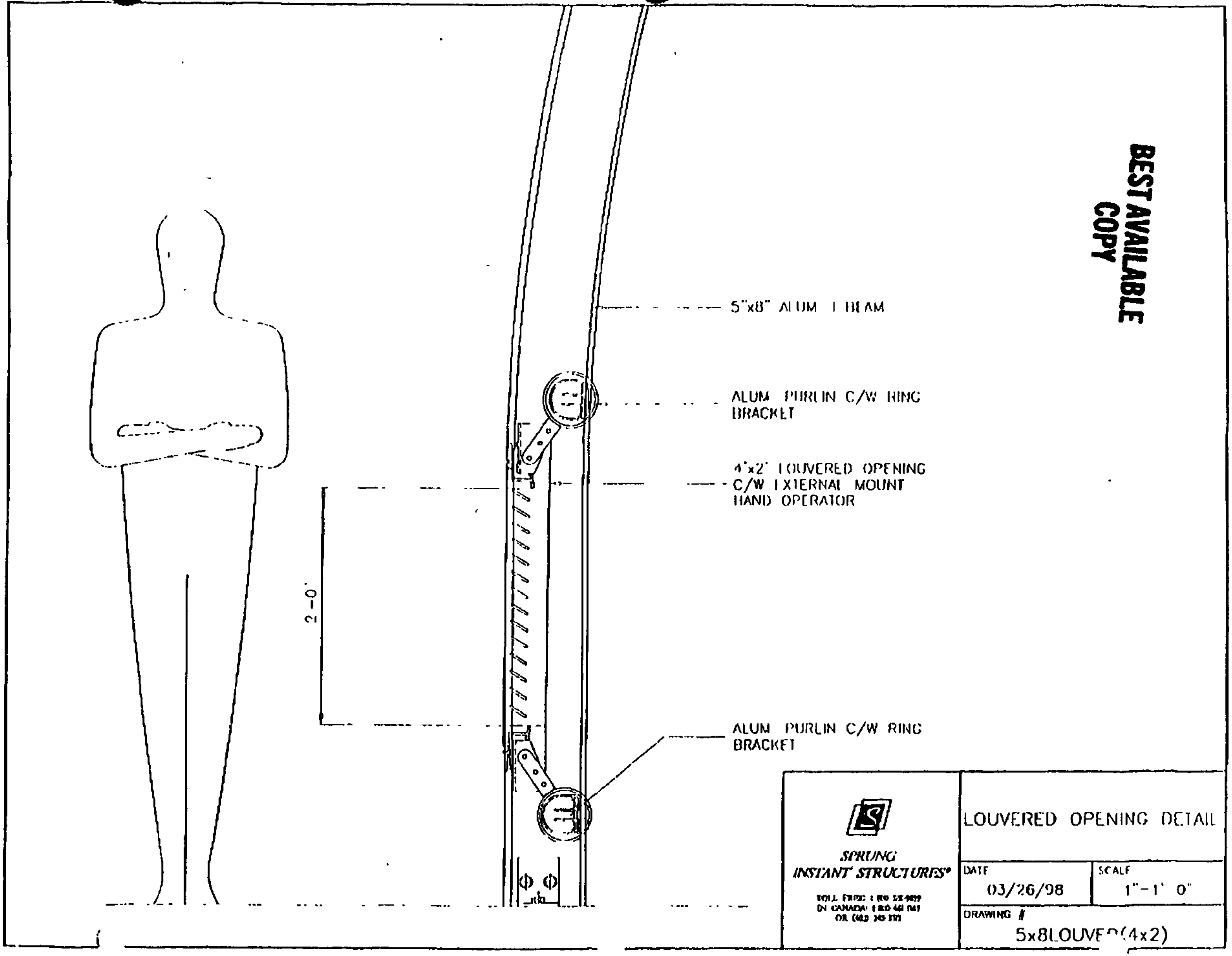
Overall filter dimensions shall be correct to within +0" to −1/8" and squareness to be within 1/8".

Each filter shall be supplied with a permanently affixed dovetailed SCE43 closed cell neoprene gasket on the upstream filter face.

Filters shall be tested and certified to comply with the performance criteria under Federal Std. 209-latest issue. For Type A and C filters.

7.0 Fan set specifications.

The fan will be variable speed so that it can maintain a predetermined flow rate It shall be capable of operating at 2500 cfm during normal operation for the described filtration system.



SPRUNG INSTANT STRUCTURES®

LOUVERED OPENING DETAIL

DATE	SCALE
03/26/98	1"-1' 0"

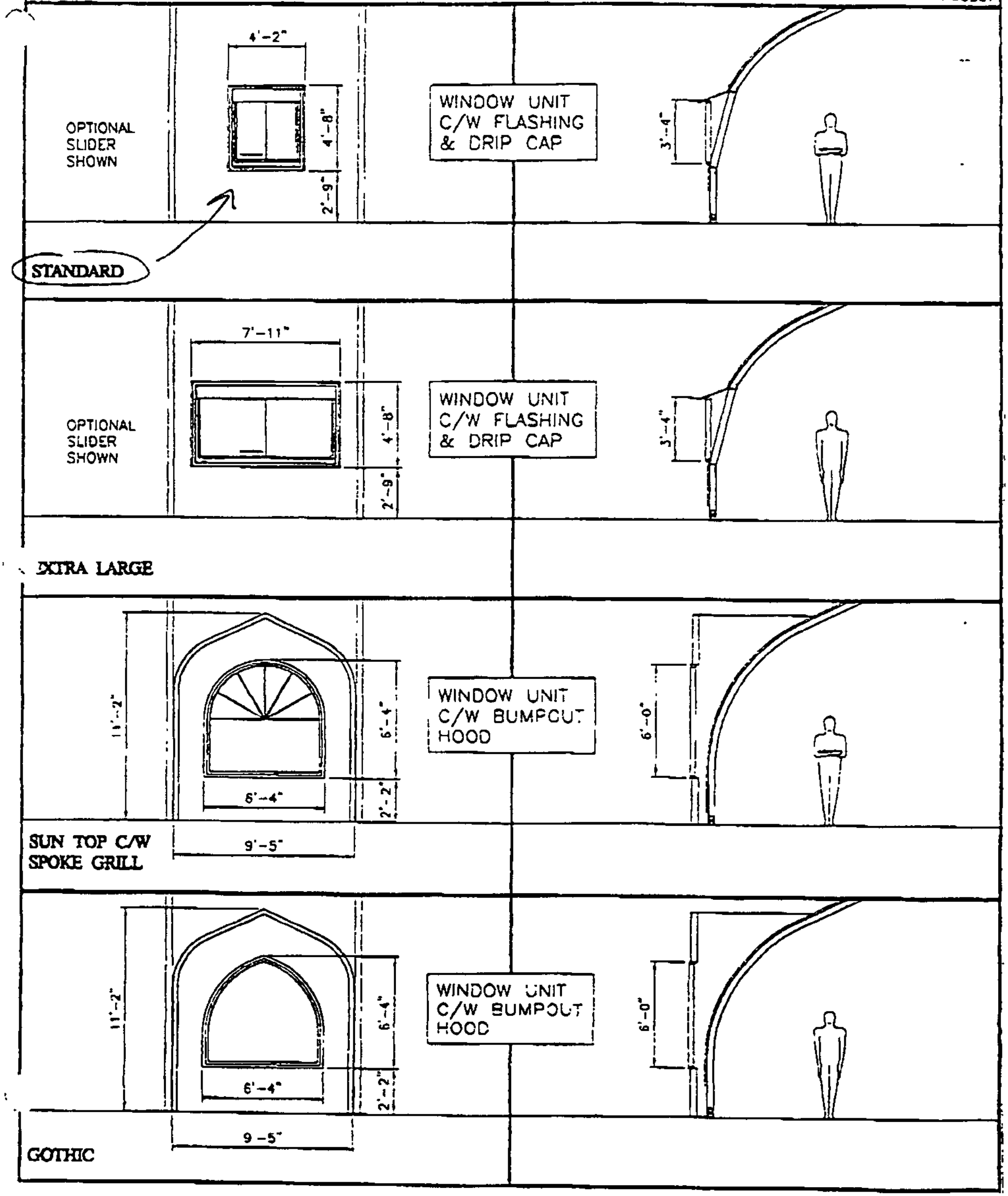
DRAWING #
5x8LOUVER(4x2)

BEST AVAILABLE COPY

SPRUNG INSTANT STRUCTURES®

TEMPERED SAFETY GLASS WINDOWS

P98287



TAB

4. Equipment Plan

4.0 Equipment Plan

4.1.0 Introduction

4.1.0.1 In order to meet the requirements of this chemical warfare materiel investigation/removal action at Dunn Field, former Defense Depot Memphis, Tennessee, it is necessary to control all project resources, to include personnel, facilities, equipment, and materials. UXB shall use the following procedures (as well as those in UXB's *Property Management Policies*) to obtain, maintain, control, and secure procured and leased resources.

4.2.0 Equipment

4.2.1 Description and Quantity

4.2.1.1 Table WP 4-1 lists the field and office equipment required for project operations.

4.2.2 Sources and Rental/Acquisition Costs

4.2.2.1 Table WP 4-2 details the sources and rental/acquisition costs analysis for the required field and office equipment, as well as any sole source justification.

4.3.0 Consumable Supplies

4.3.1 Description and Quantity

4.3.1.1 Table WP 4-3 lists the consumable supplies intended for this project. UXB's approved accounting policy states that indirect costs include "employee welfare costs, which includes employee consumables normally required under normal working conditions." These costs are components of the appropriate fringe benefit pool, i.e.; they are not a direct charge to any specific contract or single, final cost. The Contracting Officer in a letter dated May 21, 1997, approved Table WP 4-3 (Reference: Contract DACA87-97-D-0006 & UXB's Employee Consumables Chart).

4.3.1.2 The Life Cycle Project Manager (LCPM), in coordination with the SUXOS, will establish, monitor, and replenish consumable levels to ensure levels are maintained for continuous operations.

4.3.1.3 The use of consumable supplies will be monitored to provide a record of consumption and an audit trail (UXB Form 1.0043). In ink, the employee will list the item, intended use, and location of use. Supervisors at all levels will assure supplies are consumed only as authorized.

4.3.2 Source and Rental/Acquisition Costs

4.3.2.1 Table WP 4-2 details the sources and rental/acquisition costs analysis for the required consumable supplies, as well as any sole source justification.

Table WP 4-1
Equipment List

	Task 12 - Site Management	Task 3 - Brush Clearing	Task 4 - Intrusive Investigation	Task 5 - Field Monitoring	Task 6 - Investigative Waste	Task 7 - Process Scrap Metal	Task 8 - Conventional UXO Disposal	Task 9 - Engineering Controls	Task 10 - Meetings	Task 11 - Video
SITE OFFICE/EQUIPMENT										
Site Office - portable trailer	1		1							
Storage Trailer	1		1							
Computer and Printer	2		2							
Copier Machine	1		1							
Facsimile Machine	1		1							
Internet Service	1		1							
FIELD EQUIPMENT										
FM Radio, handheld with charger	2		7	1	1	1	1			
Cellular Telephone	2		1				1			
Video Camera										1
Digital Camera	1	1	1	1	1	1	1	1	1	
Shaker Table			1							
Explosives							1			
Demolition Kit							1			
Plastic Sheeting - containment			1	1	1			1		
MK 26 - Magnetometer			2							
Magazine							2			
Pickup, 1/2 Ton 4x4			3	1					4	
Van, Club Wagon, 15 Passenger			1							
Surveyor's Kit/w handheld GPS			1							
Total Station Survey Equip.			1							
Sport Utility Vehicle	2									
Backhoe			1							
Pickup, 4x4, ¾ ton					1	1	1			
Water Truck			1							
Bobcat			1							
Bulldozer and Compactor								2		
Roll-off			5							
Brush Hog		1								
Cherry Picker								1		
Crane								1		
Forklift								3		
Decontamination Trailer			1							
Protective Works							1			
Sprung Structure								1		
Cascade Air System			1							
Equipment Air Lines			5							
SCBA Test/Repair Kits			1							
Autostep Plus				2						
Multi-gas Monitor				2						
MIE Miniram Dust Monitor				2						
Photo Ionization Detector				1						
Sound Meter				1						
Draeger Pump				2						
PortaPotty			2							

Table WP 4-2
Bid Analysis

Item	Qty	Task	Duration		Vendor 1			Vendor 2			Vendor 3			Low Vendor
			weeks	months	Source	Rate	Project Cost	Source	Rate	Project Cost	Source	Rate	Project Cost	
Handheld Radio	7	Task 4	12 5		UXB	20 00	1,750.00	Comm Svc	35 00	2,940.00	Integrated	20.00	1,750 00	-
Handheld Radio	1	Task 5	12.5		UXB	20.00	250.00	Comm Svc	35.00	437.50	Integrated	20 00	40.00	
Handheld Radio	1	Task 6	2		UXB	20.00	40 00	Comm Svc	35.00	70.00	Integrated	20 00	40 00	
Handheld Radio	1	Task 7	4 5			20 00	90.00	Comm Svc	35.00	157.50	Integrated	20.00	90.00	
Handheld Radio	1	Task 8	2			20.00	40.00	Comm Svc	35.00	70.00	Integrated	20.00	40.00	
Cellular phone	1	Task 5	12.5		UXB	50.00	625 00			#VALUE!				UXB
Video Camera	1	Task 11	1		UXB	25.00	25.00			#VALUE!				UXB
Internet Service	1	Task 4	12.5											
Office Trailer	2	Task 4	12 5					Pac-Van	320 00					
Storage Trailer	1	Task 4	12 5					Pac-Van	110.00					
Trailer Setups	3	Task 4	12 5											
EM61	2	Anomoly Location			UXB	525.00	#VALUE!	JD Fett	540.00	#VALUE!	Geonics	595.00	#VALUE!	UXB
Schondstedt	1	Site Management			UXB	40.00	#VALUE!	JD Fett	42.00	#VALUE!	3rd bid unavailable		-	UXB
Schondstedt	1	Quality Control			UXB	40.00	#VALUE!	JD Fett	42.00	#VALUE!	3rd bid unavailable		-	UXB

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Schondstedt	1	Location Surveying and Mapping			UXB	40 00	#VALUE!	JD Fett	42.00	#VALUE!	3rd bid unavailable		-	UXB
Surveyor's Kit w/Handheld GPS	1	Task 4	12.5											
Total Station Survey Set	1	Task 4	12.5		UXB	650.00	8,125.00	JD Fett	667.50	8,343 75	3rd bid unavailable-		-	UXB
Sport Utility Vehicle	2	Task 12	12.5		Budget**		#VALUE!		324 50	8,112.50	Enterprise**		#VALUE!	
Pickup, 4x4 1/2 ton	3	Task 4	12.5		Budget**		#VALUE!		297.00	11,137.50	Enterprise**		#VALUE!	
Pickup, 4x4 1/2 ton	1	Task 5	12 5		Budget**		#VALUE!		297 00	3,712.50	Enterprise**		#VALUE!	
Pickup, 4x4 1/2 ton	4	Task 10	1		Budget**		#VALUE!		297.00	1,188 00	Enterprise**		#VALUE!	
Pickup, 4x4 3/4 ton	1	Task 6	2					Affordable	265.00	530.00				
Pickup, 4x4 3/4 ton	1	Task 7	4.5					Affordable	265.00	1,192.50				
Pickup, 4x4 3/4 ton	1	Task 8	2					Affordable	265 00	530.00				
Van, Club Wgn 15 Passenger	1	Task 4	12 5					Affordable	475 00	5,937.50				
Backhoe	1	Task 4	12.5					Memphis N Holland			United Equipment			
Computer w/Printer	2	Task 4	12 5		UXB	75 00	1,875.00	JD Fett			3rd bid unavailable-		-	
Digital Camera	1	Task 4	12.5		Alpha	85.00	#VALUE!	Smith			ADT@	no quote	-	
Facsimile	1	Task 4	12.5		IKON	50.00	#VALUE!	CMI Bus Products			Texas Ofc Machine	no quote	-	

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Porta-Potty	2	Task 4	12 5		S&S Syst	93 00	2,325 00	Lonestar			OK Pump			
SCBA Set	11	Task 4	12.5					Interspiro	209.00	28,737.50				
Equipment Air Lines	5	Task 4	12 5					Interspiro	181 00	11,312 50				
SCBA Test Kit	1	Task 4	12.5					Interspiro	3,305 00	41,312.50				
SCBA Repair Kit	1	Task 4	12 5					Interspiro	1,000 00	12,500 00				
Containment Structure		Task 9	8					Sprung						
Decon Trailer	1	Task 4	12 5					HAZCO	2,150 00	26,875 00				
Vehicle rentals rates (except for UXB) require the addition of 10% sales tax														
All other rentals rates (except for UXB) require the addition of 6% sales tax														
					**1050 miles included;			**1050 miles included,			**1050 miles included;			
					additional miles @ 30/mile			additional miles @.30/mile			Additional miles @.30/mile			
					* $80 00 charge for deliv & setup						@ only provided quote to purchase			

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Table WP 4-3
Consumables Supply List

Item	Direct Charge	Indirect Charge
Project Consumables		
• Paper/Pens/Pencils • Folders/Staples • Tape/Paper clips	Yes	No
Employee Consumables		
Goggles	No	Yes
Safety Equipment	Items acquired for use on the project site, e.g , fire extinguishers, lightning protection, fencing, explosive storage facilities, etc.	General, UXB owned items
Shoes	See Work Uniforms	See Work Uniform
Gloves	See Work Uniforms	See Work Uniform
Bug/Insect Repellent	Yes	No
Wet Wipes or Pre-Moistened towels	Yes	No
Paper Towels	Yes	No
Toilet Paper	Yes	No
Bottled Water	No, unless greater than 5 non-UXB employees are supported on the project site	Yes
Rain Suits	See Work Uniforms	See Work Uniform
Whistles/Air Horns	Yes, for project use	No
Sunscreen	Yes	No
Poison Ivy/Poison Oak Protection and Cleanser	Yes	No
Clocks	Yes, for project use	No
Boots	See Work Uniforms	See Work Uniform
Cups	No, unless greater than 5 non-UXB employees are supported on the project site.	Yes
Work Uniforms	Level A, B, and C PPE and any other uniform items required due to abnormal site conditions, e.g., daily laundering of coveralls or uniform items due to exposure to poison ivy or oak, special uniform items required on this site, but not normally required on other sites, e.g., composite hard toed work shoes.	Normal UXB logo items, such as T-shirts, sweatshirts, and caps and their normal maintenance

Item	Direct Charge	Indirect Charge
Office Supplies	Yes, for project site supplies and for reproduction of Work Plans, Final Reports, Invoices, etc. performed at UXB Headquarters	Miscellaneous, small office supplies used at UXB Headquarters.
Uniform Maintenance	See Work Uniforms	See Work Uniform
Laundry Items	See Work Uniforms	See Work Uniform
Flashlights	Yes, for project use	No
Batteries	Yes, for project use	No
Shovels/Rakes	Yes, for project use	No
Water Coolers	No, unless used to transport laboratory samples or other non-personnel requirements.	Yes
Keys	Yes for site facilities	UXB Headquarters and UXB owned trucks and equipment
Paint	Yes, for project use	No
Gatorade and electrolytic replacement beverages	No. Per direction of the Contracting Officer, Government personnel are to provide their own beverage	Yes
Ice	No if ice is used for beverages or other personal uses. Yes, if ice is used to package samples or other project related uses.	Yes, if used for beverages or other personal uses. No, if used to package samples or other project related uses.
Field Consumables		
• Sisal string • Wooden stakes • Pin flags	Yes	No

4.4.0 Procurement

4.4.1 Purchase Items

4.4.1.1 Table WP 4-2 details the sources and rental/acquisition costs analysis for the required equipment/supplies, as well as any sole source justification.

4.4.2 Government Furnished Equipment (GFE)

4.4.2.1 There will be GFE for this removal action. The GFE will be administered using the "Approved Property Control System for Government Property, Contract DACA 87-97-D-0006", approved September 8, 1997 by CEHNC's Acquisition Services Division.

4.4.3 General

4 4 3.1 Requests for acquisition of government property shall be made to the UXB Logistics Manager or his designee in writing These requests shall be made by the Life Cycle Project Manager or his designee.

4.4.3.2 Consent will be requested from the Contracting Officer (CO) prior to the acquisition of facility items or if the cost of the item over the course of the project would exceed $1,000.

4.4.3.3 If items requested are not available for issue, the UXB Logistics Manager will order them.

4.4.3.4 Items purchased by the UXB Logistics Manager will be issued upon receipt. All items will be documented and signed for by the LCPM or SUXOS. The UXB Logistics Manager will then keep the documentation on file with a copy forwarded to the contract file.

4.4.3.5 Items purchased by the LCPM or his designees will be documented on a UXB expense report with copies forwarded to the UXB Logistics Manager and the contract file within 3 days after submitting expense reports to accounting.

4.4.3.6 Items purchased by the UXB Logistics Manager on an overhead account may be stored in a segregated area and transferred out to projects on an as need basis. (to be determined by the UXB Logistics Manager). This type of acquisition is only for expendable property (materials such as Ziploc plastic bags, paper towels, nuts, bolts, rubber gloves, etc.) that has an individual item value under $50.00. These items can be purchased in large quantities in order to reduce overall costs to the projects

4.5.0 Receiving

4.5.1 Procedures

4.5 1.1 All property transactions will be promptly processed through the UXB Logistics Center, visually inspected to ascertain the physical condition of components, and matched to the purchase order. When deliveries are made to the project site, the SUXOS will provide the LCPM with appropriate documents to show receipt of the items; the LCPM will forward the data to UXB's Logistics Manager for accountability and control.

4.5.2 Quality Control

4.5.2.1 UXB personnel will perform receipt inspections to ensure that the equipment received conforms to required specifications. Deviations from required specifications will be reported to the LCPM for final determination of acceptance or rejection.

4.5.3 Shipment Discrepancies

4.5 3.1 When the LCPM or SUXOS receives property, he will forward the packing slip and all manufacturers manuals, warranties, etc. to the UXB Logistics Manager.

4.6.3.2 Loss, damage, or destruction of property during shipment will be immediately reported to the UXB LCPM who will inform the UXB Logistics Manager. The discrepancy will be recorded on the receiving documents, and the items will be stored in a secure area UXB will investigate the cause of the discrepancy.

4.6.0 Storage Plan

4.6.1 Storage

4.6.1.1 The project's site office is the designated storage location for project equipment. The equipment will be organized to facilitate issuance, identification, inspection, and inventory.

4.6.1.2 The LCPM or SUXOS will authorize selected personnel access to the storage area. These personnel will issue equipment, maintain on-site accountability, and conduct inventories. Government representatives will be granted access to these areas for inspection and inventory requirements.

4.6.2 Security

4.6 2.1 UXB will protect and preserve property to insure its availability and serviceability for the performance of tasks to support this delivery order.

4.6.2.2 The designated work storage areas will be secured and locked when not in use. Keys will be maintained in the site office and will be issued to authorized individuals only when required to open the location for issuance, receipt, inventory, or maintenance.

4.6 2.3 Outside storage of large equipment items is authorized. The LCPM or SUXOS will select the location and level of security for these items.

4.6.3 Motorized Equipment

4.6.3.1 Specialized equipment, vehicles, and motorized equipment will only be issued to authorized personnel trained in their use.

4.6.3.2 When not in use, all motorized equipment will be properly secured. Keys will be removed from ignitions and maintained at the site office. The LCPM or SUXOS will document the issuance of keys.

4.7.0 Accountability

4.7.0.1 UXB will establish a system to control, protect, and maintain all property and locally purchased equipment and materials used to support this contract and resultant delivery order. These records will reflect historical data, location changes, inventory dates, and other accountability data. Support documentation used for making changes will provide complete and current data.

4 7.0.1 Total Acquisition Cost Reports shall be provided annually as directed by the Contracting Officer and shall include material as a classification.

4.8.0 Inventories

4.8.0.1 If, in the process of performing the required work of this project, UXB acquires property that will become government property, UXB will initiate an inventory schedule.

4.9.0 Maintenance

4.9.1 Preventive Maintenance

4.9.1.1 Regularly scheduled maintenance will be performed to prevent the occurrence of defects and to detect/correct minor defects. The LCPM and SUXOS monitor the effectiveness of the maintenance program. Refer to SSHP Appendix D for forms detailing checkout and turn-in procedures for specific site equipment.

4.9.2 Calibration

4.9.2.1 All instruments will be calibrated prior to dispatch to the work site. UXB's Logistics Manager will monitor calibration dates and not transfer equipment to the location if the calibration date falls within the period of performance. In the event this is not possible, instrument calibration will be scheduled to prevent interruption of the work schedule.

4.9.3 Unscheduled Maintenance

4.9.3.1 Maintenance will be performed as soon as possible after a problem is encountered; records of the unscheduled maintenance and corrective actions will indicate equipment identification, problem, corrective action, person performing the maintenance, and costs. This record will be maintained in the instrument file. If equipment requires major repair or replacement, the program manager will be notified.

4.10.0 Ultimate Disposal Plan

4.10.1 Disclosure of Excess

4.10 1.1 Through an effective conservation program, the LCPM and SUXOS will reduce excessive consumption rates by prompt return of excesses, recycling usable material, and immediately changing stock levels as quantity requirements change.

TAB

5. Work, Data and Cost Management Plan

5.0 Work, Data, and Cost Management Plan

5.1.0 General

5 1.0.1 This Work, Data, and Cost Management Plan (WDCMP) effectively manages allocated funds and manpower to conduct this chemical warfare materiel/investigative removal action at the former Defense Depot Memphis Tennessee. All work will be accomplished according to the timeline set forth in Delivery Order 0012. The methods to accomplish the tasks and responsibilities of project personnel are outlined in the other sections of the Safety Submission

5.2.0 Project Management

5 2.0.1 UXB Life Cycle Project Manager and our electronic Operations Center serve several important purposes.

- UXB's Life Cycle Project Manager will be CEHNC's central point of contact from project conception, through site operations, and to final project closeout. This reduces multiple project management layers and cost, increases productivity, enhances project knowledge, facilitates on-site changes, and offers a life cycle point-of-contact during the project.

- The Operations Center is an electronic clearinghouse for daily project updates. The Life Cycle Project Manager (LCPM) will e-mail a daily project summary (including production rates, hazards encountered, personnel rosters, HTW encountered, and lessons learned) to the Operations Center. The Operations Center is networked to all of UXB's support functions (Contracts, Accounting, Human Resources, and Logistics) and the President's Office, which includes the Directors of Corporate Liaison, Compliance, Business Administration, Environmental Systems and Engineering, Federal Sector, Environmental Sector, and Technical Design Engineering Group; and UXB's Corporate Counsel. Each recipient will review the updates from and immediately respond to the program manager.

5.2.1 Project Design

5.2.1.1 UXB's Technical Design Engineering Group and the program manager reviewed the Statement of Work and the results of our site visit. This data was entered into our project timeline. As details of logistic or other requirements are realized, the timeline is refined.

5.2.1.2 UXB's Accounting Department will enter the budget, as derived from the Delivery Order and Microsoft Project, into the DELTEK Cost Accounting System (CAS); all costs will subsequently be compared to the budget.

5.2.2 Mobilization

5.2.2.1 The LCPM will coordinate with the Contracts Unit, Logistics Unit, Cost Accounting Unit, and the Contracting Officer (CO) or his designate to verify that all mobilization tasks are accomplished in a timely fashion. After coordinating all tasks and subtasks of the project, the LCPM will mobilize the appropriate teams in accordance with the work plan. The Program Manager will closely coordinate with the LCPM as the start date approaches. The coordination will be recorded on the project status records of the CAS.

5.2.3 Project Execution

5.2.3.1 As site work progresses, the LCPM will provide the Cost Accounting Unit with reviewed and approved time sheets, progress reports, per diem vouchers, and other ancillary documentation. This on-line system allows the LCPM to refine the budget as the details of logistic and subcontractor requirements, if any, are realized.

5.2.3 2 Office documentation audits will be based on the Delivery Order and Prime Contract; field documentation audits will be based on the Work Plan. Additionally, the Quality Control Specialist and the Site Safety and Health Officer (SSHO) will conduct on-site field surveillance and generate reports to verify that all established procedures and plans are being followed. All Quality Control, Surveillances, and Rework Item Lists will be distributed to the appropriate project personnel and maintained in the project file Any actions generated as a result of these reports will be similarly recorded and become part of the project file.

5.2.3 3 The program manager will also review time sheets, subcontractor invoices, supporting documentation, progress reports, and other ancillary documentation The results will be maintained in the project file; all exceptional actions will be noted. The program manager will circulate reports to the UXB Program for notification of exceptions and disposition of all corrective actions required.

5.2.3.4 Invoices will be prepared according to the progress payment schedule negotiated between UXB and CEHNC.

5.2.4 Demobilization

5.2.4 1 Upon completion of work under the Delivery Order, the program manager will coordinate with the Contracting Officer or his designate, subcontractors, and LCPM to assure that all work has been completed and accepted in accordance with the Delivery Order. Once the UXB Logistics Manager has been notified, the LCPM will demobilize the team, with the approval of CEHNC. The LCPM will review documentation generated during the project and complete the final report for the CEHNC. The final report will contain items, reports, information, and data as required by the Delivery Order. If subcontractors are utilized, their information will be reviewed and indexed into the final report. UXB maintains project documentation and final reports for a period of four years from the date of project completion, unless directed by CEHNC to maintain the information for a longer period of time.

5.2.4 2 The Cost Accounting Unit will review all remaining project cost invoices and outstanding items appropriate to the Delivery Order.

5.3.0 Work Accomplishment

5.3.0 1 Figure 5-1 depicts the timeline for operations.

5.4.0 Cost Control

5.4.1 General

5 4.1.1 Cost elements, such as labor hours expended (time sheets), materials and equipment utilized, and other direct costs incurred, will be tabulated and maintained by the LCPM. The LCPM is responsible for accurately recording, obtaining necessary approvals, and transmitting these cost elements via computer or facsimile to UXB's Headquarters office where they will be compiled by the MIS and accounting staffs. The hard copies of time sheets, invoices, rental agreements, etc. will be sent to UXB Headquarters on a weekly basis for retention. The LCPM will review logs, time sheets, invoices, etc. for contractual, FAR, and CAS compliance.

5.4 1.2 UXB utilizes the subtask approach in the record keeping and project budget review process. Since UXB provides continuous in-flow of data by subtask, the budget becomes a "living" document for use by appropriate personnel. The budget is compared to the project timeline for monitoring purposes .

5.4.1.3 This system allows for near real-time exchange of all project information This facilitates management control and dedication of resources to complete the project per the requirements of the Delivery Order

5.4.2 Supervision, Tracking, and Cost Control Methodology

5 4 2.1 Microsoft Project will track project activities. UXB examined the Delivery Order project goals, developed a management strategy to accomplish the goals within the Project Schedule, established a task and subtask sequence using defined milestones, assigned resources to accomplish the milestone tasks, and calculated the costs associated with the task. This equips UXB with the resources to complete the project milestones on or ahead of schedule.

5.4.2.2 The LCPM will record correct time sheet information. This labor information is then compared to the original budget for the Delivery Order, any deviations will be quickly identified, and corrective action taken. Material components will be tracked and monitored in a similar fashion. All employees shall complete and sign their individual timesheets.

5.4.2.3 UXB offers regularly scheduled, in-house training sessions and refresher courses to employees who are exposed to service contracts. The UXB audit program is reviewed and all UXB employees are cognizant of the accuracy requirements in reporting information.

5.4.2 4 The levels of supervision for cost/schedule control are shown at Table WP 5-1.

Table WP 5-1
Cost/Schedule Control Supervision

Position	Cost/Schedule Control Supervisor
SUXOS	UXB Life Cycle Project Manager
Vice President, CWM Sector Director	President
Controller	Executive Vice President, Director of Administration

5.4.3 Efficiency Improvement Methods

5.4.3 1 With the control in the tracking and supervision of labor and material components, UXB is able to identify potential deviations at the earliest possible time. This system identifies efficient methods so they can be replicated, and inefficient methods so they can be modified.

5.4.4 Cost/Schedule Control System

5.4.4.1 UXB utilizes two fully-integrated systems for Cost/Performance Control: the Microsoft Project management system and the Cost Accounting System. The Senior Management Team and the assigned program manager review the reports.

5.4.5 Project Costs

5.4.5.1 Labor hours by labor category and other direct costs will be reported to the Contracting Officer by Statement of Work/Proposal Task.

Table WP 5-2
Work Plan Development Timeline

Task Name	Duration	Start	Finish
Final SS Approval	42 d	1/28/00	4/05/00
Non-Intrusive WP & Approval	20 d	2/1/00	2/28/00
Brush Clearing/Road Prep/Utilities/Office Set up	10 d	2/29/00	3/7/00
VCS Construction	3 d	3/8/00	3/12/00
Filter Set up	5 d	3/13/00	3/20/00
Site Set up/ECBC Set up	10 d	3/17/00	3/27/00
Personnel Training	5 d	3/27/00	4/02/00
Table Top/Pre-Operational Exercise	2 d	4/3/00	4/4/00
Approval/Begin Intrusive Work	1 d	**4/5/00**	**8/1/00**

* As forwarded by the U.S. Army Engineering and Support Center on 11 January 2000.

5.5.0 Project Organizational Structure

5.5.0.1 Refer to other sections of the Safety Submission for discussions of the assignment of functions, duties and responsibilities, and functional relationships for this project.

5.6.0 Recurring Deliverables

5 6.0.1 Please refer to Table WP 5-3 for a list of the recurring deliverables for this project.

Table WP 5-3
Recurring Deliverables

Item	Reference (DID/CDRL)	Delivery
Telephone Conversation/ Correspondence Report	OT-055/NS06	Monthly
Report/Minutes, Record of Meeting	OT-045/NS03	As necessary, within 5 working days
Accident/Incident Report	OT-015-NS02	Within 24 hours of the occurrence
Cost/Schedule Status Report	OT-035/NS04	Monthly, due no later than 25 calendar days following the reporting cut-off date
Accident Exposure Data Report	SAFT-101	Monthly, due no later than 10 days after the end of the report month

TAB

6. Conventional Ordnance Handling Plan

6.0 Conventional Ordnance Handling Plan

6.1.0 Introduction

6.1.0.1 The purpose of this plan is to identify all the possible scenarios and the associated procedures that UXB will follow in the event conventional ordnance is encountered during the removal actions at Dunn Field. These procedures are intended for use during the disposal by detonation of conventional ordnance. Only upon the positive identification of an item, by UXO personnel, as a piece of conventional ordnance will an item be destroyed by detonation. These procedures do not apply to items identified as or suspected of being chemical ordnance.

6.1 0 2 During disposal of UXO and related material, safety is the primary concern. The most obvious requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases. Planned detonation of explosives requires more stringent safety distance requirements than those for ordnance in storage, and shall be conducted in accordance with the USACE *Safety and Health Requirements Manual* (EM 385-1-1).

6 1.0.3 A review of available documentation reveals that conventional ordnance is not expected to be encountered during this project. However, conventional ordnance, specifically WWII souvenirs, were disposed of at Dunn Field If any conventional ordnance is encountered, chances are the items encountered will be of this type, usually small, easily carried items such as hand grenades or rifle grenades, or small artillery shells (40mm or smaller).

6.1 0.4 In the event a large UXO item is found (larger than 20 lbs. net explosive weight), one whose detonation could not be contained by engineering controls, UXB will, with concurrence of the CEHNC Safety Specialist, call for EOD support The U.S. Army EOD unit that has cognizant response authority for the Depot is the 717th EOD, Ft. Campbell, KY. Contact number is (502)-798-2312, after duty hours (931)-431-3824.

6.2.0 UXO Disposal

6.2.0.1 UXB will dispose by open detonation of recovered conventional UXO with a net explosive weight (NEW) of 20 lbs. or less. UXO with a NEW greater than 20 lbs. will be disposed of by EOD. Refer to Section 6.9 for the appropriate procedures. UXB is not authorized to perform render safe procedures (RSP). RSPs may be required on items determined unsafe to move in its current condition. The responding EOD shall perform RSPs as required.

6.2.0 2 In all instances, UXB will perform UXO identification and characterization in accordance with CEHNC's *Basic Concepts and Safety Considerations for UXO Operations.* In addition, UXB, in coordination with TEU, will positively identify all ordnance as non-CWM prior to any demolition work being performed on the item by UXB.

6.2.0.3 If the item's fuzing condition permits, the item will be transported to the center of Dunn Field, or other suitable location within Dunn Field, where UXB personnel will dispose of the item by open detonation.

6.2.0.4 UXB will utilize electrical disposal procedures for the disposal of conventional ordnance.

6.2.0.5 All personnel directly or indirectly engaged in unexploded ordnance operations are thoroughly trained and capable of recognizing hazardous explosive exposures. All personnel are required to read, become familiar with, and adhere to the requirements contained in this section to assure that all general safety regulations and safe work practices are observed at all times. Absence of a written safety requirement does not indicate that safeguards are not required.

6.2.0.6 These procedures will be utilized by all UXB personnel engaged in demolition activities. However, situations may warrant additional safety measures, such as fire trucks, medical personnel, and protective clothing. The Senior UXO Supervisor (SUXOS) has the overall responsibility to comply with the minimum requirements listed below and the authority to upgrade as the situation dictates.

6.3.0 UXO Identification/Characterization

6.3.0.1 UXO personnel will perform UXO identification and characterization in accordance with CEHNC's *Basic Concepts and Safety Considerations for UXO Operations*.

6.3.0.2 If the item is positively identified and the fuzing allows, UXB will move and secure the item upon approval of the CEHNC Safety Specialist.

6.3.0.3 If an item is identified as unsafe to move, UXB will leave the item as encountered and perform "blown-in-place" (BIP) procedures. Refer to Section 6.4 for details concerning protective works.

6.4.0 Evacuation

6.4.0.1 Prior to taking any actions, such as evacuation of the work site, UXB will coordinate with all concerned agencies through the CEHNC Safety Specialist. This will include, at a minimum, Depot personnel, local fire and police, and all agencies with personnel on the site.

6 4 0.2 UXO disposal operations, to include BIP procedures, will require the evacuation of the work site; the evacuation distance is based upon the item's size and potential filler. The evacuation distance is determined in accordance with Center of Expertise (CX) Interim Guidance Document 98-08 *Determination of Appropriate Safety Distances on Ordnance and Explosives (OE) Project Sites*, June 1, 1998. The CEHNC Safety Specialist will contact the Structures Branch at CEHNC (Ms. Michelle Crull 256-895-1653) with information concerning the specific ordnance item. The Structures Branch will then determine the appropriate withdrawal and fragmentation distances. Emergency contact numbers can be found in Table WP 10-1 in the SSHP of this Safety Submission.

6.4.0.3 Evacuees will only be permitted to re-enter the area after the demolition point has been inspected and the "All Clear" has been given by the UXO Demolition Supervisor.

6.5.0 Protective Works

6.5.0.1 Protective works will be used in order to protect nearby property; the level of protective works used depends upon the size of the UXO as well as the amount and type of filler material. Protective works are physical barriers designed to limit, control, or reduce adverse effects of blast and fragmentation generated during the high order detonation of UXO

6.5.0.2 For all planned detonations UXB will follow guidelines in HNC-ED-CS-S-98-7, Use of Sandbags for Mitigation of Fragmentation and Blast Effects Due to Intentional Detonation of Munitions. It is expected that use of this documents procedures will reduce the necessary withdrawal distance for any disposal operation to 200 feet.

6.5.0.3 If necessary, additional protective works such as: tire barricades, deflector shields, trenches/pits, directional detonations, fragmentation blankets, and plywood sheets will be utilized. The results of demonstrations and practical applications have revealed that if appropriate protective works are used, the adverse effects of the blast and fragments resulting from a high order UXO detonation can be contained or eliminated.

6.5.0.4 U.S. Army Technical Manual (TM) 60A-1-1-4 (*Protection of Personnel and Property*) also outlines specifics concerning protective works.

6.5.0.5 UXB will conduct demolition operations only after all personnel protective measures have been completed and reported to the Demolition Supervisor. UXB may need the assistance of Depot personnel and local law enforcement personnel to accomplish this task.

6.5.0.6 In the highly unlikely event that BIP procedures are required, consideration will be given to removing all or a part of the filtered-air containment structure, if the recovered UXO item has a large NEW A combination of a series of protective works in addition to using the least amount of explosives required for the task, should provide the filtered-air containment structure enough protection against small UXO items. Any such scenarios will be analyzed on a case-by-case basis.

6.6.0 UXO and Explosives Transportation

6 6.0.1 During transportation of explosive material, safety is the primary concern. The most obvious requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases.

6.6.0.2 Vehicle operators will be UXB employees, licensed, trained, and informed of the explosive hazards involved with the cargo.

6.6.0.3 UXB does not plan to move any discovered UXO off of Dunn Field. However, if operational considerations are such that the item is too large to dispose of on Dunn Field and is safe to move, and the storage magazines on the Depot are available, the item may be moved to the magazines on the Depot with concurrence of the CEHNC Safety Specialist. The transportation of UXO requires adherence to the same principles as the transportation of explosives.

6.6.0.4 UXB does not plan on transporting any explosives (see Explosives Management Plan). If it is necessary to transport explosives, the following directions apply.

6.6.0.5 UXB will segregate the material identified for transport by type and load it into a vehicle meeting the regulations of 49 CFR and applicable state laws. UXB personnel will block, brace (as required), and transport the explosives material required for the disposition of UXO.

6.6.0.6 Prior to movement, the driver will visually inspect the explosive laden vehicle to ensure the load is properly secured and safe-to-move; the Demolition Supervisor will provide oversight during loading. The cargo will be checked to ensure containers are loaded, blocked, braced, tied down, or otherwise secured to the vehicle body to prevent movement. If using a vehicle with an open body, a closed container to contain the explosives will be secured to the bed of the vehicle.

6.6.0.7 The Demolition Supervisor will ensure that the following general safety precautions are observed during transport operations:

- Blasting caps and high explosives will remain separated at all times by means of either transporting these items in separate vehicles, or by using an IME22 or Mk663 container for the blasting caps if transporting the items in the same vehicle.
- Explosives will be secured during transport in accordance with 49 CFR.
- Explosives will not be transported in the passenger compartment of a vehicle.
- Explosive laden vehicles will not be left unattended.
- No person is permitted to ride on, or in, the cargo compartment.
- Smoking in and around vehicles transporting explosives is prohibited.

- Refueling of vehicles will be accomplished without the explosive cargo.
- Vehicles will not exceed the posted speed limit. If a prudent speed is less than the posted speed limit, the operator may not exceed a safe and reasonable speed.

6.6.0.8 Vehicle Requirements for Transporting UXO and Explosives. Transportation vehicles will be designated and inspected to determine that they are suitable and properly equipped for movement of explosives. Inspections and findings will be recorded on the Daily Truck Inspection Log (UXB Form 1.0041)

6.6 0.9 If required to transport explosives on public roads, UXB will properly placard transport vehicles to warn personnel and furnish specific guidance to fire fighters and other personnel who may be responding to an emergency involving the vehicle. Transportation on public roads will be in accordance with applicable federal and state regulation, to include driver testing and licensing.

6.7.0 UXO Storage

6.7.0.1 The storage of recovered UXO in a Depot standard constructed, earth-covered storage magazine will require coordination with Mr. John DeBack, the Depot's Base Transition Coordinator/Site Manager. The storage of UXO requires adherence to the same principles as the storage of explosives (refer to Explosive Management Plan). The storage of any UXO, if necessary, will be far under the storage quantity limits of these magazines. Additionally, the storage of recovered UXO requires separation and segregation from explosives in storage.

6.8.0 Responsibilities

6.8.0.1 **Senior UXO Supervisor.** The SUXOS is responsible for assuring adequate safety and housekeeping measures are implemented—operations are to be conducted safely, cleanly, efficiently, and economically.

6.8.0.2 **Demolition Supervisor.** Demolition operations shall be under the direct control of an experienced and trained UXO Supervisor charged with the responsibility for all demolition activities within the area. The Demolition Supervisor, assigned by the SUXOS, shall be responsible for training all personnel regarding the nature of the materials handled, the hazards involved, and the precautions necessary, and shall be present during all on-site disposal operations. The Demolition Supervisor will also maintain custody of the blasting machine or fuse igniters. The Demolition Supervisor shall also notify the appropriate organizations prior to demolition operations.

6.8.0.3 **Demolition Team Members.** Individuals will report the completion of tasks to the Demolition Supervisor The types of tasks which may be required are.

- Secure all access roads to the area.
- Visually check demolition site for any unauthorized personnel.
- Check firing wire for continuity and shunt.
- Prepare designated shots.
- Check continuity of detonators.
- Secure the detonators in a safe location.
- Place charge in desired location.

6.9.0 Overall Safety Precautions

6.9.0.1 **General.** Prior to conducting a disposal operation, the Demolition Supervisor will conduct a safety briefing to the members of the demolition team. This safety briefing will include, at a minimum: phases of the operation, review of explosive handling and EMR precautions, location of safe area, emergency notification procedures, site specific characteristics, type of OE/UXO being destroyed, placement and quantity of counter charge, misfire procedures, post-detonation clean up of range, care and handling of explosive materials, personal hygiene, two person rule, potential trip/fall hazards, location of range vehicle, wind direction (toxic fumes), and the location of first aid kit and fire extinguisher. Range vehicle engine will be started prior to initiating priming procedures and kept running.

6.9.0.2 Telephone or radio communication will be established with emergency response personnel. No radio or cellular telephone transmissions will take place in the vicinity during the positioning or connecting of electrical initiating devices.

6.9 0.3 **Hazard of Electromagnetic Radiation to Ordnance (HERO) Evaluation.** Table 2-3 of Army Technical Manual (TM) 9-1375-213-12 provides minimum safe distances between mobile radio frequency (RF) transmitters and electric blasting operations. Since both the hand-held radio and cellular telephone operates at less than five watts, the minimum safe distance is five feet.

6.9.0 4 Since radios and cellular telephones are normally operated at about 5 feet above the ground surface, no HERO hazard exists as long as personnel keep these items a minimum of five feet away from the ordnance.

6 9 0 5 **Fragmentation Distance.** Fragmentation distances are based upon the net explosive weight of a particular demolition shot plus the countercharge. The calculation of fragmentation distances are important in order to ensure the safety of not only site personnel, but also the general public. Fragmentation distances will be provided by CEHNC, depending upon the item to be destroyed (refer to Section 6.3.0 1).

6.9.0.6 The fragmentation distances are for open, un-barricaded shots. If there is a protective shelter with frontal and overhead protection, a shorter distance is possible. However, every effort should be made to adhere to the appropriate fragmentation range regardless of shelter or depth the shot is buried.

6 9 0.7 Additional overall safety precautions for demolition operations include:

- Demolition operations will be conducted in strict accordance with this plan, which was written in accordance with U.S. Army TM 60A-1-1-31 (Explosive Ordnance Disposal Procedures) and Safety Supplement 1.
- If required, demolition explosives will be delivered on an as needed basis.
- During demolition operations, a designated emergency vehicle (in addition to the range vehicle) will remain in the area.
- Keep blasting caps in approved containers, located at least 7.62 meters (25.0 feet) from other explosives, until they are needed for priming.
- Always point the explosive end of blasting caps, detonators, and explosive devices away from the body and other personnel during handling. This will minimize injury should the item explode.
- Blasting caps used for initiation of explosive charges will not be buried.

- If explosive charges are to be covered or tamped with earth, charges will be fitted with detonating cord leads that protrude 1.8 meters (6 feet) from the earth.

- Blasting caps less than the equivalent of a commercial No. 8 cap will not be used unless used with commercial explosives and approved by the explosives manufacturer.

- Only those explosives or initiators needed to meet the requirement of the operation will be transported to the disposal site.

- Blasting machine or activating device will not be surrendered to the individual designated to fire the shot until the Demolition Supervisor is assured that the area is clear.

- An appropriate distance around the demolition site shall be cleared of dry grass, leaves, and other extraneous combustible materials.

- There will be a minimum wait time of 30 seconds between detonations for electric operations.

6.10.0 Demolition Procedures

6.10.0.1 **General.** Control of the demolition site must be maintained during demolition operations. All personnel who are not essential to demolition operations must evacuate to a safe area. Access roads entering the blast area will be blocked during explosive disposal operations to ensure that unsuspecting individuals are not placed in jeopardy by the explosion. The Demolition Supervisor will assure the area is clear of unauthorized personnel and equipment prior to permitting attachment of the initiation devices to the priming charge.

6.10.0.2 An observer will be stationed at a location where there is a good view of the air and surface approaches to the demolition site. It shall be the responsibility of the observer to notify the Demolition Supervisor to suspend firing if any aircraft, vehicle, or personnel are sighted approaching the general demolition site

6 10.0.3 A minimum of two UXO qualified personnel, one of which will be the Demolition Supervisor, will conduct demolition operations. The Demolition Supervisor will decide which firing system is suitable for the specific task to be accomplished. An electrical firing system provides better control of the demolition activities, yet, on specific sites, based on the terrain, vegetation and other site parameters, the use of a non-electrical firing system may be acceptable. Control of initiation devices will remain with the Demolition Supervisor until attachment to the firing circuit.

6.10.0.4 The Memphis City Fire Department will be informed of the location, date and time of detonation and of the materials to be detonated. The fire department will be requested to standby on site for all detonations. (The Memphis City Fire Department can be reached at 901-393-7441) In the event of a fire or unplanned explosion, UXB personnel will attempt to put out the fire. If unable to do so, fire support services will be requested from the Fire Department and the area will be evacuated. Subject to the remoteness of the demolition range area, fire department personnel may employ UXB personnel to provide additional fire fighter support.

6.10.0 5 Prevailing weather condition information will be obtained from the NOAA weather station (162.400 mhz) or calling 901-544-0399; this data will be logged before each on-site detonation. Demolition charges will not be primed or connected for electrical firing during the approach or presence of a thunderstorm. Other weather conditions (high winds, dust storms, snow storms, temperature inversions, low altitude clouds, or a cloud coverage of more than 50%) may adversely impact planned demolition operations. The Demolition Supervisor will take these conditions into consideration when determining whether or not to conduct demolition operations. If weather conditions preclude the disposal by BIP, UXB will secure the UXO with sandbags and cover, properly mark, until favorable conditions allow the BIP

6.10.0.6 **Explosive Limit.** The maximum quantity of explosives that may be disposed of at one time will include the net explosive weight of the item(s) to be disposed of plus the weight of the priming charge. Since it is assumed that no conventional UXO is expected to be encountered during this project, the determination of a maximum explosive limit will be done by the SUXOS and the CEHNC Safety Specialist when an item requiring disposal by detonation has been found.

6.10.0.7 **Blow-in-Place Procedures.** UXB will notify the CEHNC Safety Specialist and the Memphis Depot BRAC Environmental Coordinator of its intent to blow-in-place, if such procedures are required. This notification will take place upon discovery of an item requiring blow-in-place procedures.

6 10 0.8 Detonations will occur only after all unnecessary personnel have left the area, road guards have been posted, and the required post personnel have been notified. Prior to conducting the disposal procedures, the Demolition Supervisor will check the area and available drawings to determine if there are any underground utilities that may be affected by a detonation.

6.10.0.9 UXB personnel not involved in the disposal operation will act as perimeter guards, as directed by the Demolition Supervisor.

6.10.0.10 **Electrical Demolition Procedures.** An electric firing system is one in which electricity is used to fire the primary initiating element An electric impulse supplied from a power source, usually an electric blasting machine, travels through the firing wire and cap lead wires to fire an electric blasting cap. The chief components of the system are the electric blasting cap/electric squibs, firing wire, and the blasting machine. The preparation of the explosive charge for detonation by electrical means is called electric priming.

6.10.0.11 Static electricity is an increased hazard when operating in an extremely cold climate or area of low humidity Care must be taken to reduce the possibility of premature detonation of electric blasting caps and other electro-explosive devices.

Safety Precautions

- Personnel working with electric blasting caps or other electro-explosive devices will not wear static producing clothing such as nylon, silk, or synthetic fiber.
- Prior to making connection with the electric blasting cap, the firing circuit will be continuity tested.
- Electric blasting caps will be connected to the firing circuit before connection to the main initiation charge.
- Electric blasting caps of different manufacturers or types will not be used in the same system
- The shunt will not be removed from the wires until the individual performing the operation has been grounded.
- Test electric blasting caps for continuity with a galvanometer at least 25 feet downwind from any explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be short-circuited by twisting the bare ends of the wires together. The wires will remain shunted until ready to connect to the firing circuit.
- Do not pull on electrical lead wires of electric blasting caps, detonators or other electro-explosive devices; a detonation may occur.
- Unroll the legs so that the cap is as far as possible from the operator and pointing away from him

- Place the blasting cap in a hole or behind a barricade before removing the shunt and testing for continuity. Make sure the cap does not point toward other personnel or explosives.
- Use only authorized and serviceable testing equipment.
- Do not connect the blasting machine to the firing wires until all pre-firing tests have been completed and until ready in all respects to fire the charge.
- Do not hold the blasting cap directly in the hand when uncoiling leads. Hold the wires approximately 6 inches from the cap. This will minimize injury should the cap explode. The lead wires should be straightened by hand and not thrown, waved, or snapped to loosen the coils.
- Do not remove the shunt from the lead wires of blasting caps except for testing for continuity or actual connection into the firing circuit. The individual removing the shunts should ground himself prior to this operation to prevent accumulated static electricity from firing the blasting cap.
- Keep both ends of the firing wires shorted or twisted together except for testing or firing. Do not connect the blasting caps to the firing circuit unless the power end of the firing circuit leads are shorted.
- Keep all parts of the firing circuit insulated from the ground or other conductors such as bare wires, rails, pipes, or other paths of stray current.

Procedures

- Prepare and place all explosive charges.
- After locating a firing position a safe distance away from the charges, lay out the firing wire. (Do not drag firing wire over sand which may generate a static charge)
- Test the firing wire by using a blasting galvanometer or test set, after you have ensured the testing equipment is functional, and after the firing wire has been unreeled. Ensure ends are twisted together when not testing.
- Separate firing wire conductors at both ends, and touch those at one end of the galvanometer/test set posts. Needle should not move or lamp glow; if either occurs, the firing wire has a short circuit
- Twist wires together at one end and touch those at other end to galvanometer/test set posts. This should cause a wide deflection of the needle or the lamp to glow. No movement of the needle indicates a break; a slight movement indicates a point of high resistance which may be caused by a dirty wire, loose wire connections, or wires with several strands broken off at connections.
- Ground yourself. Test the blasting caps by removing the short circuit shunt. Touch one end of the cap lead wire to one post and other cap lead wire to other post. If galvanometer's needle deflects slightly less than it did when the instrument was tested, the blasting cap is satisfactory; if not, the cap is defective and should not be used; should read at least half-scale. Ensure cap lead wires are twisted together when not testing.
- Connect the blasting cap leads to the firing circuit and insert blasting caps into the main charge or attach to detonating cord leads if main charge is buried or tamped.
- Depart to firing point.
- Take cover.
- Obtain a head count.

- Ground yourself. Test entire circuit after inserting caps into the charges and connecting charges with the firing wires and moving to firing position. Touch free ends of firing wire to test instrument posts. This should cause a wide deflection of needle or lamp to glow. If the firing circuit is defective, shunt wire. Then go down-range and recheck circuits. If the splice is found defective, replace wires. If the cap is found defective, replace it. Retest the entire circuit again to make sure that all breaks have been located before attempting to fire.
- Test the blasting machine before attaching the firing wire. Untwist ends of the firing wire and fasten them to the posts of the blasting machine.
- Yell "Fire In The Hole" three times and initiate charge.
- Observe a 5-minute wait time after the detonation. This wait time may be waived by the Demolition Supervisor based on observation of the detonation.
- Remain in designated safe area until Demolition Supervisor announces "All Clear."

6.10.0.12 **Electric Misfires.** In order to prevent misfires, insure that all blasting caps are included in the firing circuit; all connections between blasting cap wires, connecting wires, and firing wires are properly made; short circuits are avoided; grounds are avoided; and number of blasting caps in any circuit does not exceed the rated capacity of the power source on hand.

6.10 0.13 Common causes of electric misfires include inoperative or weak blasting machine or power source; improperly operated blasting machine or power source; defective and damaged connections, causing either a short circuit, a break in the circuit, or high resistance with resulting low current; faulty blasting caps, the use in the same circuit of blasting caps made by different manufacturers or of different design, and the use of more blasting caps than the power source rating permits

6 10.0.14 **Clearing Electric Misfires.** Make several successive attempts to fire.

- Check firing wire connections to blasting machine terminals to be sure that contacts are good.
- Make two or three more attempts to fire charge.
- Disconnect blasting machine and short firing wire.
- Attempt to fire the charge(s) with an alternate blasting machine, if available.
- A wait time of 30 minutes will be observed in accordance with Safety Supplement 1, TM 60A-1-1-31, before starting to investigate, unless it can be ascertained that the blasting cap failure is strictly electrical and then, corrective action may be taken immediately.
- Test firing circuit with circuit tester for breaks and short circuits, and correct any defects discovered.
- Remove and disconnect old blasting caps and short wires, place these items on the subsequent shot for disposal.
- Connect wires of new blasting cap(s) to firing circuit and re-prime the charge.
- Reconnect firing wire ends to blasting machine and fire charge(s).

6.11.0 Post Demolition/Disposal Procedures

- Do not approach a smoking hole; do not allow personnel out of the designated safe area until cleared to do so with the "All Clear" signal.
- Prior to giving the "All Clear" signal, check pit for 'low orders' or 'kick outs'; Intact ordnance items that failed to detonate will be counter-charged and blown in place Explosive residue will be collected and detonated.

- Surface sweep pit and remove any fragmentation; metal fragments will be examined to ensure complete detonation of the explosive material.
- Back fill hole, as necessary.
- Police up all equipment.
- Notify police, fire, etc. that the operation is complete.

TAB

7 Environmental Protection Plan

7.0 Environmental Protection Plan

7.1.0 Introduction

7.1.0.1 The Environmental Protection Plan (EPP) for remedial activities at sites 24-A, 24-B, and Site 1 at the Depot, is presented in this section The measures that will be taken to protect natural resources and to control pollution that may develop as a result of remedial activities are described in the sections that follow. All parties will comply with federal, state, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution. It will ultimately be the responsibility of UXB to ensure that the remedial action complies with the requirements of this EPP.

7.1.0.2 The site EPP meets the requirements of DACA87-97-D-0006/0001, Data Item Description OT-005, applicable sections of Army Regulations AR-200-1 (Environmental Protection and Enhancement and Environmental Effects of Army Actions).

7.2.0 Protection of Natural Resources

7.2.0.1 This section discusses measures that will protect natural resources within the project boundaries Construction activities will be confined to the limits of the work areas as specified in the Task Order. Natural resources will be restored to an equivalent condition upon completion of the work. Restoration will be as directed by the Contracting Officer or Contracting Officer's Representative (CO/COR) in accordance with the contract documents

7.2.1 Pre-Construction Survey

7.2.1.1 According to DID OT-005 a joint condition survey, also known as an Environmental Survey (ES), is to be conducted by the Contractor and the Contracting Officer/Representative prior to the start of any on-site response activities The survey is meant to identify any wetlands, protected species, cultural sites, historical areas, special habitats or other protected areas and to report the condition of trees, shrubs, and grassy areas in and immediately adjacent to the work area, storage area and access routes. This survey will include taking photographs that show existing environmental conditions in and adjacent to the site.

7.2.2 Land Resources

7.2.2.1. Except in the immediate vicinity of the burial areas, ground cover will not be removed, cut, defaced, injured, or destroyed without the Depot/CEHNC permission. Ropes, cables, or guys will not be fastened to existing trees for anchorage unless authorized by the Depot/CEHNC Project Managers. Where such use of ropes, cables, or guys is authorized, UXB will be responsible for any resultant damage. Trees and other landscape features scarred or damaged by equipment operations will be removed and replaced with equivalent, undamaged trees and landscape features.

7.2.2.2 UXB will be responsible for preventing contaminated soil and debris from spreading beyond the limits of the excavation. Plastic sheeting will be placed adjacent to the excavation, and all excavated material will be placed in a container or on impervious sheeting. Each container of soil/debris moved outside of the filtered-air structure will be covered with a wind and rain cover at the completion of daily activities or in the event of inclement weather.

7.2.2.3 UXB will be responsible for backfilling the excavation to grade. Backfill placement will follow the procedures specified in Section 7.5.4 below. Imported backfill will be clean and free of waste material and debris, and will be certified free of contaminants above levels of regulatory concern, prior to use. After backfilling, earthwork will immediately be brought to the final grade.

7 2 2.4 UXB will restore the surface of the burial areas to their original condition The final surface will be consistent with that of the surrounding area and will not impede drainage at the site. The contractor will provide seeding with indigenous grass, where the ground has been disturbed Topsoil or nutrients will be included during the seeding operation to reestablish a suitable stand of grass, as necessary.

7.2 2.5 Traces of temporary construction facilities such as haul roads, work areas, structures, and other signs of construction will be removed upon completion of the project by UXB. Temporary roads, parking areas, and similar areas will be graded to conform to surrounding land contours.

7.2.3 Water Resources

7.2.3 1 UXB will prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. UXB will take measures to prevent surface or storm water run-off into the excavations. Excavated soil and debris will be placed on impervious sheeting or in a container. Soil piles and containers located outside of the filtered-air structure will be covered with impervious sheeting to serve as a wind and rain cover. This cover will be placed at the completion of daily activities or in the event of inclement weather.

7.2.3 2 Temporary fuel oil or petroleum storage tanks brought on-site will be surrounded with a temporary earth berm of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage. The interior of the berm will be lined with plastic sheeting.

7.2.4 Air Resources

7.2.4.1 UXB will control dust at all times, including non-working periods. To mitigate dust generation, a fine water mist may be applied with either a hand wand or a water truck over the site, haul roads, and other areas disturbed by operations. The amount of water will be controlled such that only the surface of the soil will remain moist but "ponding" and run-off will not occur.

7.2.5 Historical and Archaeolog ical Resources

7.2.5.1 UXB will carefully protect in-place, any historical or archeological items discovered in the course of intrusive excavation work and report their presence to the Depot personnel or the CEHNC Project Manager immediately. UXB will stop work in the immediate area of the discovery until directed by the appropriate personnel to resume work.

7.3.0 Vegetation Control

7.3.0.1 UXB will not clear land by burning ground cover Clearing and grubbing will control vegetation only where necessary to facilitate efficient and safe operations. Trees, stumps, roots, brush, and other vegetation in areas to be cleared will be cut off or pulled out flush with or below the original ground surface, except for such trees and vegetation which are directed to be left standing. Trees and brush to be left standing will be protected from damage incident to clearing, excavation operations or other activities conducted on site. Depressions made by grubbing will be filled with suitable material and compacted to make the surface conform to the original adjacent surface of the ground. Logs, stumps, roots, brush, rotten wood and other refuse from the clearing and grubbing operations will be moved to a pickup point or disposal area designated by Depot personnel.

7.4.0 Waste Control And Disposal

7.4.1 Solid Waste

7.4.1.1 UXB will maintain the work area in a neat and orderly condition It is the responsibility of UXB to control solid waste in the work area. Solid wastes not related to excavation activities will be placed in containers that are regularly emptied. UXB will contract with a local waste disposal firm for pickup of solid waste generated by the work crew while at the Depot. Upon completion of work, UXB will leave the work areas clean and free of garbage, rubbish, or debris Food will not be prepared, cooked, or disposed of on the project site.

7.4.2 Sanitary Waste

7.4.2.1 UXB will provide a chemical flush toilet or comparably effective unit for the use of persons working on site Sanitary wastes will be periodically emptied by a service contractor into a municipal, district, or station sanitary sewage system.

7.4.3 CWM And Hazardous Waste

7.4.3.1 Intact vials or identification kits suspected to be CWM will be segregated from excavated soil and debris as described in Section 3.0 of the Work Plan. This material will be handled and transported in accordance with the Interim Holding Facility Plan and the Transportation Plan prepared by PMNSCM (Book 2 of the Safety Submission).

7.4.3.2 After removal of CWM items, excavated soil and debris will be sampled and analyzed to determine if it is to be classified as hazardous waste. A waste code determination will be conducted based on the soil/debris characterization samples (refer to Section 12.1 of the Work Plan). The soil and debris will be handled in accordance with 40 CFR 262 Before transport, the soil and debris will be placed in containers in accordance with 49 CFR 178. The containers will be removed from the project site, transported, and disposed of in accordance with 40 CFR 263 and 40 CFR 264. All appropriate regulations pertaining to shipment of hazardous wastes (i.e., manifesting etc) will be complied with. Detailed information on the sampling programs and on waste management can be found in Sections 12.0 and 11.0 of this Work Plan, respectively.

7.4.4 Investigation Derived Waste

7.4.4.1 It is the responsibility of UXB to control investigation derived waste in the work area Excavated soil and wastewater generated from decontamination operations will be managed as described in Section 11.0 of this Work Plan UXB will be responsible for containerizing all investigation derived wastes in Department of Transportation approved containers and for following appropriate labeling requirements. The containers will be free of contaminants, and will not crack, split, readily corrode, or leak. UXB will be responsible for ensuring all regulations are followed for the manifesting, scheduling, transportation, and disposal of wastes

7.4.4.2 Under no circumstances will any water be discharged to the ground surface, and all other materials will be handled so as to prevent releases to the environment and to ensure proper disposal. After disposal of all materials, the containers will be cleaned of all material and contaminants and disposed of properly or returned to the leasing agency.

7.4.4.3 Non-disposable personal protective equipment (PPE) will be decontaminated in accordance with Section 6.0 of the SHHP. Disposable PPE worn while excavating the burial site will be containerized and disposed of in the same manner as soil and debris from this area.

7.5.0 Site Restoration Plan

7.5.1 Post-Removal Clean-up

7 5.1.1 Upon project completion and subject to instructions by the COR, UXB shall remove all temporary construction facilities, stockpiles of excess material, and other signs of activity As directed by the COR, disturbed areas will be re-graded and seeded in an effort to restore the area to near original condition.

7.5.1.2 The reclamation of all areas affected by site activities (such as administrative areas, stockpiles, storage areas, excavations and soil disturbance areas) will include re-contouring and grading to match adjacent areas. Whenever possible, existing topsoil will be removed and stored separately from subsurface spoils, and returned during final grading operations. Reclamation of temporary construction roads will include smoothing and grading to eliminate ruts and to match the contours of the adjacent areas. Eroded or caved-in banks will be trimmed and leveled to provide a stability and adequate drainage.

7.5.2 Temporary Facilities

7 5.2.1 Unless directed by the CEHNC to do otherwise, all temporary facilities that were erected by UXB to execute the scope of work will be removed during demobilization.

7.5.3 Disturbed Areas

7.5.3.1 All excavation activities associated with this project will be conducted to minimize impacts to land resources within and outside the project boundaries. Areas impacted by the project will be restored, as practical, to a condition that appears to be natural and does not detract from the overall appearance of the site If detonation of hazardous ordnance is necessary, significant soil compaction is not anticipated. Detonations may increase naturally occurring fractures within the soil, making areas where drainage is poor and slopes are higher more susceptible to slide and creep movements. Where possible, soils excavated at the site will be returned to their original locations.

7.5.3.2 All areas (including wetlands, historical sites, archaeological sites, and natural habitats) damaged or otherwise altered by activities associated with this project will be restored, as much as practical, to near-natural or pre-existing conditions Restoration will be as directed by the CO/COR in accordance with the contract document.

7.5.4 Backfill Placement

7 5 4.1 The chosen consultant/contractor will backfill the excavation with approved imported clean fill. Imported clean fill will not be construction waste material and will be free of organic material and debris. The consultant/contractor will provide written certification backed by the analytical data that the imported clean fill is free of contaminants or that contaminant concentrations are below regulatory levels of concern. Depot approval of all proposed fill material is required prior to use.

7.5.5 Grading

7 5.5.1 Topography in the vicinity of the project site is generally flat. The burial areas will be regraded so that the final surface is consistent with that of the surrounding area and will not impede drainage at the site. The consultant/contractor will be responsible for ensuring that drainage at the site is not impeded by the finished backfill profile.

7.5.6 Reseeding/Tree Planting

7 5 6 1 Seeding with a local grass seed will restore vegetation areas disturbed by the project and lawns will be reseeded or sodded as directed by the CO/COE. Topsoil or nutrients will be included during the seeding operation to reestablish a suitable stand of grass, as necessary.

7.5.6.2 All trees measuring three (3) inches or less in diameter may require removal to facilitate investigative actions, discretion will be used prior to any final decisions. Trees which are marred unavoidably will be trimmed and treated with an approved wound dressing as soon as possible.

7.6.0 Spill Control Plan

7.6.0.1 The following sections (7.6.1 and 7.6.2) summarize the emergency spill response and spill control measures to be utilized during all phases of the CWM removal action at Dunn Field.

7.6.1 Preventative Spill Control Measures

7.6.1.1 Good energy conservation practices will be followed, and all project activities will be conducted in a manner that prevents the discharge of pollutants

7.6 1.2 Vehicles will be maintained in good operating condition and will be left running only when necessary All vehicles used will be fueled, maintained, and serviced at a location with protective containment equipment in place. Cleaning or washing of vehicles or equipment will be permitted only in areas with appropriate sumps and drainage. Runoff will not be allowed to flow onto open ground.

7.6.2 Emergency Spill Response

7.6.2.1 UXB shall have available on site, a spill response kits containing absorbent materials designed to absorb water, diesel fuel, oil, and other liquids expected to be used during operations. This kit is compiled prior to mobilization and after a complete list of chemicals/liquids to be used on-site has been generated. In the event of a spill or leak, site personnel will:

- Immediately inform the Senior UXO Supervisor, who will immediately report the spill to the CEHNC Safety Specialist
- Locate the source of the spillage or leak and stop/contain the flow, if it can be done safely, utilizing properly protected personnel
- Stay upwind of and out of low areas
- Keep combustibles away from the spilled material
- Use water spray or other approved methods, if appropriate, to reduce vapors, gases, and/or dust emissions
- Begin containment and recovery of the spilled materials

7.7.0 Petroleum Products

7.7.0.1 UXB will conduct the fueling and maintenance of equipment and motor vehicles so as to protect against spills and evaporation. In the event of an oil or gasoline spill, UXB will immediately implement the Emergency Response and Contingency Plan (Section 7.6.2 of the Environmental Protection Plan), as appropriate, and notify the Depot BEC and CEHNC Project Manager.

7.7.0 2 All containerized lubricants and excess oil will be disposed of in accordance with applicable regulatory requirements.

TAB

8. Chemical Data Quality Management Plan

8.0 Chemical Data Quality Management Plan

8.1.0 General

8.1.0.1 This Chemical Data Quality Management Plan (CDQMP) has been prepared in accordance with the U.S. Army Corps of Engineers, Huntsville District guidance for Environmental Data Quality Management. It has been designed to establish an effective and efficient system which will ensure that appropriate and consistent controls are implemented during this delivery order, and that data are precise, accurate, representative, complete, comparable, legally defensible, and of sufficient quality to meet intended usage. This CDQMP also complies with EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QAIR-5, 1994). It is the responsibility of all project personnel either performing or overseeing sampling and analysis activities to adhere to the requirements of this CDQMP and any supporting project-specific documents.

8.1.0.2 UXB has coordinated with the Edgewood Chemical Biological Center (ECBC) to analyze environmental samples for H, L, TDG, 1 ,4-dithiane, 1 ,4-oxathiane, phosgene and chloropicrin on-site using their Mobile Environmental Analytical Platform (MEAP). The MEAP is a self-contained mobile platform designed as a fully functional trailer laboratory. It contains all the equipment necessary to analyze both air samples taken with DAAMS tubes and extracts of soil and water samples. Once soil samples have been cleared for CWM by ECBC, splits of these samples will be shipped off-site for the remaining hazardous waste analyses. The required analyses, data uses, and data quality objectives are identified in Section 12 of this Work Plan.

8.2.0 Chemical Data Quality Objectives

8.2.0.1 Data quality is evaluated relative to data quality objectives (DQOs). DQOs are qualitative and quantitative statements that specify the field and laboratory data quality necessary to support specific decisions or regulatory actions. The DQOs describe which data are needed, why the data are needed, and how the data will be used to meet the needs of the project. DQOs also establish numeric limits for the data to allow the data user to determine whether the data collected are of sufficient quality for their intended use. The DQOs for the remedial action at Dunn Field, DDMT, were developed following the guidance contained in *Data Quality Objective Process for Superfund, Interim Final Guidance* (EPA 540-R-93-07 1). The results of this process are described in detail in Sections 8.2 1 through 8 2.7 A summary of the DQOs for this project are presented in Section 12 0 (Sampling Plan).

8.2 0 2 Data quality is based on the end use of the data (DQOs), and is determined by the methods of collection/analysis and the level of quality control (QC) and documentation used to produce the data. Except for field measurements and observations, all data will be definitive. Definitive data are data that are quantitative, collected using standard sampling methodology as defined in available and applicable guidance, and analyzed using rigorous analytical methodology of known precision and accuracy (e.g., *EPA Test Methods for Evaluating Solid Waste,* SW-8461 for hazardous waste analyses). Screening data, on the other hand, are data that are collected using nonstandard sampling methodology or collected using rapid less precise methods of analysis with less rigorous sample preparation or quality control as compared to most standard methods of analysis. Field measurements (e.g., headspace monitoring) and observations also fall into the category of screening data.

8.2.0.3 Data reporting requirements are referred to as Level I, II, III or IV, as defined in Table WP 8-1. Although this reporting level terminology is no longer used to reference data quality, it has become an industry standard and will be used for this project to define data reporting and associated validation requirements. The data reporting requirements for all data levels are described in Table WP 8-1. As shown on this table, the primary difference between Level III and Level IV data is the inclusion of raw data in the Level IV data package and the evaluation of the raw data during the data validation process.

8.2.0.4 Standard laboratory reports (or Comprehensive Certificates of Analysis) will be provided for each sampling event with definitive data. For this project, Level III data validation will be conducted for all definitive data based on QC sample results and other data validation criteria (refer to Section 8.10). In addition, Level IV data validation will be conducted on 10 percent of the data. Level IV data will be reported using CLP-like data packages for 10 percent of the environmental samples. All Level III and Level IV data will be validated based on the guidance in the *Contract Laboratory Program National Functional Guidelines for Evaluating Organic and Inorganic Data Review* (Functional Guidelines; EPA, 1994) The reporting levels for each of the data types collected during this project are identified in Table WP 12-1.

8.2.1 Statement of the Problem

8.2.1.1 In order to eliminate any potential risk from the future reuse of Dunn Field, the hazardous contents of the burial pits will be removed. Removal of these items will eliminate any potential exposure pathways. The objective of the sampling effort at Dunn Field is to document the characteristics of wastes discovered and/or generated during the excavation of the burial site, and to document that soils left in place are either native soils or uncontaminated backfill. The contaminants of potential concern for soils include industrial chemicals, SVOCs, arsenic, and chemical warfare agents (and their associated breakdown products).

8.2.2 Identification of Decisions

8.2.2.1 The decisions to be made during the removal action are:

1) Have all of the buried items at Sites 23-A. 23-B and 1 been removed?

2) Is the remaining soil from the floor and sidewalls of the disposal trench free of contamination?

3) To ensure proper waste disposal, what is the nature and characterization of the excavated soil/debris?

8.2.3 Identification of Inputs to Decisions

8.2.3.1 Field descriptions of excavation activities, including types of debris encountered and the volume of soil removed, are necessary to ensure that the identified sites are remediated. Analytical data on the concentrations of contaminants in the excavated soils and wastes generated by this remedial action are needed to characterize these wastes for disposal and to confirm attainment of the cleanup objective (i.e., removal of all burial trench contents & associated CWM breakdown products).

8.2.4 Definition of Study Boundaries

8.2.4.1 The excavation boundaries for this project will have been approximated by Parsons ES prior to the start of operations. Exact boundaries will be determined prior to the start of excavation activities. Areas of relatively high VOC contamination, including CCl4 and breakdown products of DANC were discovered during RI sampling. Based on data previously collected at the site, groundwater has not been impacted by CWM burial activities at Dunn Field, and soil contamination from the buried materials is not anticipated to be widespread. The dimensions of the burial pit have been approximated through geophysical surveying techniques.

8.2.5 Development of Decision Rules

8.2.5.1 The point of compliance for soil will be removal of all soil/debris from the burial trench, as confirmed by monitoring data, visual observations, and compliance (verification) sampling. Cleanup levels established for the contaminants of concern were based on the Method Detection Limit for that compound.

The total volume of soil removed will be determined by the volume of debris encountered and the soil cleanup goals for the contaminants of concern.

8.2.6 Specification of Limits on Decision Errors

8.2.6 1The contaminant concentration data from the soil/debris characterization samples, soil confirmation samples, and investigation-derived waste samples shall meet the precision, accuracy, representativeness, comparability, and completeness (PARCC) goals defined in Section 8.8.

8.2.7 Optimization of Investigation Design for Obtaining Data

8.2.7.1 Because insufficient data is available to statistically evaluate an appropriate sampling location methodology, the most resource-effective sampling and analysis design for generating the data that will satisfy the project DQOs is to collect discrete samples from random locations within a uniform grid network that covers the floor and sidewalls of the excavation. This sampling rationale will ensure that results are representative, uniform, and unbiased. A discussion of the proposed confirmation sample locations and rationale is provided in Section 12.0 of this work plan.

8.3.0 Project Organization and Data Quality Management Responsibilities

8 3 0.1 This section identifies those individuals or organizations participating in the project and defines their specific roles and responsibilities as they relate to the data quality management function. Key organizations that comprise the team for this project are identified in Section 1.7.0 of this Work Plan. All project personnel are responsible for identifying, reporting, and documenting any activities that could adversely affect the quality requirements set forth by the contract. Specific responsibilities of key personnel and subcontractors are defined in the paragraphs that follow.

8.3 0 2 **UXB International, Life Cycle Project Manager.** As the prime contractor, the UXB LCPM will report to CEHNC and is responsible for waste characterization and confirmation of data collection. Other duties, as appropriate, include directing sampling activities, supervising field staff and any subcontractors, and ensuring that field procedures described in the Sampling Plans (Section 12.0) are implemented in accordance with the SSHP. The Field Team Leader will be responsible for maintaining daily records of work performed, personnel on site, and any work stoppages or communications with other agencies pertaining to the project.

8.3.0.3 **Project Chemist.** The Project Chemist will report to the UXB LCPM and will provide direction and support for all project sampling activities, including sample collection, handling, storage, preservation, and shipment. Other responsibilities include but are not limited to:

- Supporting the preparation of this Work Plan with respect to analytical issues.
- Interfacing with Contract Laboratory on matters concerning chemical sampling and analysis, laboratory readiness, sampling schedules, sample containers, laboratory reports, verification and validation of data, and the resolution of non-conforming activities or data.
- Reviewing analytical data to ensure conformance with quality assurance testing and standards, performing data validation, and approving analytical data.
- Identifying, reporting, and recommending solutions for non-conforming sampling or analytical activities or data

8.3.0. **Laboratory Project Manager.** Laboratory Project Managers are responsible for ensuring that all analytical data generated under this contract are reviewed prior to their release to the UXB and the

CEHNC PM The Laboratory Project Managers will provide direct interface with personnel. The Laboratory Project manager will have sufficient authority to assure that samples submitted from the project site are received and processed in accordance with the accepted quality management system. Other responsibilities include but are not limited to:

- Supervising laboratory quality control activities.
- Sample management, coordination, and tracking.
- Serving as the collection point for laboratory staff reporting and disposition of non-conformances and changes in laboratory procedures that affect project samples.
- Reporting "use-as-is" and "rework" non-conformances to the Project Chemist, and obtaining approval prior to implementation of follow-up action.
- Ensuring that all project analytical data packages are reviewed for conformance to established guidelines and data quality objectives.

8.3 0 5 **Laboratory Quality Assurance Officer.** The Laboratory Quality Assurance Officer is responsible for the day-to-day implementation of the laboratory's quality management system and reports directly to upper management. Their responsibilities include, but are not limited to, the following:

- Stopping production of data in a laboratory area where the analysis of QC data indicates deviations that could adversely affect analytical data results.
- Overseeing sample storage, equipment calibration, preventative maintenance, and sample disposal protocol within the laboratory
- Performing quality assurance audits and surveillance of the implementation of the laboratory quality management system and reporting the results to the Project Chemist.
- Reviewing a minimum of *5* percent of project analytical data packages to verify conformance to established guidelines and data quality objectives.
- Maintaining established schedules for analytical results.

8.4.0 Contract Laboratory Certification

8.4.0 1 As stated in Section 8.1.0.1, ECBC will be analyzing soil samples for H, L, TDG, 1,4-dithiane, and 1,4-oxathiane on-site using their mobile laboratory (MEAP). ECBCs monitoring plan is included in Book 2, Volume III of this Safety Submission.

8.4.0.2 An off site laboratory will perform all HTRW analyses once the samples have been cleared for CWM by ECBC. This laboratory will use EPA certified methods to support the standard environmental methods under SW-846.

8.5.0 Sample Types

8.5 0.1 The sampling programs to be conducted as part of the removal action at OU 1 include 1) soil/debris characterization sampling, 2) characterization of intact non-CWM items (if recovered), 3) soil compliance (verification) sampling, and 4) investigation-derived waste sampling. These sample types and their collection are described in detail in Section 12.0 of this Work Plan. For reference, a summary-level sampling schedule indicating the samples anticipated to be collected during the remedial action is presented in Table WP 12-2. Note that samples collected during the remedial action will be analyzed for CWA and their associated breakdown products by ECBC prior to being transported off-site for additional analyses.

8.6.0 Sample Collection Procedures and Locations

8.6.0.1 Sample collection and sample identification procedures defined in Section 12.0 of this Work Plan (Sampling Programs) are designed to meet the project-specific DQOs. Sample containers will be filled in order of compound volatility or stability. All samples will be placed in contaminant-free containers as specified in the *U.S EPA Specifications and Guidance for Obtaining Contaminant-Free Sample Containers* (U.S. EPA, 1992). Containers shall be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. The containers that are recommended for sample collection, the required preservatives (if applicable), and sample holding times are listed Table WP 12-3 (refer to Section 12.0 of this Work Plan).

8.7.0 Sample Handling, Custody, and Documentation

8.7 0 1 To assure that the samples are representative of the environment from which they are collected, chain of custody records will be used as control documents for ensuring that samples are handled properly and sample custody is maintained. An example chain of custody record is shown in Figure WP 8-1 (this is an example only, site specific forms will be generated for DDMT). The chain of custody record will be initiated by the field sampling personnel upon collection of a sample, and will accompany each sample cooler. Each cooler will then be hand carried to ECBCs Mobile Environmental Analytical Platform (MEAP) for on-site analysis of the Caws H and L and their associated breakdown products. Once the sample is confirmed to be free of agent contamination, the sample will be shipped off-site by UXB for the remaining hazardous waste analyses. Each individual who has the samples in his/her possession will sign the chain of custody. This includes both ECBC and UXB.

8.7.0.2 For each cooler shipped off-site, the cooler temperature will be recorded and the sample container integrity will be checked. Any deficiencies at the time of sample receipt at the laboratory will be documented on the cooler receipt form (Figure WP 8-2*)* by the sample custodian, and the UXB Project Chemist will be notified for necessary resolution.

8.7.0.3 To control common problems such as labeling errors, chain of custody errors, transcription errors, preservation failures, etc., detailed procedures for properly recording sample information and analytical requests on chain of custody records, for preserving samples as appropriate, and for sample packaging and shipment are described in Section 12. Field sampling personnel will be required to become familiar with appropriate sections of this Work Plan, prior to initiating fieldwork

8 7.0.4 The Field QC Supervisor will generate a sample register in the field with assistance from the UXB Field Team Leader. The function of the sample register is to provide a comprehensive record of collected samples to be used for shipment tracking, tracking receipt of analytical data, and to provide a foundation for information management. All information will be recorded daily in indelible ink. Daily entries will include information on the date and time sampled, sampling location, headspace readings, sample identification number, sample type, matrix type, laboratory destination, date shipped, shipment tracking number, and associated QA/QC samples.

8 7.0.5 Prior to shipment, samples will be certified free of airborne agent above the Ales for H and L (0.003 mg/m^3) in accordance with U.S. Army Pamphlet (DA-PAM) 385-61 (refer to Section 3.0 of this Work Plan). In addition, the laboratory shall be notified that the samples are from a suspect CWM site, and that they have been analyzed for agent prior to shipment.

8.8.0 Laboratory Analytical Procedures

8.8.0.1 This section describes each laboratory analytical method to be used for the acquisition of chemical data during the Dunn Field removal action, and includes relevant aspects of laboratory procedures (sample preparation/extraction procedures, instrumentation, calibration procedures, preventative maintenance, method/instrument detection limits [Mils], and practical quantitation limits [Pals). Analytical quality control requirements, evaluation criteria, acceptance criteria, and corrective actions are discussed in subsequent sections. SW-846 methods will be used for the analysis of hexachloroethane, n-nitrosodiphenylamine, arsenic, TCLP metals, reactivity, ignitability, and corrosivity, as listed in Table WP 12-1. Analytical procedures to be used for the analysis of chloroacetophenone. chloropicrin, adamsite, lewisite, mustard, thiodiglycol, 1-4 dithiane and 1 ,4-oxathiane are also identified in Table WP 12-1 and are described in Appendix B of this section.

8.8.1 Analytical Methods

8.8.1.1 The analytical methods for this project and their associated extraction/preparation procedures are identified in Table WP 8-2. These analytical methods were selected for this project because they represent the best available methods for analysis of the contaminants of concern, and the PQLs for these methods meet the project DQOs and are at or below the soil cleanup goals.

8.8.2 Method Detection Limits, Practical Quantitation Limits, and Contract Required Quantitation Limits

8.8.2.1 **Method Detection Limit.** The MDL is an empirically derived value that is used to estimate the lowest analyte concentration a method can detect in a matrix-free environment. SW-846 defines the MDL as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDLs are updated annually by the Contract Laboratory following the guidance in 40 CFR 136 Appendix B.

8.8.2.2 **Practical Quantitation Limit.** The PQL is the lowest concentration that can be reliably achieved within limits of precision and accuracy during routine operating conditions, and for SW-846 methods is based on the MDL for each analyte. The PQLs for each of the definitive methods are listed in Appendix C of this section. For this project the PQLs will be the Contract Required Quantitation Limits (CRQLs).

8.8.2.3 **Reporting Requirements.** Non-detects in method blanks will be reported as less than the MDL (<MDL value) for SW-846 methods. For MEAP methods, non-detects in method blanks will be reported as less than the PQL (<PQL value) in accordance with ECBCs governing agency Chemical Agent Standard Analytical Reference Material (CASARM). For field samples, the following will apply:

- All non-detected target analyte will be reported as less than the PQL value.
- if target analytes are detected at or above the PQL, they will be reported as quantified.
- For SW-846 methods, target analytes detected below the PQL but above the MDL will be qualified due to the limited accuracy and precision associated with quantification.

8.8.2.4 If a sample must be diluted and reanalyzed to bring the concentration of a single compound of interest within the linear calibration range of the instrument, and this results in non-detect values for other originally detected target analytes, the data for both the initial and reanalysis will be reported with the appropriate notations in the case narrative. if samples must be diluted and reanalyzed due to matrix interference, a detailed description of all failures to meet the PQLs will be included in the case narrative and the supporting documentation (chromatograms) will be included in the Comprehensive Certificate of Analysis.

8.8.3 Instrument Calibration and Frequency

8.8.3.1 Instrument calibration is necessary to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet CRQLs. Calibration establishes the dynamic range of an instrument, establishes response factors to be used for quantitation, and demonstrates instrument sensitivity. Criteria for calibration are specific to the instrument and the analytical method. Specific calibration procedures are taken from the Contract Laboratory's SOPs. The QC acceptance criteria and corrective actions for instrument calibration of definitive analytical methods are included in Appendix C. The following paragraphs describe the general requirements for standards preparation and traceability and laboratory instrument calibration procedures.

8.8.3.2 **Standard/Reagent Preparation.** To ensure the highest quality standard, primary reference standards used by the Contract Laboratory for SW-846 methods of analysis will be obtained from the National Institute of Standards and Technology (NIST), EPA Cooperative Research and Development Agreement (CRADA) vendors, American Association of Laboratory Accreditation (A2LA) vendors, or other reliable commercial sources. Standards are obtained in their pure form or in a stock or working standard solution. Dilutions are made from the vendor standards. Vendor certification for the standards will be retained in the laboratory's files and made available upon request.

8.8.3.3 All records regarding standards will unambiguously trace their preparation, their use in calibration, their expiration dates, and the quantitation of sample results. When standards are received at the laboratory, the date received, supplier, lot number, purity, concentration, and expiration date shall be recorded in a standards preparation logbook. All standards will be given a standard identification number. The final concentration of the standard, the volume of the standard that was diluted, the solvent and the source and lot number of the solvent used for standard preparation, the expiration date of the standard, and the preparer's initials will also be recorded in the standards logbook

8.8.3.4 After preparation and before routine use, the identity and concentration of the standards will be verified. Verification procedures include a check for chromatographic purity (if applicable) and verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source (if available).

8 8.3 5 Reagent purity will be assessed by analyzing an aliquot of the reagent lot using the analytical method in which it will be used; for example, every lot of dichloromethane (for organic extractables) is analyzed for undesirable contaminants prior to use in the laboratory.

8.8 3.6 Standards will be routinely checked for signs of deterioration (e.g., discoloration, formation of precipitates, and changes in concentration), and will be discarded if deterioration is suspected or their expiration date has passed Standard expiration dates will be based on vendor recommendations, the analytical methods, or from internal research.

8.8.3.7 For MEAP methods, reference standards will be obtained from stock agents located at the Chemical Transfer Facility (CTF) at the Edgewood area of Aberdeen Proving Ground (APG). Because agent reference standards are regulated by CTF, only limited volumes of standard (usually stocks of 10 to 20 ppm prevailed in 1.8 milliliter autosampler vials) will be provided to ECBC at any given time. Agent standards are verified at the CTF before they are received by ECBC. Certifications for the agent standards are maintained at the CTF. Holding times for agent standards are based on CTF's recommendations. Documentation procedures for standard preparation are the same as those described in paragraph 8.7.3.3. The standard, the volume of the standard that was diluted, the solvent and the source and lot number of the solvent used for standard preparation, the expiration date of the standard, and the preparer's initials will also be recorded in the standards logbook

8 8 3.8 After preparation and before routine use, the identity and concentration of the standards will be verified Verification procedures include a check for chromatographic purity (if applicable) and verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source (if available).

standards are verified at the CTF before they are received by ECBC. Certifications for the agent standards are maintained at the CTF. Holding times for agent standards are based on CTF's recommendations. Documentation procedures for standard preparation are the same as those described in paragraph 8.7.3.3. The standard, the volume of the standard that was diluted, the solvent and the source and lot number of the solvent used for standard preparation, the expiration date of the standard, and the preparer's initials will also be recorded in the standards logbook.

8.8.3.8 After preparation and before routine use, the identity and concentration of the standards will be verified. Verification procedures include a check for chromatographic purity (if applicable) and verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source (if available).

8.8.3 9 Reagent purity will be assessed by analyzing an aliquot of the reagent lot using the analytical method in which it will be used; for example, every lot of dichloromethane (for organic extractables) is analyzed for undesirable contaminants prior to use in the laboratory.

8.8 3.10 Standards will be routinely checked for signs of deterioration (e.g , discoloration, formation of precipitates, and changes in concentration), and will be discarded if deterioration is suspected or their expiration date has passed. Standard expiration dates will be based on vendor recommendations, the analytical methods, or from internal research.

8.8.3 11 **Instrument Calibration Procedures.** All instruments will be calibrated in accordance with the Contract Laboratory's SOPs. Laboratory instrument calibration is required to ensure that the analytical system is operating correctly and functioning at the sensitivity necessary to meet the CRQLs. Each instrument will be calibrated according to the manufacturer's guidelines using standard solutions appropriate to the type of instrument and the linear range established for the analytical method. For SW-846 methods, the instrument calibration will be from the lowest to the highest calibration standard, and the lowest calibration standard concentration will be set to as close to the MDL as possible, but in all cases to at least the PQL (CRQL) for each target analyte. For MEAP methods, instrument calibration will be from the highest to the lowest calibration standard based on the government restrictions associated with these compounds.

8.8.3.12 The Contract Laboratory will maintain records of instrument calibration that will include at a minimum the equipment calibrated, the reference standards used for calibration, the calibration techniques, actions, acceptable performance tolerances, frequency of calibration, and calibration documentation format. The analysis logbook maintained for each analytical instrument will include at a minimum the date and time of calibration, the initials of the person performing the calibration, the calibration reference number, and concentration. For SW-846 methods, the instrument calibration records will also include daily checks using standards prepared independently of the calibration standards and instrument response will be evaluated against established criteria. For MEAP methods, an independent check standard is not analyzed because the CTF is the only distributor of standards for CWA.

8.8.4 Preventative Maintenance

8.8.4.1 Preventative maintenance of all laboratory equipment and instruments is essential to ensure the quality of the analytical data produced. The objective of preventative maintenance is to ensure instrument operation is appropriate for both project and method DQOs. The Contract Laboratory has a routine preventative maintenance program to minimize the occurrence of instrument failure and other system malfunctions. The Contract Laboratory has designated individuals who perform routine scheduled maintenance for each instrument system and required support activity. The following paragraphs focus on: maintenance responsibilities, maintenance schedules, record keeping, and inventory of spare parts and equipment.

receipts are stored in the organic section). This logbook serves as a permanent record documenting any routine preventative maintenance performed, as well as any service performed by external individuals such as manufacturer's service representatives. In addition, all receipts from routine maintenance performed by manufacturer's representatives will be kept in folders and maintained in the laboratory's file. These records will be made available upon request during external audits.

8 8 4.5 **Spare Parts.** An adequate inventory of spare parts will be maintained to minimize equipment down time. This inventory will include those parts (and supplies) which are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner. The laboratory will also have a mechanism in place that assures the maintenance of this inventory.

8.8.4.6 **Contingency Plan. In** the event of instrument failure, every effort will be made to analyze samples by an equivalent alternate means within holding times, if the redundancy in equivalent instrumentation is insufficient to handle the affected samples, the UXB Project Chemist will be immediately notified and the corrective action to be taken will be determined by the laboratory, the CEHNC PM, and the Project Chemist.

8.9.0 Quality Control Requirements

8.9.0 1 The term "data quality" refers to the level of reliability associated with a particular data set or data point. The data quality associated with environmental measurement data is a function of the sampling plan rationale, the procedures used to collect the samples, and the analytical methods and instrumentation used in making the measurements. The overall quality assurance objective for this investigation is to develop and implement sample collection, sample handling, and analytical procedures that will provide data that can be used to fulfill the project DQOs. The DQOs for the remedial action are presented in Section 8.1. The remainder of this section defines how the data will be assessed to meet the project DQOs, and the criteria that will be used to define acceptable limits of uncertainty.

8.9.0.2 To determine overall data quality, the results of QC sample analysis will be evaluated in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC). The QC samples that will be used to assess the quality of both the field and laboratory data (prepared both in the laboratory and in the field) are described in more detail in Section 8.9. A summary of the chemical data quality control evaluation program in terms of PARCC is presented in Table WP 8-3. The frequency of both field and laboratory quality control samples used to evaluate analytical data for this program are described and listed by data type and analytical method in Table WP 8-4. Method-specific quality control procedures and acceptance criteria (control limits) for definitive methods that will be used by the laboratory as guidance are included in Appendix C of this section. Laboratory corrective action summaries for definitive methods are also provided in Appendix C. The following paragraphs define the PARCC parameters and how they will be used to assess data quality

8.9.1 Precision

8.9.1.1 **Definition.** Precision is the reproducibility of measurements under a given set of conditions. For large data sets, precision is expressed as the variability of a group of measurements compared to their average value (i.e.. standard deviation) For duplicate measurements, precision is expressed as the relative percent difference (RPD) of a data pair and will be calculated using the following equation:

$$RPD = \frac{\frac{|A-B|}{(A+B)} \times 100}{2}$$

where A and B are the reported concentrations for duplicate sample analyses.

8.9.1.2 **Field Precision Objectives.** Field precision will be assessed through the collection and analysis of field replicate samples (refer to Section 8.1.). Field replicates will be collected for each analytical method at a rate of 1 replicate sample per 10 soil samples.

8.9.1.3 **Laboratory Precision Objectives.** Analytical laboratory precision will be assessed through the calculated RPD between matrix spike and matrix spike duplicate (MS/MSD) sample data (see Section 8.9.1.) and the calculated RPD between the field sample and field replicate. Precision in the laboratory will also be assessed by relative standard deviation (RSD) for three or more replicated samples (e.g., response factors for calibration standards). The control limits for precision for the definitive methods are listed in Appendix C.

8.9.2 Accuracy

$$\text{Percent Recovery} = \frac{|A-B|}{C} \times 100$$

where: A is the target analyte concentration determined analytically from the spiked sample

B is the background level determined by a separate analysis of the unspiked sample

C is the concentration of spike added.

quantitatively through the analysis of MS/MSD and standard reference materials (SRM),which include surrogate spikes, laboratory control samples (LCS), and response factors for internal and calibration standards (see Section 8.9). The QC limits for the definitive methods are provided in Appendix C.

8.9 2 1 **Field Accuracy Objectives.** Although accuracy of the field program cannot be assessed quantitatively, the following criteria will be used for a qualitative accuracy assessment for this project: sample handling, shipping, preservation, and holding time.

8.9.2.2 **Laboratory Accuracy Objectives.** Laboratory accuracy will be assessed quantitatively through the analysis of MS/MSD and standard reference materials (SRM), which include surrogate spikes, laboratory control samples (LCS), and response factors for internal and calibration standards (See Section 8.10). The QC limits for the definitive methods are provided in Appendix C of this section.

8.9.3 Representativeness

8 9.3.1**Definition.** Representativeness is a qualitative expression of the degree to which sample data accurately and precisely represent a characteristic of a population, a sampling point, or an environmental condition Representativeness is maximized by ensuring that, for a given project, the number and location of sampling points, and the sample collection and analysis techniques are appropriate for the specific investigation, and that the sampling and analysis program will provide information that reflects "true" site conditions.

8.9 3.2 **Measures to Ensure Representativeness of Field Data.** Representativeness of field data is dependent upon the proper design of the data collection procedures. Sampling and field measurement procedures should be based on existing analytical data, and the physical setting and past land use history of the site. The sampling procedures to be used during excavation operations are outlined in Section 12.0 of the Work Plan. Representativeness of the field data will be evaluated by assessing whether this Work Plan was followed during sample collection In addition, the analytical results from field replicate samplings also will be used to evaluate the representativeness of field sampling procedures.

8 9.3.3 **Measures to Ensure Representativeness of Laboratory Data.** Laboratory data will be evaluated for representativeness by assessing whether the laboratory followed the specified analytical criteria in this Work Plan and their SOPs, evaluating holding time criteria, and the results of method blank samples and field replicate samples.

8.9.4 Comparability

8.9.4.1 **Definition.** Comparability is a qualitative parameter that expresses the confidence with which one data set may be compared with another. Comparability is dependent on similar QA objectives and is achieved through the use of standardized methods for sample collection and analysis, and the use of standardized units of measure

8.9.4.2 **Measures to Ensure Comparability of Field Data.** The field data that will be collected will include the documentation of the removal action procedures and the sample collection, handling, and shipping procedures. These data will be recorded in a field logbook or on the applicable field forms. Comparability of the sampling program will be evaluated by the reviewing of the field documentation to determine whether the removal action and the sample collection, handling and shipping protocols specified in the Work Plan were followed.

8.9.4.3 **Measures to Ensure Comparability of Laboratory Data.** Laboratory data comparability is dependent on the use of similar sampling and analytical methodology and standard units of measure for different projects at a specific site. Comparability of laboratory data will be maximized by specifying standard sampling and analytical methodologies (SW-846) in the Work Plan that are similar to those used in previous projects (as appropriate). Laboratory data comparability will be assessed by comparing data collected during the removal action to historical data (as available) and assessing whether the analytical methodology presented in the Work Plan were followed.

8.9.5 Completeness

8.9.5.1 **Definition.** Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct, normal conditions Completeness will be calculated using the following equation:

<u>Number of valid data points</u> ~ 100 Completeness — Total number of measurements

8.9 5.2 **Field Completeness Objectives.** Field completeness is a quantitative measure of the actual number of samples collected compared to those samples scheduled for collection. The field completeness goal for this project is 100 percent (minimum criterion)

8 9 5 3 **Laboratory Data Completeness** Objectives Laboratory data completeness is a quantitative measure of the percentage of valid data for all analytical data as determined by the precision, accuracy, and holding time criteria evaluation. Completeness will be calculated by dividing the total number of valid data points by the total number of data points Laboratory completeness for this project is 100 percent.

8.10.0 Internal and External QC Controls

8.10 0.1 **Internal** quality control evaluates whether a method is performing within acceptable limits of precision and accuracy The internal quality control samples that will be used to evaluate analytical data for this program are described and listed by data type and analytical method in Table WP 8-4. These include QC samples prepared both in the field and by the laboratory. Table WP 8-3 summarizes the QC sample evaluation of laboratory data in terms of the PARCC parameters Method-specific quality control procedures, frequency of QC sample analysis, acceptance criteria (control limits), and corrective actions for definitive methods are included in Appendix C of this section. The following paragraphs describe the QC samples and holding time criteria that will be used to assess data quality.

8.10.1 Field Quality Control Program

8.10.1 1 For field sampling, quality control samples are used to assess sample collection techniques and to assess environmental conditions during sample collection and transport. For this project QC samples will include temperature blanks and field replicates (submitted blind to the laboratory).

8.10.1.2 **Temperature Blanks and Cooler Temperature.** Temperature blanks and the internal temperature of the cooler will be used to evaluate representativeness by assessing whether the sample temperature criterion of $4^{0}C \pm 2^{0}C$ was met during sample shipment to an off-site laboratory. The temperature of the blank and the internal temperature of the cooler is measured at the time the samples are received by the laboratory and recorded on the chain of custody. Temperatures that exceed the temperature criterion indicate that the samples may not have been handled or transported properly

8.10.1.3 **Replicate Samples.** Replicate soil samples (submitted blind to the laboratory) will be used to assess variability in the sample media and to assess sampling and analytical precision. A replicate sample pair is a single grab sample that is split into two samples during collection. For each replicate sample pair, one of the samples is labeled with the correct sample identification and the other is labeled with a fictitious sample name. This sample pair is then submitted to the same laboratory as two separate samples. Precision will be evaluated by calculating the RPD between the field replicate samples for all analytes detected at or above the PQL. RPD calculations will not be performed when either one or both sample results for the field replicate sample pairs are lower than the PQL. Because there is no guidance that specifies QC acceptance criteria for field replicate samples, the following acceptance criteria will be used for this project:

- *35* percent for concentrations greater than 10 times the PQL
- *50* percent for concentrations less than 10 times the PQL.

8.10.2 Laboratory Quality Control Program

8.10.2 1 The Contract Laboratory will conduct internal quality control procedures in accordance with their SOPs, the individual method requirements, and this Work Plan. Prior to making changes to the Work Plan or analytical methodology, the Contract Laboratory will notify the Project Chemist in writing. The CEHNC PM will be notified of any proposed changes. All changes to the Work Plan or analytical methodology will be approved by the CEHNC PM, the Depot, EPA Region IV prior to their implementation.

8.10.2.2 Laboratory quality control consists of two distinct components—a laboratory component and a media component The laboratory component measures the performance of the laboratory analytical process during sample analysis, while the media component measures the effects of specific media on method performance Criteria and quality control samples that will be used to assess the laboratory component include holding times, method blanks, internal standards, surrogate spikes, and LCS. The QC samples that will be used to assess media affects include MS/MSD and blind replicates samples.

8.10 2.3 The Contract Laboratory will, at a minimum, analyze internal QC samples at the frequency specified by the analytical method and in this Work Plan. Method-specific quality control procedures, frequency of QC sample analysis, acceptance criteria (control limits), and corrective actions for definitive methods are provided in Appendix C. The following paragraphs discuss holding time and the QC samples that the Contract Laboratory will use to assess data quality.

8.10.2.4 **Sample Holding Time.** Sample holding time reflects the length of time that a sample or sample extract remains representative of environmental conditions. For methods that do not require sample extraction one holding time will be evaluated: the length of time from sample collection to analysis. For methods that require sample extraction prior to analysis two holding times will be evaluated: the length of time from sample collection until sample extraction, and the length of time from sample extraction to sample analysis. These holding times will be compared to the holding times specified by SW-846. The

UXB Project Chemist will be notified immediately if any sample exceeds the method holding time. No samples will be analyzed outside of the specified method holding times. The holding times are presented in Table WP 12-3 of Section 12.0 (Sampling Plan) for each analytical method.

8.10.2.5 **Method Blanks.** Method blanks will be used to monitor the laboratory preparation and analytical systems for interference's and contamination from glassware, reagents, sample manipulations, and the general laboratory environment. The method blank is an analyte-free matrix (reagent grade water or laboratory grade sand) to which all reagents will be added in the same volumes or proportions as used in sample processing. Method blanks are taken through the entire sample preparation/extraction and analytical process. One method blank will be prepared for each extraction or analytical batch of samples (less than or equal to 20 samples).

8.10.2.6 If analytes of interest are detected in the method blanks and in associated field samples, the data for the associated field samples may be considered unrepresentative of the site conditions. This evaluation depends on the relative concentrations of contaminants in the method blank and field samples. All data for field samples with associated blank contamination will be qualified in accordance with the functional guidelines for data validation (EPA, 1994). In addition, an explanation detailing any blank contamination problems will be provided in the case narrative (which is included in the Certificate of Analysis). Data qualifiers that will be used by the laboratory are listed in Table WP 8-5.

8.10.2.7 **Surrogate Spikes.** Surrogate spikes will be used to evaluate the accuracy of analytical instrument performance for organic methods analyzed by SW-846. Surrogate spikes will be added to each sample, including QC samples, prior to extraction as specified in the Contract Laboratory's SOP. After the analysis has been completed, the percent recovery of each surrogate spike will be calculated and compared to the Contract Laboratory's QC acceptance criteria (Appendix C of this section). *If* the surrogates fail, an explanation of the failure will be included in the case narrative, and the supporting documentation (chromatograms) will be included in the Comprehensive Certificate of Analysis. if the surrogate failure indicates a system problem, the system will be evaluated and the samples will be re-prepared and reanalyzed, as appropriate. No surrogates are available for agent analyses.

8.10.2.8 **Laboratory Control Samples.** Laboratory control samples (LCSs) will be used to measure laboratory accuracy in the absence of matrix interference Laboratory control samples are prepared in the laboratory and consist of samples of a known matrix (reagent grade water or laboratory grade sand) spiked with a known quantity of specific target analytes in accordance with the laboratory SOPs. These samples are taken through the entire sample preparation and analytical process. LCSs will be prepared and analyzed with each analytical or preparation batch of environmental samples up to a maximum of 20 samples of a similar matrix.

8.10.2.9 Accuracy will be evaluated by calculating the percent recovery for each spiked compound and comparing it to the QC limits established by the laboratory for each method (Appendix C). if the LCS does not meet the acceptance criteria for accuracy, the LCS will be reanalyzed to assess whether the result is representative of a transient instrument problem. The reanalysis of the LCS will occur in real time with respect to sample analysis, otherwise reanalysis of the complete sample/instrument batch will occur. if the LCS fails a second time, the sample/instrument batch (as appropriate) will be re-extracted and reanalyzed.

8.10.2.10 **Matrix Spikes and Matrix Spike Duplicates.** Matrix spikes (MS) and Matrix Spike Duplicates (MSD) measure matrix-specific method performance and will be used to assess accuracy and precision. MS and MSD samples will be analyzed at a frequency of *5* percent for each analytical method using site specific media. For TCLP analyses, only an MS will be analyzed Unlike LCSs, MS/MSD samples will be used to assess the influence of the sample media (media interference) on the analysis. Each MS/MSD sample will be spiked with the compounds specified by the analytical method prior to sample extraction or analysis in accordance with the Contract Laboratory's SOPs. To evaluate accuracy, the percent recovery for each spiked compound will be calculated and compared to the Contract Laboratory established QC limits listed in Appendix C. Precision will be evaluated by calculating the RPD between the MS and MSD samples for each spiked analyte and comparing the results to the Contract Laboratory established QC limits listed in Appendix C of this section.

8.10.2.11 The results of the MS/MSD sample analysis will be assessed in accordance with the Functional Guidelines (EPA, 1994). If the MS/MSD fails because the concentration of the target analytes in the sample is greater than four times the spike concentration, the data will be accepted as reported. If the MS/MSD fails the QC acceptance criteria for accuracy or precision (outside the four times rule criterion), the MSJMSD will be re-extracted (as appropriate) and reanalyzed. Failure of different spike analytes on successive runs for methods with multiple spiked analytes will be considered a reanalysis failure and will satisfy the requirement for reanalysis. MSIMSD failure will initiate a review of the data for the corresponding analytical batch. A determination will be made as to whether the failure is representative of the sample that was spiked or representative of the entire sample batch. If the MS/MSD failure is attributed to media interference, both sets of data will be reported, a discussion of the MS/MSD failure will be presented in the case narrative, and the supporting documentation (chromatograms) will be included in the certificate of analysis If trend analysis of the batch data indicates that the MS/MSD failure is associated with a system problem, re-extraction (if applicable) and reanalysis of the batch will be performed

8.10.2.12 Field Replicates. As discussed previously, field replicates will be used to assess both sampling and analytical precision. The purpose of submitting samples "blind" to the laboratory is to assess the consistency or precision of the laboratory's analytical system. Precision will be evaluated by calculating the RPD between the field replicate samples. Because there is no specific acceptance criteria for assessing precision for field replicate samples, the acceptance criterion of ±35 percent for target analyte concentrations greater than 10 times the PQL and *±50* percent for target analyte concentrations less than 10 times the PQL has been adopted for this project.

8.10.2.13 Batch Quality Control Logic. The frequency of instrument calibration and QC sample analysis for the analytical methods are batch controlled. All site sample data for this project will be associated with sample batch QC samples that were extracted concurrently with the site samples and analyzed in the same analytical batch (sequence on the same instrument relative to the primary sample results). The following paragraphs define sample and instrument batches.

8 10.2.14 For this project, a sample batch is a group of twenty or less environmental samples of the same matrix which are extracted within the same time period (concurrently) or in limited continuous sequential time periods. Keeping batches "open" for more than two hours will not be acceptable; samples and their associated QC samples (method blank, LCS, and MS/MSD) will be prepared in a continuous process. The sample batch will be analyzed sequentially on a single instrument.

8.10.2.15 The instrument batch is a group of 20 or less environmental samples which are analyzed together within the same analytical run sequence as defined by the method calibration criteria or in continuous sequential time periods. Samples in each batch are of similar matrix (e.g., soil, sludge, liquid waste, and water), are treated in a similar manner, and use the same reagents.

8.11.0 Laboratory Data Review, Validation, and Verification

8 11.0.1 The Contract Laboratory will be responsible for reviewing all analytical data generated under this contract to ensure it meets the requirements of this Work Plan. In addition, data validation based on the Functional Guidelines (EPA, 1994) will be performed by the UXB Project Chemist, their designee, or by a subcontracted professional data validation firm, on all definitive samples analyzed for this project. As described in Section 11.8, the validity of the field and analytical data will be evaluated using the PARCC parameters. The PARCC parameters will be used to determine whether the data quality objectives of this investigation have been met by comparing QC sample results and standard procedures with acceptance criteria established for this project. The Project Chemist will also verify that the certificates of analysis are complete.

8.11.1 Laboratory Data Review

8.11.1.1 Each analyst reviews the quality of their work based on established protocols specified in laboratory SOPs, analytical method protocol, and project-specific data quality objectives. This initial review of the data package, performed by the analyst, is conducted to assess whether:

- Sample preparation procedures and documentation are correct and complete.
- Sample analysis and documentation are correct and complete
- The appropriate SOPs have been followed.
- Analytical results are correct and complete.
- QC samples are within established control limits and method blanks are

  acceptable.
- Documentation is complete (e.g., all anomalies in the preparation and analysis have been documented, out-of-control forms, if required, are complete, holding times are documented, etc).

8.11.1 2 It is the analyst's responsibility to check the QC information against limits of acceptability for the analysis. When an analysis of a QC sample (blank, spike, check standard, replicate, or similar sample) shows that the analysis of that batch of samples is not in control, the analyst will immediately bring the matter to the attention of the group leader. The group leader will, if necessary, consult with the Laboratory Quality Assurance Officer and/or Laboratory Project Manager to determine whether the analysis can proceed, or if selected samples should be rerun, or specific corrective action needs to be taken before analyzing additional samples. Out-of-control analyses and information justifying recovery or precision outside QC acceptance criteria must be documented. The analyst or group leader will file a Nonconformance Report with the Laboratory Quality Assurance Officer for laboratory analysis out of control events that require documentation. The UXB Project Chemist will be notified as soon as feasibly possible of any out-of-control events resulting in unacceptable data related to their samples. If warranted, the Project Chemist will also consult with the CEHNC PM and/or EPA Region IV. The CEHNC PM will then decide what further action, if any, needs to be taken.

8 11.1.3 The Laboratory Project Manager shall review the report, chain of custody records, and other supporting documentation to ensure that the data meets the project-specific limits for the analyses. The supporting documentation includes, at a minimum:

- Laboratory name and address.
- Sample information (including unique sample identification, sample collection date and time, date of sample receipt, and date(s) of sample preparation and analysis).
- Analytical results, reported with an appropriate number of significant figures.
- Reporting limits reflecting dilutions, interferences, and corrections for dry weight as applicable.
- Method references.
- Appropriate QC results and correlations for sample batch traceability and documentation.
- Data qualifiers with appropriate references and narrative on the quality of results.
- Confirmation that project-specific requirements have been met.

8.11.2 Validation and Verification Methods

8.11.2.1 After the laboratory review, the Certificates of Analysis for all samples will be forwarded to the Project Chemist. Raw data will be included for 10 percent of the samples. Data validation will be performed on all data packages by a data review specialist whose function is to provide an independent data review that back checks the laboratory QC results. This individual may either be the Project Chemist or a subcontracted professional data validation firm. The validation is structured to assure that the QC samples and their acceptance criteria have been met for definitive data. PARCC parameters will be used to validate the quality of analytical data and determine whether the DQOs of the project have been met. Table WP 8-3 depicts how the QC samples will be used to assess PARCC parameters. The calculations that will be used to assess data quality are included in Section 8.8.

8.11 2 2 To further assess data validity, the analytical results from 10 percent of the samples, documented in the Level IV raw data package, will be checked back to the bench sheet. If no problems are found with the Level IV raw data package, the review will be considered complete. If any significant procedural problems are found with the 10 percent data back check, an additional 10 percent of the samples may be checked to the bench sheet. This process will continue until no substantial errors are found or until all of the data has been reviewed in its entirety. This validation is documented on the Data Validation Form (Figure WP 8-3), which also includes the signature of the reviewer and the date of the validation. The validated data are then approved for release, and are ready for incorporation into final reports.

8.11.2.3 Data validation techniques include accepting, rejecting, or qualifying the data on the basis of acceptance criteria outlined in Section 8.10.2.1. Data will not be released prior to completion of the data validation. Data qualifiers that will be used for validation are listed in Table WP 8-5.

8 11.2.4 The Project Chemist will also review the field data to identify inconsistencies and/or anomalous values, and to further ensure data usability. Any inconsistencies discovered will be resolved immediately, if possible, by seeking clarification from those personnel responsible for data collection. At a minimum, the information contained in boring logs, field notes, field-sampling forms, and chain of custody records, as applicable, will be included in the review process All changes or corrections to this field documentation will also be reviewed. Once the review has been performed, the field data will be forwarded to all data users

8.11.3 Reconciliation with Data Quality Objectives

8.11.3.1 Each step of the reconciliation process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of the data is essential to ensuring that the data consistently meet the data quality objectives of the project.

8 11.3.2 Before the Comprehensive Certificate of Analysis is released to the Project Chemist and CEHNC PM, the Laboratory Quality Assurance Officer will review the data for conformance to the project DQOs. All data collected during this project will be reviewed and flagged with the appropriate laboratory qualifiers before being reported (Table WP 8-5). If anomalous results are obtained, efforts will be made to identify any problems in the sample collection, preparation, and/or analysis that could have contributed to the anomaly. If any problems have occurred, they will be reported and include an estimate of the impact the problem may have on the remaining data. In addition, the UXB Project Chemist will be notified of any existing problems and will be updated as conditions dictate.

8.11.3.3 Following the analytical laboratory data review, the sample data will be submitted to the UXB Project Chemist who will review and compare all data with the project data requirements. If the sample results do not conform to the data quality objectives, the data will be thoroughly reviewed to identify any existing problems. Depending on the DQOs for the non-conforming data, the data will either be qualified as to limitations on the use of the data, or the sample analysis will be repeated, if deemed necessary. The CEHNC PM will be included in all decisions made by the Project Chemist.

8.12.0 Corrective Actions

8.12.0.1 Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or performance that may affect data quality. All proposed and implemented corrective action will be documented in Daily Quality Control Reports (DQCRs) to the appropriate Project Manager. Corrective action will be implemented only after approval by the Operations Officer, or the CEHNC Project Managers, as appropriate, if immediate corrective action is required, approvals secured by telephone from the CEHNC Operations Officer will be documented in an additional memorandum. If warranted, EPA Region IV will also be included in the corrective action process.

8.12.1 Field Corrective Action

8.12.1.1 During any field activity, the field staff will be responsible for documenting and reporting all suspected technical and QA non-conformances, and suspected deficiencies. Typical field protocol to correct problems associated with field measurements or sampling equipment include the following:

- Repeating the measurement to check for error.
- Making sure the meters or instruments are adjusted properly for ambient conditions, such as temperature.
- Checking or replacing batteries..
- Recharging batteries.
- Recalibrating the instruments.
- Replacing the meters or instruments used to measure field parameters.
- Stopping work (if necessary) until the problem is corrected.

8.12.1.2 If a non-conformance or problem requires a major adjustment to the field procedures outlined in the Work Plan (e.g., changing sampling methodology or sampling schedule), in conjunction with CEHNC will be responsible for 1) initiating corrective actions, 2) evaluating the reported non-conformance, 3) determining the appropriate corrective actions, 4) securing approval from EPA Region IV, if appropriate, 5) approving all changes in writing or verbally prior to field implementation, if feasible, 6) ensuring that explanations of non-conformances and associated corrective actions are included in an appendix to the report scheduled for this investigation, and 7) ensuring that no additional work dependent on the non-conforming activity is performed until the appropriate corrective actions are completed.

8.12.2 Laboratory Corrective Action

8.12.2.1 Corrective actions are required whenever unreliable analytical results prevent the quality control criteria from being met, as specified by the method or this Work Plan. The corrective action taken depends on the analysis and the non-conformance. Appendix C of this section. provides a summary of corrective actions that will be undertaken for problems associated with definitive laboratory analyses.

- QC data are outside the acceptance criteria for precision and accuracy.

8.12.2.2 Corrective action will be undertaken if any of the following occurs:

- Blanks contain contaminants above acceptance levels.

- Undesirable trends are detected in spike recoveries, spike recoveries are outside the QC limits, or RPDs between duplicate analyses are consistently outside QC limits.

- There are unusual changes in detection limits.

- Deficiencies are detected during QA audits.

- Inquiries concerning data quality are received from the Project Chemist.

8.12.2.3 Corrective actions will be handled primarily at the bench level by the analyst who reviews the sample preparation or extraction procedures, and performs the instrument calibration and analysis. If the problem persists or its cause cannot be identified, the matter will be referred to the department supervisor or QA department for further investigation. Once resolved, full documentation of the corrective action procedure will be filed with the QA department A summary of the corrective actions will be included in the data reports (Comprehensive Certificates of Analysis).

8.12.3 Data Validation Corrective Actions

8 12.3.1 Corrective action may be initiated during data validation or data assessment Potential types of corrective action include resampling by the field team or reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, how critical the data are to the project DQOs, and whether the samples are still within holding time criteria. When a corrective action situation is identified, the Operations Officer and CEHNC PM will be notified, and will have the final responsibility for authorizing the implementation of the corrective action, including resampling and documenting the corrective action. If warranted, EPA Region IV will also be included in the corrective action process.

8.13.0 Data Management and Reporting

8.13.0.1 The individuals responsible for data management include all personnel responsible for identifying, reporting, and documenting activities affecting data quality. The technical qualifications of individuals associated with data management activities will be commensurate with level of expertise necessary to ensure the intended level of evaluation.

8.13.0 2 All project files will provide a traceable record for all data management activities. The Contract Laboratory will maintain a project file that includes but is not limited to the following: formulas used, computer programs used, which data transfers are electronic or manual, validation steps, etc All data acquired electronically will be transferred and manipulated electronically to reduce errors inherent in manual data manipulation. Data entered, transferred, or calculated by hand will be spot checked for accuracy by someone who did not perform the original entries or calculations.

8.13.0.3 The Comprehensive Certificates of Analysis will be prepared at the conclusion of work for each sampling event, and will be received by the UXB Project Chemist no later than 3 working days after receipt of the samples and chain of custody at the laboratory. The data reporting requirements for the Comprehensive Certificates of Analysis are outlined in Table WP 8-1. This submittal is subject to review and comment by UXB and CEHNC. The Contract Laboratory may be directed to resubmit the final Comprehensive Certificate of Analysis if the conditions of these specifications are not met.

8.13 0.4 All data will be qualified as specified in Section 8.10. Ragging criteria are applied to definitive data when acceptance criteria were not met and corrective action was not successful or not performed. The data flags and flagging criteria are described in Table WP 8-5. Any qualified datum will have only one associated data qualifying flag, which will reflect the most severe qualification

8 13.0.5 The Contract Laboratory will maintain a project-specific file such that the analytical process can be completely reconstructed; The Contract Laboratory will preserve all information regarding sample

analyses (correspondence, sample custody forms, hard copies of raw data, results, calibration records, etc.) in the project file. Data storage and documentation will be maintained in logbooks and on data sheets that will be included in the project file. Computer-acquired data will also be stored on magnetic tape, disks, or other media that can be accessed using industry-standard hardware and software for data processing, retrieval, or reporting. The Contract Laboratory will maintain all data under this contract for a minimum of ten years following submission of the Certificate of Analysis (data package).

8.14.0 Chemical Data Quality Management Deliverables

8.14.0.1 Specific reporting mechanisms have been developed to keep management informed on the status of project quality. This section describes the type, frequency, content, and distribution of reports issued to inform management of project status, performance evaluation and system audit results, data quality assessment results, quality assurance problems and recommended solutions. This will be accomplished in part by including CEHNC on the distribution of these reports.

8.14.1 Daily Quality Control Reports (DQCRs)

8 14.1.1 Daily Quality Control Reports are field reports, which summarize daily activities. These reports will include location(s) of work, weather conditions and temperatures, work performed, results of any inspections/tests performed, the individuals performing the inspections/tests, calibration procedures, problems identified and associated corrective actions taken, any instructions received from DDMT or CEHNC, and any general comments. UXB will prepare DQCRs for every day there is work being performed, material being delivered, or a labor force. present DQCRs will be submitted to CEHNC within 48 hours of request.

8.14.2 Non-Routine Occurrence Reports

8.14 2.1 Written reports of all significant non-routine occurrence events will be sent to the CEHNC PM within 48 hours of occurrence of non-routine events for field and laboratory work. Significant events are occurrences impacting cost of work, schedule of work, quality of work, or quality of environmental analytical data. These reports will identify the problem, corrective action, and verbal/written instructions from the CEHNC PM to project personnel.

8.14.3 Quality Control Summary Report (QCSR)

8.14.3.1 A Quality Control Summary Report will be prepared at the end of the project. Issues covered in this report will include the quality control practices employed in execution of the delivery order, and a discussion of all data points which may have been compromised and their impact on the data quality objectives or remedial decisions. The QCSR will be submitted to the CEHNC PM at the time of submission of the Removal Action Report. The QCSR will be prepared by compiling information relative to the project according to the following outline.

- Project Scope
- Project Description
- Sampling Procedures
- Summary of Daily Quality Control Reports
- Analytical Procedures
- Data Presentation (including Analysis and Validation)

8.14.1 Daily Quality Control Reports (DQCRs)

8.14.1.1 Daily Quality Control Reports are field reports, which summarize daily activities. These reports will include location(s) of work, weather conditions and temperatures, work performed, results of any inspections/tests performed, the individuals performing the inspections/tests, calibration procedures, problems identified and associated corrective actions taken, any instructions received from DDMT or CEHNC, and any general comments. UXB will prepare DQCRs for every day there is work being performed, material being delivered, or a labor force. present. DQCRs will be submitted to CEHNC within 48 hours of request.

8.14.2 Non-Routine Occurrence Reports

8.14.2.1 Written reports of all significant non-routine occurrence events will be sent to the CEHNC PM within 48 hours of occurrence of non-routine events for field and laboratory work. Significant events are occurrences impacting cost of work, schedule of work, quality of work, or quality of environmental analytical data. These reports will identify the problem, corrective action, and verbal/written instructions from the CEHNC PM to project personnel

8.14.3 Quality Control Summary Report (QCSR)

8.14.3.1 A Quality Control Summary Report will be prepared at the end of the project. Issues covered in this report will include the quality control practices employed in execution of the delivery order, and a discussion of all data points which may have been compromised and their impact on the data quality objectives or remedial decisions. The QCSR will be submitted to the CEHNC PM at the time of submission of the Removal Action Report. The QCSR will be prepared by compiling information relative to the project according to the following outline.

- Project Scope
- Project Description
- Sampling Procedures
- Summary of Daily Quality Control Reports
- Analytical Procedures
- Data Presentation (including Analysis and Validation)
- QC Activities
- Conclusions and Recommendations

8.14.4 Removal Action Report

8.14.4.1 After conclusion of the field work, a Removal Action Report will be prepared which summarizes the work performed, data obtained for closure, results of data validation, and any significant deviations from this Work Plan. The QCSR will be provided as an appendix to the Removal Action Report. The Removal Action Report will be submitted to the Memphis Depot and CEHNC for their review and subsequently to TDEC and the EPA for acceptance and site closure.

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Figure WP 8-1

Chain of Custody Form

CHAIN OF CUSTODY RECORD/LAB WORK REQUEST

Chain of Custody N
Cooler Number :
Page : of :
Air Bill No. :

LABORATORY :
UXB International, Inc

MW Contact
Project :
Project Number :
Date Due :
Samplers Signature :

Lab ID No. (Lab Only)	Location ID	Sample ID	Depth Interval (ft)	Date Collected	Time Collected	Matrix*	Sampling Technique	ANALYSES REQUESTED								Lot Control ID

* Matrix:
SO - Soil
SE - Sediment
WS - Surface Water
WG - Ground Water
LF - Product
AA - Air
SW - Wipe
EP/TCLP Leachate
WQ - Trip Blank, Equipment Blanks
WW - Wastewater

* Sampling Technique
Composite=C
Grab=G
Hand Auger=HA
Cone Penetrometer=CN
Bladder Pump=BP
Submersible Pump=SP
Bailer=B

SPECIAL INSTRUCTIONS

Relinquished by/Affiliation	Received by/Affiliation	Date	Time

Relinquished by/Affiliation	Received by/Affiliation	Date	Time

LABORATORY USE ONLY

SAMPLES WERE:
1 Shipped or hand delivered
Notes:
2 Ambient or Chilled
Notes:
3 Temperature
4 Received Broken/Leaking (Improperly Sealed)
Y N
Notes:
5 Properly Preserved
Y N
Notes:
6 Received Within Holding Times
Y N
Notes:

COC Tape Was:
1 Present on Outer Package
Y N NA
2 Unbroken on Outer Package
Y N NA
3 Present on Sample
Y N NA
4 Unbroken on Sample
Y N NA
Notes:

Discrepancies Between Sample Labels and COC Record?
Y N
Notes:

Defense Distribution Depot, Memphis, TN
Chain of Custody Form
Figure WP 8-1

Figure WP 8-2

Example: Cooler Receipt Form

Client Name. ____________________ Log #: ____________

Project # (LIMS) ID #: ____________ Project Copied: ____________

	Intials	Date
Location(s): ____________		
Date Received: ________ Time Received. ________	______	______
Delivered by: ☐ Federal Express ☐ Airborne ☐ Courier Express ☐ DHL ☐ White Cotton Delivers ☐ UPS ☐ Over the Counter (OTC) ☐ Go-Getters ☐ Other: ____________		
Custody Seal Status. ☐ Intact ☐ Broken ☐ N/A	______	______
Custody Seal Number(s): ____________		
Shipping Container(s): ☐ Quanterra ☐ Client ☐ N/A	______	______
Temperature Record (in ¡C):		
COC#: ____________	______	______
Temp Blank: ____________		
Ambient Temp: ____________		
pH Measured: ☐ Yes ☐ Anomaly ☐ N/A	______	______
Sample(s) Labeled By:	______	______
Sample Labeling Checked By:	______	______
Short Hold Time Notification: Sample Receiving ☐ N/A	______	______
Wet Chem ☐ N/A	______	______
Metals (Filt/Pres) ☐ N/A	______	______
☐ Complete shipment received in good condition. with appropriate temperatures. containers. and preservatives.	______	______
☐ Anomaly (-ies)/comments: ☐ Temperature exceeded (2¡C-6¡C)	______	______
____________ ☐ PM notified N/A		

____

____

____

____

____

Table WP 8-1

Data Quality Levels and Reporting Format Summary

Data Reporting Level	Data Reporting Requirements	Report Format (per data type)
I	Field operations (locations, dates, and times)	Project-specific logbook
	Physical characteristics of the soil/debris	Project-specific logbook
	Depth and volume of soil removed	Project-specific logbook
	Screening method results	Hard copy of data report
II	Survey data on the location and depth of the excavation	Hard copy of data report
III	Case narrative (including samples not meeting QC criteria, out of control conditions, corrective actions, and matrix effects with justification)	Hard copy of data report
	Completed chains of custody (form and internal tracking documents)	Hard copy of data report
	Initial calibration summary form	Hard copy of data report
	Continuing calibration summary form	Hard copy of data report
	Injection logs	Hard copy of data report
	Target compound results for all samples, including field QC samples including dilution factors, reanalysis, batching information, and bracketing information	Electronic copy of data
	Method blank results	Hard copy of data report Electronic copy of data
	MS/MSD results (actual values and percent recovery)	Hard copy of data report Electronic copy of data
	LCS results (spike concentration, actual values, and percent recovery)	Hard copy of data report Electronic copy of data
	Surrogate results, if applicable (spike concentration, actual values, and percent recovery)	Hard copy of data report Electronic copy of data

Data Reporting Level	Data Reporting Requirements	Report Format (per data type)
	Holding time summary	Hard copy of data report
	Inventory Sheet	Hard copy of data report
IV (CLP-like data reports)	Case Narrative (same as Level III, but also including field sample IDs, a list of parameters analyzed for each sample)	Hard copy of data report
	Cover Sheet/Traffic Report	Hard copy of data report
	QC Summary (as applicable to the method)	
	- System monitoring compound summary	Hard copy of data report
	- Surrogate results	Hard copy of data report Electronic copy of data
	- LCS results	Hard copy of data report Electronic copy of data
	- Method blank results	Hard copy of data report Electronic copy of data
	- MS/MSD results	Hard copy of data report Electronic copy of data
	- Interference check sample	Hard copy of data report
	- Method of Standard Additions	Hard copy of data report
	- ICP serial dilutions, linear ranges, and inter-element correction factors	Hard copy of data report
	- Interference check sample	Hard copy of data report
	- GC/MS instrument performance check	Hard copy of data report
	- Retention time windows	Hard copy of data report
	- Internal standard area and RT summary	Hard copy of data report
	- Reconstructed total ion chromatograms (RIC) for all data	Hard copy of data report
	- Raw spectra and background-subtracted	Hard copy of data report

Data Reporting Level	Data Reporting Requirements	Report Format (per data type)
	mass spectra of target compounds identified	
	Standards Data (All instruments)	
	- Initial calibration data	Hard copy of data report
	- RICs and quantitation reports for all standards	Hard copy of data report
	- Continuing calibration data	Hard copy of data report
	Raw QC Data	
	- DFTPP/tuning standards (as appropriate)	Hard copy of data report
	- System blank data	Hard copy of data report
	- Laboratory control sample data	Hard copy of data report
	Holding time summary	Hard copy of data report

All data for analyses during the period covered by the comprehensive Certificate of analysis will be included as an appendix to the comprehensive report. This data shall be presented on numbered pages with an index or table of contents describing the contents of the appendix.

Table WP 8-2

Summary of Analytical methods

Analytical				Extraction/Preparation	
Parameter	Matrix	Method	Procedure	Method	Procedure
Lewisite	Soil	MEAP	Gas Chromatography/Mass Spectrometry (GC/MS)		Microextraction
Mustard	Soil	MEAP	Gas Chromatography/Flame Photometry		Microextraction
Thiodiglycol	Soil	MEAP	GC/MS		Microextraction
1,4-Dithiane	Soil	MEAP	GC/MS		Microextraction
1,4-Oxathiane	Soil	MEAP	GC/MS		Microextraction
Chloroform	Soil	8260B	GC/MS	5030	Purge and Trap
Chloropicrin	Soil	8270C Mod	GC/MS	3540	Soxhlet
Arsenic	Soil	6010B	Inductively coupled Plasma Atomic emission Spectrometry (ICP)	3051	Acid Digestion
	Water	6010B	ICP	3020A	Acid Digestion
TCLP Metals	Soil	6010B	ICP	1311	Toxicity Characteristic Leaching Procedure
	Soil	7470A	Cold-Vapor Atomic Absorption	1311	Toxicity Characteristic Leaching Procedure
Reactivity	Soil	Section 7.3.3	Gas Scrubber (Hydrogen Cyanide)		
		Section 7 3 3	Gas Scrubber (hydrogen Sulfide)		
Ignitability	Soil	1030	Setflash Closed Tester		
Corrosivity	Soil	9045C	Electrometric		
	Water	9045C	Electrometric		

Table WP 8-3

Chemical Data Quality Control Evaluation in Terms of PARCC

PARCC	Quality Control Program	Applicable Methods	Evaluation Criteria
Precision	Field Replicates	SW-846 6010B (Total arsenic only), 8260B, 8270C and MEAP	Relative Percent Difference (a)
	MS/MSD Sample Pairs	SW-846 6010B (Total arsenic only), 8082, 8260B, 8270C and MEAP	Relative Percent Difference
Accuracy	Surrogate Spikes	SW-846 8082, 8260B and 8270C	Percent Recovery (b)
	MS	SW-846 7470A (TCLP), 6010B (TCLP and total arsenic), 8082, 8260B, 8270C and MEAP	Percent Recovery
	MSD	SW-846 6010B (Total arsenic only), 8082, 8260B, 8270C and MEAP	Percent Recovery
	LCS	SW-846 6010B (Total arsenic only), 8082, 8260B and 8270C	Percent Recovery
	LFB	MEAP	Percent Recovery
Representa tiveness	Method Blanks	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C, Sections 7 3.3 & 7.3.4 and MEAP	Qualitative, Degree of Confidence
	Field Replicates	SW-846 6010B (Total arsenic only), 8260B, 8270C and MEAP	Qualitative, Degree of Confidence
	Temperature Blanks	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C and Sections 7.3.3 & 7.3.4	Qualitative, Degree of Confidence
	Equipment Blanks	SW-846 6010B (Total arsenic only), 8082, 8260B and 8270C	Qualitative, Degree of Confidence
	Holding Time	SW-846 7470A (TCLP), 6010B (TCLP and total arsenic), 8082, 8260B, 8270C and MEAP	Qualitative, Degree of Confidence
	Trip Blanks	SW-846 8260B	Qualitative, Degree of Confidence
Comparabili ty	Standard Field Procedures	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C, Sections 7.3.3 & 7.3 4 and MEAP	Qualitative, Degree of Confidence
	Standard Analytical Methods	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C, Sections 7.3.3 &	Qualitative, Degree of Confidence

PARCC	Quality Control Program	Applicable Methods	Evaluation Criteria
		7.3.4 and MEAP	
	Standard Units of Measure	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C, Sections 7.3.3 & 7.3.4 and MEAP	Qualitative, Degree of Confidence
Completeness	Valid Data	SW-846 7470A, 6010B, 8082, 8260B, 8270C, 1030, 9045C, Sections 7.3.3 & 7.3.4 and MEAP	Percent Acceptable Data (c)

LCS Laboratory Control Sample
LFB Laboratory Fortified Blank

MEAP Mobile Environmental Analytical Platform
Mod Modified
MS/MSD Matrix Spike/Matrix Spike Duplicate
PARCC Precision, Accuracy, Representativeness, Completeness, and Comparability
TCLP Toxicity Characteristic Leaching Procedure

(a) Relative Percent Difference = $\frac{\text{Sample Concentration - Duplicate Concentration}}{\text{(Sample concentration + duplicate Concentration)/2}} \times 100$

(b) Percent Recovery = $\frac{\text{Spiked Analyte Concentration in Spiked Sample - Spiked Analyte Concentration in Unspiked Sample}}{\text{Concentration of Spiked Analyte}} \times 100$

(c) Percent Valid Data = $\frac{\text{Number of Acceptable Data Points}}{\text{Total number of Measurements}} \times 100$

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Table WP 8-4

Quality Control Sample summary

QC Sample Type	Applicable Methods	Rational	Frequency	Description	QC Sample Data Assessment
Field QC Samples					
Field Replicate	6010B (Total As only), 8260B, 8270C, MEAP	Assess sampling and analytical precision.	One per 10 samples for each analytical method.	Replicate of a specific sample submitted blind to the laboratory.	RPDs will be calculated between the sample and its replicate. The RPD for field replicate sample analysis will be plus or minus 50% for concentrations less than 10 times the PQL or 35% for concentrations greater than 10 times the PQL.
Equipment Blank	6010B (Total As only), 8260B, 8270C	Assess the completeness of the decontamination process for non-dedicated sampling equipment	One per sampling event.	Collect rinsate from equipment decontamination and carry through the dame sample collection, handling, and analytical procedures as the investigative samples	All target analyte detections will be evaluated in accordance with the functional guidelines for data validation (U S. EPA 1994)
Temperature Blank	6010B (As & TCLP), 7470A (TCLP), 8082, 8260B, 8270C, Sec 7.3 3, Sec 7.3 4, 1030, 9045C	Assess sample temperature criterion.	Each sample cooler.	A 40 ml glass vial filled with reagent grade water. The temperature of this sample is measured at the time samples are received by the laboratory	Assess whether temperature criterion has been met for representativeness evaluation.
Laboratory QC Samples					
Method Blank	6010B (As & TCLP), 7470A (TCLP), 8082, 8260B, 8270C, Sec. 7.3.3, Sec. 7.3 4, 1030, 9045C, MEAP	Identify Target analytes that may have been introduced into the sample during analysis.	Each extraction batch (20 samples maximum) for each analytical method.	Reagent-grade water that is carried through the same analytical process as native samples.	All target analyte detections will be evaluated in accordance with the functional guidelines for data validation (U.S. EPA 1994).

QC Sample Type	Applicable Methods	Rational	Frequency	Description	QC Sample Data Assessment
Surrogate Spikes	8082, 8260B, 8270C	Assess analytical accuracy.	Each sample for analysis including both investigative and QC samples for each method	Each sample will be spiked in the laboratory with surrogate spikes in accordance with the laboratories SOPs for the respective methods	Percent recovery will be calculated for each spiked analyte and compared to the QC limits for surrogate recoveries for the respective methods.
Matrix Spike (MS)	6010B (As & TCLP), 7470A (TCLP), 8082, 8260B, 8270C, MEAP	Identify media interference during analysis.	One per 20 samples for each media for each analytical method.	Site-specific soil samples will be spiked in the laboratory in accordance with their SOPs for the respective methods	Percent recovery and the RPD for each spiked analyte will be calculated and compared to laboratory established QC limits for the respective methods
Matrix Spike Duplicate (MSD)	6010B (Total As only), 8082, 8260B, 8270C, MEAP	Identify media interference during analysis.	One per 20 samples for each media for each analytical method	Site-specific soil samples will be spiked in the laboratory in accordance with their SOPs for the respective methods.	Percent recovery and the RPD for each spiked analyte will be calculated and compared to laboratory established QC limits for the respective methods
Laboratory Control Sample (LCS)	6010B (Total As only), 8082, 8260B, 8270C	Assess media interference in the event of MS/MSD analysis that fail QC criteria and to assess laboratory accuracy.	One per extraction batch (20 samples maximum) for each analytical method	LCSs are prepared by the laboratory and consist of reagent-grade soil spiked with the analytes specified in the laboratories SOPs for the respective methods.	Percent recovery and the RPD for each spiked analyte will be calculated and compared to laboratory established QC limits for the respective methods
Laboratory Fortified Blank (LFB)	MEAP	Assess ,media interference in the event of MS/MSD analysis that fail QC criteria and to assess laboratory accuracy.	One per extraction batch (20 samples maximum) for each analytical method	LFBs are prepared by the laboratory and consist of reagent-grade soil spiked with the analytes specified in the laboratories SOPs for the respective methods.	Percent recovery and the RPD for each spiked analyte will be calculated and compared to laboratory established QC limits for the respective methods.

As	Arsenic
LCS	Laboratory control sample
LFB	Laboratory fortified blank
MEAP	Mobile Environmental Analytical Platform
ml	Milliliter

MS	Matrix spike
MSD	Matrix spike duplicate
PQL	Practical quantitation limit
QC	Quality control
RPD	Relative percent difference
SOPs	Standard operating procedures
TCLP	toxicity Characteristic Leaching Procedure

Table WP 8-5

Guide to Data Qualifiers

R	Result is considered unusable.
UB	Analyte is considered not detected at or above indicated concentration due to blank contamination.
UK	Analyte is considered not detected at or above indicated concentration based on data evaluation
UJ	Possible false negative result due to related QC problems.
J	Result is considered estimated based on MS/MSD or surrogate percent recoveries.

TAB

9. Air Monitoring Plan

9.0 Air Monitoring Plan

9.1.0 General

9.1.0.1 Air monitoring will be conducted by UXB and ECBC in accordance with Section 8.0 of the SSHP and ECBCs Monitoring Plan.

9.1.0.2 During removal activities, ECBC personnel will be responsible for monitoring all work areas for the presence of CWM in real time using the Miniature Chemical Agent Monitoring System (MINICAMS) and Real Time Analytical Platform (RTAP). ECBC's Monitoring Plan (Book 2 of this Safety Submission) contains the specific monitoring procedures and protocols.

9.1.0.3 UXB is responsible for performing all non-CWM site monitoring. Section 8 of the SSHP provides a detailed description of the various non-CWM to be monitored for during this effort.

TAB

10. Quality Control Plan

10.0 Quality Control Plan

10.1.0 Purpose

10 1 0 1 The purpose of this Quality Control Plan is to specify the policies and procedures for ensuring quality control in the successful accomplishment of all assigned task orders under the scope of work for the CWM investigation/ removal action at Dunn Field, former Defense Depot Memphis Tennessee.

10.1.0.2 This Quality Control Program applies to all UXB team members involved in the execution of this delivery order.

10.2.0 Quality Policies and Objectives

10.2.1 Quality Policies

10.2.1.1 All of UXB's services are consistent with the public good and comply with all applicable laws and regulations. Quality management is applied through all phases of the project—from the first time a member of the U.S. Army Engineering and Support Center, Huntsville calls authorizing the Delivery Order, until the Final Report is accepted. The Quality Program emphasis is placed on preventive actions.

10.2.1.2 All UXB employees and team members are empowered to and expected to identify and evaluate potential problem areas, and are encouraged to recommend solutions and corrective actions. All UXB employees and team members are held accountable for the quality of their work.

10.2.1.3 UXB employees and team members are provided with a Contracting Officer approved Safety Submission prior to the performance of any UXO-related activities on the project site. UXB will take timely corrective and preventive actions on any complaint or quality defect from an audit of operations. UXB's Quality Program is developed with input from both the technical and administrative sectors within UXB.

10.2.2 Quality Objectives

10.2.2.1 To provide quality services which consistently meet or exceed the expectations of the U.S. Army Engineering Support Center, Huntsville, during the administration of this UXB Delivery Order.

10.2.2.2 To staff this project site with the best qualified, trained, and available personnel, based upon their knowledge and experience with the type of operations and hazards expected to be encountered. The minimum qualifications delineated in OT-025, dated 970422, are required for all UXB personnel involved in UXO-related activities.

10.2.2.3 To maintain a high degree of day-to-day quality awareness in all UXB employees and team members and to provide a high quality product for the client.

10.3.0 Definitions

Access Procedures: Those actions taken to locate exactly and to gain access to the contents of burial pits indicated in the statement of work.

Chemical Agent: A chemical agent listed in Appendix B to AR 50-6 that is intended for use in military operations to kill, seriously injure, or incapacitate a person through its physiological properties.

Clearance Standard: All burial pits to the depths specified in the Safety Submission.

Customer/Client Refer to the U S. Army Engineering & Support Center, Huntsville

Explosive Ordnance Disposal (EOD) Personnel. Active duty military EOD personnel.

Explosive Soils (ES): Explosive soils refer to mixtures of explosives in soils, sands, clays, or other media at concentrations such that the mixture itself is explosive. Soils containing 13% or more by weight of any secondary explosives is considered explosive soil.

Government Representative: An on-site Government employee with specified responsibilities and authority.

Hazardous Toxic Radiological Waste (HTRW): Waste or media (i.e. air, water, soil, etc.) contaminated with chemicals or compounds that have been determined to be harmful to human health and the environment and are regulated by Federal and State Law.

Inert Ordnance Inert ordnance is an item which has functioned as designed leaving an inert carrier, an item manufactured inert to serve a specific training purpose, or an ordnance item that has been inerted by military EOD

Nonconformance:

A minor nonconformance is not likely to materially reduce the usability of the services. It is generally a departure from the approved procedures that have little bearing on the end-product.

A major nonconformance is likely to result in failure of the services or to materially reduce the usability of the end-product.

A critical nonconformance is likely to result in hazardous or unsafe conditions for individuals using or depending upon the services.

Ordnance and Explosives (OE): OE is anything designed to cause damage to people or material through explosive force, incendiary action, or toxic effects. This includes bombs; warheads; missiles; artillery; mortars; rockets; small arms ammunition; anti-personal and antitank mines; demolition charges; pyrotechnics; grenades; torpedoes and depth charges; high explosives and propellants; depleted uranium rounds; military chemical agents; and all similar and related items or components explosive in nature or otherwise designed to cause damage to people or material (fuzes, boosters, bursters, or rocket motors)

Purchaser: When used in the U S. Army Engineering & Support Center, Huntsville contracts, the term purchaser shall refer to the body of the Government Agency administering the particular contract involved, or in the authorized representative of the U. S. Army Engineering and Support Center, Huntsville.

Quality Assurance: The procedures by which the Government fulfills its responsibility to be certain that QC is functioning and the specific product is realized.

Quality Conformance Inspection (QCI): Normal inspections/audits conducted by authorized UXB personnel during the accomplishment of the organization's mission to determine conformance to contract requirements.

Quality Control (QC): The UXB system to manage, control, and document the activities to comply with the contract requirements.

Quality Defect: A nonconformance issue with published policy and/or a contractual requirement that requires corrective action(s).

Quality Management All those control and assurance activities instituted to safely and effectively accomplish the assigned mission.

Recovered Chemical Warfare Material (RCMW): Chemical agent and/or associated equipment and surrounding contaminated media discovered either by chance or during deliberate real estate recovery/restoration operations that was previously disposed of as waste. RCMW is classified as hazardous waste and not within the scope of the Army Chemical Surety Program.

Root Cause. The basic reason for an undesirable condition or problem which, if eliminated or corrected, would have prevented it from existing or occurring.

Stop-Work-Authority. The right and obligation to stop all work when serious quality or safety concerns arise.

Subsurface Clearance. Removing UXO that are not visible on the surface, requiring the use of geophysical detection equipment to locate the items.

Supplier: The organization that provides a product or a service to the purchaser. When used in the Quality Systems definition of U. S Government contracts, the term supplier denotes the contractor (UXB).

Surface Clearance: Removing UXO that are visible on the surface. This includes items partially exposed, which will require only minimal hand excavation to determine identification.

Unexploded Ordnance (UXO): An item of explosive ordnance which has failed to function as designed or has been abandoned, discarded, or improperly disposed of and can still function, causing damage to personnel or material.

UXO Personnel: Former EOD.personnel provided by UXB.

10.4.0 Associated Material

- DACA87-97-R-0006
- OT-005, Work Plan, dated 970203
- OT-015, Accident/Incident Report, dated 960530
- OT-020, Location Surveys and Mapping, dated 960130
- OT-025, Personnel Qualifications, dated 960422
- OT-030, Site Specific Removal Report, dated 960227
- OT-035, Cost/Schedule Status Report, dated 950817
- OT-040, Disposal Feasibility Letter Report, dated 970211
- OT-045, Report/Minutes, Record of Meeting, dated 950821
- OT-050, Property Management Plan, dated 950413
- OT-055, Telephone Conversations/Correspondence Records, dated 942513
- OT-060, Remedial Action Safety Plan (RASP), dated 942513
- OT-065, Exposure Data Report, dated 970326
- Safety Concepts and Basic Considerations for Unexploded Ordnance Operations, USAESCH, February 16, 1996.
- Work Standards for Ordnance Response, USAESCH, October 25, 1994. [30 July 1996]

- DoD Manual 4160.21 M Defense Reutilization and Disposal Manual
- DoD 6055.9 Std. DoD Ammunition and Explosive Safety Standard
- AR 200-1 Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-40, Accident Reporting and Records with USACE Supplement
- AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat.
- AR 385-64, Ammunition and Explosive Safety Standards
- Government-Furnished Technical Manual 60-series publications.
- MIL-I-45208A, Inspection System Requirements, dated July 24, 1981
- EM 385-1-1, CE Safety and Health Requirements Manual
- USAESCH Quality Management Plan for Ordnance and Explosives Program, Chapter 5
- UXB International, Inc., Quality Management Plan, UXBQUAL-1-96
- *Root Cause Analysis, A Tool for Total Quality Management* by Wilson, Dell, and Anderson

10.5.0 Responsibilities

10.5.1 UXB Responsibilities

- UXB has the sole responsibility for the control of product quality and for offering to the U. S. Army Engineering & Support Center, Huntsville for acceptance only products/services (OE contract end product) determined by UXB to conform to the contractual requirements.
- Ensure that the corporate quality policy and program is understood, implemented and maintained at all levels within the UXB team.
- Ensure that vendor and subcontractors have and maintain a quality control system acceptable to the U.S. Army Engineering & Support Center, Huntsville.
- Maintain documented evidence that the services conform to the contract requirements. This includes the quality program procedures and processes, and the specified end-product
- Provide and maintain a quality control inspection system that is acceptable to the client.
- Assure the Quality Program provides for the prevention and ready detection of quality defects, and for timely and positive corrective action. The evidence of quality performance and/or non-conformance shall be documented and readily available to the U. S. Army Engineering & Support Center, Huntsville and included in the project final report.
- Ensure that the Quality Program provides for an equipment maintenance program which addresses 1) preventive maintenance, 2) routine repair and adjustment and, 3) emergency repair.
- Provide effective management for quality by assuring personnel performing quality functions have sufficient, well-defined responsibilities including stop-work authority, and the organizational freedom to identify and evaluate problems and to initiate, recommend or provide solutions.
- Provide a training program for all on-site personnel and those personnel that perform quality

functions.

10.5.2 UXB Director of Quality Responsibilities

- Execution of and compliance with the Quality Management Program
- Delegation of the authority to administer the on-site quality control function to the on-site Quality Control Personnel.
- Meet or exceed the minimum qualifications for QC personnel.
- Issue a Certificate of Training documenting that training of the on-site QC personnel has been completed

10.5.3 UXB On-Site LCPM/SUXOS Responsibilities

- Assure that all personnel are aware of the tasks to be performed and the expected quality standard to which the task is to be performed
- Coordinate with the Quality Control Personnel to accommodate the Quality Program activities.
- Immediately address customer complaints received verbally, by written correspondence, or a HND Form 948. The UXB LCPM/SUXOS will conduct an investigation to analyze the complaint and assure corrective action has been initiated. The corrective action will address the root cause and the controls applied to assure effectiveness. The LCPM/SUXOS will document the complaint and investigation on a Customer Action Request (CAR) (UXB Form 1.007a).
- Assure that all personnel are aware of the tasks to be performed and the expected standard to which the task is to be performed.
- Coordinate with the Quality Control Personnel to accommodate the Quality Program activities.

10.5.4 UXB Quality Control Personnel Responsibilities

10.5.4.1 A Quality Control Supervisor will be assigned to projects that warrant additional quality control personnel. If no Quality Control Supervisor is assigned, the Quality Control Specialist assumes the responsibilities of the Quality Control Supervisor UXB will have full time QC Personnel on the project. This individual reports directly to the Director of Quality, but is a member of the on-site team He will coordinate his scheduled activities with the LCPM/SUXOS, and the Site Safety and Health Officer. Figure WP 10-1 illustrates the UXB on-site QC organization.

10.5.4.2 This coordination and lateral communication are critical for proper implementation of the Quality Control Program QC personnel responsibilities are as follows:

- Assure that all personnel are aware of the tasks to be performed and the expected standard to which the task is to be performed.
- Conduct compliance audits on all site operations to assure the objectives of the project are being accomplished in accordance with the approved Work Plan. The Quality Conformance Inspection (QCI) Schedule outlines the audits to be performed.
- Brief the on-site personnel, during site -specific training on the importance of quality work and review of the quality policies and objectives stated in Section 10.3.0 of this program.

- Prepare the Daily QCI Report
- Perform Quality Conformance Inspections.
- Maintain all required Quality Program Records
- Complete Part Three of CAR to verify corrective/preventive actions taken for the complaint/non-conformance have in fact addressed the issues. Schedules future QCI to monitor and ensure the CAR solution is effective
- Initiate action to prevent occurrence of quality non-conformities relating to the provided services.
- Identify and record any quality problems relating to the services
- Recommend and implement solutions through the compliance channel.
- Verifies successful implementation of solutions
- Control further actions of non-conforming services until the unsatisfactory conditions have been corrected.

10.5.5 UXB Site Safety and Health Officer(SSHO) Responsibilities

- Verifies that all required safety procedures are followed.
- Reports to the Director of Quality any safety program non-compliance.
- Conduct daily tailgate safety meetings.
- Conduct weekly supervisor safety meetings.
- Provide visitors general and specific hazards training

10.5.6 UXB Site Team Members

- To perform all work in accordance with all the safety and health procedures.
- To perform all work with the highest standard of quality possible.
- To stop work when operations are not being performed in accordance with established safety practices and/or the UXB Quality Program.
- Maintain qualifications current for the tasks being performed.
- Keep field supervisors and project managers informed of changing field conditions which could affect the safety and quality of the work being performed.

10.6.0 Procedure

10.6.1 Quality Control Program

10 6 1.1 UXB's Quality Program has been established at the direction of the President. The responsibility for the development, integration and execution of the Quality Program resides with the Director of Quality. The authority to administer the on-site Quality Control (QC) Program is delegated to the on-site QC personnel.

- Approval authority for the Quality Control Program resides with the following UXB personnel:
  - President
  - Director, Federal Sector Programs
  - Director, Technical Design Engineering Group
  - Director of Quality
- Changes to the Quality Control Program are restricted to the approval authorities or their designees.
- The Quality Program is an integral part of the Work Plan.

10.6.2 Work Plan

10.6.2.1 Prior to commencing development of the Work Plan, the UXB management team reviews the delivery order to assure that requirements are concisely defined and a clear understanding of the scope of work between UXB and the U.S. Army Engineering & Support Center, Huntsville.

10.6.2.2 The Work Plan is the product of the Technical Design Engineering Group, which describes the process and procedures that will be used by UXB to complete the tasks specified in the delivery order.

10.6.2.3 Upon receipt of the delivery order, the Technical Design Engineering Group devotes the necessary resources to develop the Work Plan in accordance with the requirements of OT-005, for their customer, UXB's CWM Sector Program.

10.6.2.4 The Work Plan generated by the UXB Technical Design Engineering Group is reviewed, at the appropriate phases, by the following:

- Life Cycle Project Manager/Senior UXO Supervisor assigned to the project
- Director, Federal Sector Programs
- Certified Industrial Hygienist
- Safety/Training Manager
- Director of Quality

The reviews will be documented and maintained by the Technical Design Engineering Group.

10.6.2.5 The Work Plan is used by on-site supervision to brief and train their team members at the project site.

10.6.3 Preventive Maintenance

10.6.3.1 The Work Plan will include a maintenance program for all site equipment that addresses: 1) preventive maintenance; 2) routine repair and adjustment, and 3) emergency repair.

13.6.3.2 Preventive maintenance (PM) includes scheduled or unscheduled maintenance performed by appropriate personnel, i.e., an operator, in an effort to maintain the equipment in a satisfactory operating condition. The LCPM/SUXOS's conduct before, during, and after operation maintenance checks, which are documented. The LCPM/SUXOS's maintenance checks will include, as a minimum, the following equipment:

- Magnetometers
- Other UXO Detectors & Geophysical Equipment
- Radios & Cellular Telephones
- Vehicles
- Earth Moving Machinery
- Air Monitoring Equipment (if required)
- Calibration & Test Equipment

10.6.4 Property Accountability

10.6.4.1 When Government Furnished Property (GFP) is provided and Contractor Acquired Property (CAP) is purchased, the accountability for this equipment is controlled with the appropriate UXB Property Management procedures. The property administration fulfills the requirements of FAR Subpart 45 5. These procedures include the following:

- Examination upon receipt to detect damage in transit.
- Inspection for completeness and proper type
- Periodic inspection and precautions to assure adequate storage to guard against damage and theft.
- Function testing to determine satisfactory operation.

10.6.5 Quality Control Procedures

10 6.5.1 Quality Control Inspections (QCI) are normal inspection and audits conducted by authorized UXB personnel during the accomplishment of the organizations mission to determine conformance to contract requirements. Performance of QCI is addressed in the UXB Quality Control procedures. Attachment 1 to this chapter lists the Quality Control Inspection (QCI) Schedule. This QCI schedule includes all QCI's required by OT-005, Quality Control Plan, Section 10.13 5.1, which are:

- Equipment Calibration audits
- Property accountability audits
- UXO-related audits
- Equipment operator maintenance audits
- Personal Protective Equipment (PPE) audits

10 6.5.2 QCI conducted on Hazard Assessment and Risk Analysis will be assessed in terms of hazard severity and accident probability and assigned a risk assessment code (RAC). The QCI will verify that a RAC has been completed by the on-site management, and that it is a valid RAC. The guidelines for RAC are contained in Attachment 2 to this chapter.

10.6.5.3 QCI Documentation is completed for QCI's found to be in compliance, those uncompliant and for reinspection of non-conformance. The QCI findings are documented on the Daily QCI Report (UXB Form 1.0020). Figure WP 10-2 illustrates the QCI/Audit procedure flowchart.

- Daily QCI Report is prepared daily in an electronic transmission format. The form documents the daily QCI activities performed by the UXB QC staff and the daily QA activities which were performed by the U.S. Army Engineering & Support Center, Huntsville (CEHNC)

- Format is the same as UXB Form 1.0020 (Attachment 3 to this chapter).

- Prepared in Microsoft Word

- Submitted at the end of each work day.

- Distribution is as follows:

  bjgodek@uxb.com

  CEHNC - as directed

- Daily QCI Reports will categorize non-conformant tasks as minor, major or critical.

- When a non-conformance occurs, the QC personnel record the non-conformance item on the Rework Item List (RIL) (UXB Form 1.0063). The RIL is used by UXB Team members to document the resolution of the non-conformance item. Upon completion of the rework item, QC personnel are notified so that the item may be re-inspected for conformance and proper resolution.

- The Daily QCI Report will indicate all re-inspection nonconformances. Nonconformances have to be corrected by on-site management. Inaction by the on-site management will result in another QCI being performed, reported on the Daily QCI Report, and another Rework Item List generated

- Once resolution has been achieved for the non-conformance on the RIL, the RIL will be signed off and completed, and QC personnel notified that the non-conformance has been corrected

- If re-inspection indicates the non-conformance has been corrected, The completed Rework Item List will be retained and filed with the Daily QCI Report which noted the non-conformance

10 6.5.5 Customer Action Request (CAR) - Customer complaints are immediately addressed. The complaint may be by verbal comment, written correspondence, or a HND Form 948. The UXB LCPM/SUXOS will conduct an investigation to analyze the complaint and assure corrective action has been initiated The corrective action will address the root cause, as well as the application of controls to ensure its effectiveness.

1. The UXB LCPM/SUXOS will use the Customer Action Request (CAR) (UXB Form 1.007a.Rev.1) to document the complaint or nonconformance and the investigation. The investigation will entail studying the symptoms of the problem and determining the root cause. Instructions for completing the form are on the reverse side of the form

2 The action on the CAR is not complete until QC Personnel have completed Part Three. The corrective/preventive actions must be adequate to prevent reoccurrence and the CEHNC must be satisfied with these actions.

3. QC Personnel will schedule a future QCI to address the issues in the CAR to ensure that the corrective/preventive actions were successful.

4. The Director of Quality will maintain a CAR Log which accounts for all CAR's and indicates each CAR's status.

10.6.6 Quality Control Records

10.6.6 1 Quality Control records for all on-site activities are maintained on-site and available for USAESCH review The QC Specialist establishes and maintains the following files.

1 Daily QCI Report File - may be either hard copy or on a computer disk.

2. CAR File - A two part file containing active and inactive CAR's.

10.6.6.2 The Director of Quality will maintain a CAR Log which accounts for all CAR's and indicates each CAR's status.

10.6.7 Quality Control Audits

10.6.7.1 The routine Quality Control Audits to be performed are listed in Attachment 1. This attachment lists the definable work breakdown number, feature of work, the auditable activity, the property of that activity to be audited, the QC phase and the audit frequency. The routine audits correspond to the QCI's and are documented as such.

10.6.8 Quality Control Training

10.6.8.1 The UXB Director of Quality (Corporate Quality Program Manager) will have the necessary experience in UXO related tasks to conduct the program.

10.6.8.2 The UXB QC field personnel will meet the minimum qualifications as outlined in the OT-025 Personnel Qualifications. In addition, the individual will complete the following training:

1. U. S. Army Corps of Engineers video-based Course #784, Construction Quality Management for Contractors.
2. FAR Part 46, Quality Assurance
3. FAR Clause 52.246-1, Contractor Inspection Requirements
4. FAR Clause 52.246-4, Inspection of Services - Fixed-Price
5. FAR Clause 52.246-5, Inspection of Services - Cost-Reimbursement
6. FAR Clause 52.246-6, Inspection - Time-and-Material and Labor-Hour

10.6.8.3 Quality Control Training for all site personnel will be conducted by the Quality Control Personnel to meet the requirements of the Work Plan.

10.6.8.4 Safety Training for all site personnel will be conducted by the SSHO in accordance with the Work Plan This training will consist of the following as a minimum:

1. Site Specific Training
2. Daily tailgate safety meetings
3 Weekly Supervisor safety meetings
4. Visitor training for general and specific hazards training, as required.

10.7.0 Distribution

10 7.0.1 In addition to being a component of the Work Plan, this QC Program is distributed to the following:

1. President UXB
2. Director, Federal Sector Programs
3. Director, Technical Design Engineering Group
4. Director of Quality
5. Project Life Cycle Manager/Senior UXO Supervisor
6. Project QC Personnel
7. Project Bulletin Board

Figure WP 10-1
UXB On-Site Quality Control Organization

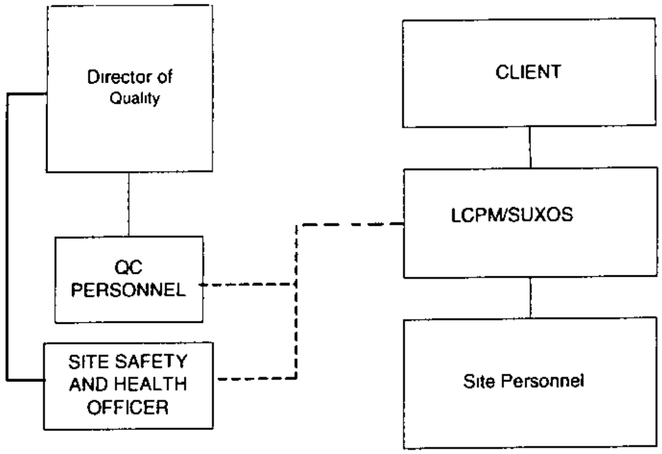
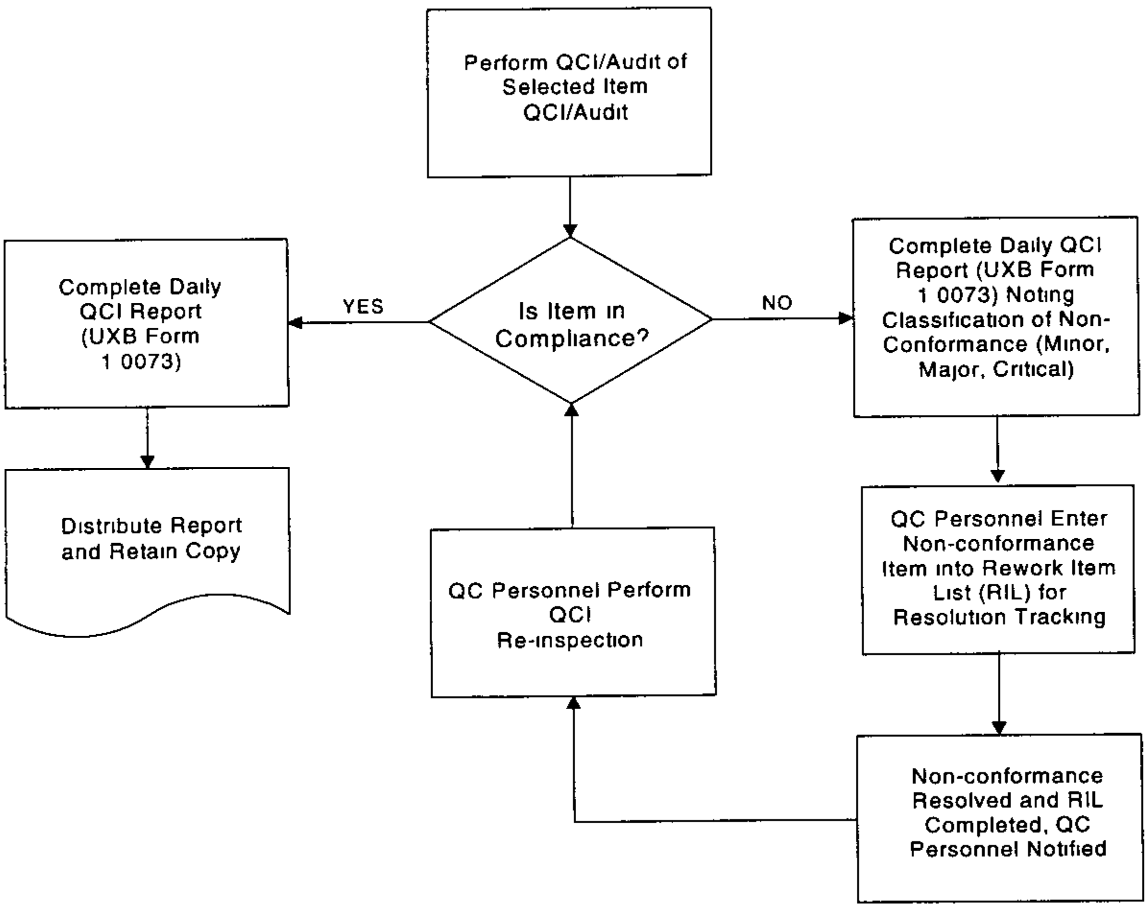


Figure WP 10-2
Quality Conformance Inspection (QCI)/
Audit Flowchart



Attachment 1
Quality Control Plan
Quality Conformance Inspection Schedule

Number	Definable Feature of Work with Auditable Function	QC-Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
01	**Project Management**				
	Administrative				
	Licenses/ATF/blasters/transport	PP/IP	O	Major	Verify all licenses and permits were obtained and current.
	Personnel Qualifications				
	Completeness	PP/IP	O	Major	Verify all required qualifications are complete.
	Currentness	IP/FP	M	Major	Check that all qualifications are up to date and current.
	Communications				
	System	PP/IP	O	Major	Review system meets requirements of contract
	System	FP	D	Major	Verify system is present and functional.
	EMR Calculations	PP	O	Major	Confirm EMR calculations were performed and documented.
	Operational Checks	IP/FP	D	Major	Verify daily operational checks are being performed.
	System Redundancy	IP/FP	D	Major	Confirm system redundancy exists.

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Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Maintenance	FP	W	Major	Check that required maintenance is being performed
	Management of GFP/CAP/CPP				
	Initial Receipt Inspection	PP	O	Minor	Review receipt inspection documentation for completeness.
	Maintenance & Testing	FP	W	Minor	Review and check maintenance and testing documents.
	Secured Storage	FP	W	Minor	Verify secured storage is intact and security is functional.
	Inventory	FP	W	Major	Confirm equipment inventories are being maintained properly.
	Energy Conservation	FP	M	Minor	Check that energy conservation is being practiced.
	Administration				
	Approved SS	PP/IP	O	Minor	Verify that an approved and current Safety Submission is onsite
	HR materials	PP/IP	O/M	Minor	Verify all HR materials are posted IAW HR Compliance Posting Requirements Checklist
	Field Cost Accounting	FP	W	Major	Examine cost accounting and budget for proper controls.
02	**Design Development**				

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Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Contract review	PP	O	Minor	Check that proper contract review was performed.
	Delivery Order review	PP	O	Minor	Verify DO review prior to start of Work Plan design.
	Regulatory review	IP	O	Minor	Confirm that all regulatory reviews are completed.
	Site visit	IP	O	Minor	Verify site visit provided information needed for design.
	Concept development	FP	O	Minor	Review design concept for technical and economic soundness.
	60% Review	FP	O	Minor	Verify 60% review was completed with proper approvals
	100% Review	FP	O	Minor	Verify 100% review was completed with proper approvals
03	**Location Survey and Mapping**				NA
	Final drawings				
	Clearance boundaries/exceptions	FP	O	Minor	Check drawings for indication of boundaries and exceptions.
	OE	FP	O	Minor	Confirm that all OE are properly located and identified.

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
04	**Site Preparation**				
	Environmental Controls(if required)	IP/FP	D	Major	Verify environmental controls are correct and functional
05	**OE Surface Clearance**				NA
06	**Geophysical Detection and Analysis**				
	Instrumentation				
	Calibration	IP/FP	O/D	Major	Verify current calibration documentation for all instruments.
	Operation & Maintenance	FP	D	Minor	Check daily operation and maintenance forms for completeness.
07	**OE Subsurface Clearance**				
	Anomaly Excavation (manual)				
	Procedure	FP	D	Major	Verify excavation procedure is being followed.
	Anomaly Excavation Log	FP	D	Minor	Confirm the excavation log is being properly completed.
	Anomaly Excavation (mechanical)				

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Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Operator training	IP	O	Minor	Review heavy equipment training is current for operators.
	Procedure	FP	D	Major	Verify excavation procedure is being followed
	Maintenance	FP	W	Minor	Audit heavy equipment maintenance IAW UXB form 1.0046
	OE Assessment	FP	E	Major	Ensure OE assessments are performed for each OE identified.
	OE Removal	FP	D	Critical	Verify proper OE removal IAW the Work Plan
08	**OE Disposition**				
	OE assessment	FP	E	Major	Ensure OE assessments are performed for each OE identified.
	Disposition evaluation				
	Fragmentation radius	FP	E	Major	Verify fragmentation calculations for each disposition.
	Environmental impacts	FP	E	Minor	Verify environmental impacts minimized for each disposition.
	Protective works requirements	FP	E	Minor	Verify proper protective works in place for each disposition.
	Disposition activity				
	Notifications	FP	E	Major	Confirm notifications are performed prior to a

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Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
					disposition action.
	Work Plan Compliance	FP	E	Major	Ensure disposition activity is performed IAW Work Plan.
	Documentation	FP	E	Major	Verify documentation for each disposition is properly completed.
	Backfill & stabilization	FP	W	Minor	Verify backfill and stabilization are accomplished IAW Work Plan.
09	**Explosives Management**				
	Demolition Supervisor				
	Training	PP/IP	O	Major	Check licenses and training are current and IAW Work Plan
	Storage				NA
	Fire protection				
	Fire extinguishers	IP/FP	O/W	Major	Confirm fire extinguisher type, size, mounting and serviceability.
	Inventory management	IP/FP	O/D	Critical	NA
	Transportation - driver				NA
	Transportation - vehicle				NA

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
10	**Inert OE and OE Related Scrap**				
	Facility	IP	O	Major	Verify scrap storage facility is proper and security measures intact.
	Segregation	FP	E	Major	Confirm scrap segregation is occurring and properly monitored.
	Transportation	FP	E	Major	Confirm scrap is being transported IAW Work Plan Requirements
	Disposition	FP	E	Major	Verify UXO-related scrap disposal IAW Work Plan & DRMO
	Documentation	FP	E	Critical	Verify DD Form 1348-1 properly completed IAW DoD 4160.21-M.
11	**Environmental**				
	Regulatory review	PP	O	Major	Verify Regulatory review has occurred & is properly documented.
	Environmental survey review	PP	O	Minor	Verify environmental survey review is properly documented
	Environmental assessments				
	Wetlands	PP/IP	O	Major	Verify wetlands assessment is completed and documented.
	Flora/fauna	PP/IP	O	Major	Verify flora/fauna assessments are completed and documented.

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Cultural resource assessment				
	Historical properties	PP/IP	O	Major	Confirm historical properties review is complete and documented.
	Archaeological sites/features	PP/IP	O	Major	Verify archaeological assessments are complete and documented.
	SPCC Plan	IP/FP	O/W	Major	Check if SPCC plan is in place and implementable.
	Solid waste control and disposal	IP/FP	O/W	Major	Verify solid waste disposal and control procedures are being used.
	Sanitary waste control and disposal	IP/FP	O/W	Major	Verify sanitary waste and disposal is occurring IAW the Work Plan
12	**Quality Control**				
	Coordination & Mutual Understanding Meeting	I/P	O	Major	Review SOW, Work Plan, QA/QC programs, and AHA. Examine work areas, discuss protocols and QCI's/audits Document attendees
13	**Health and Safety**				
	Records				
	Medical Surveillance	PP/IP/FP	O/O/M	Major	Audit medical surveillance records for completeness & currency.

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Daily Safety Briefing	FP	W	Major	Audit safety meeting documentation UXB form 1.0023.
	Weekly Supervisor Safety Mtg.	FP	W	Major	Audit safety meeting documentation UXB form 1.0023.
	Visitor Briefings	FP	W	Major	Audit site visitor documentation UXB form 1 0012.
	OSHA 200 log	FP	M	Major	Review and verify proper OSHA 200 log keeping
	Accident & Incident reports	FP	E	Major	Verify timely and complete preparation of reports/notifications.
	Safety Inspections	FP	M	Major	Audit UXB form 1.0024 and observe safety inspection.
	PPE				
	Work Plan compliance	FP	W	Major	Verify implementation of PPE requirements and its proper usage.
	Emergency Response				
	Telephone numbers	IP/FP	O/W	Major	Verify telephone numbers are current and properly documented.
	Medical support locations	IP/FP	O/W	Major	Verify locations are identified and directions for each is available
	Evacuation routes	IP/FP	O/W	Major	Verify evacuation routes are identified and documented.
	Onsite medical supplies	IP/FP	O/W	Major	Verify supplies are replenished and locations are suitable.

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Fire protection				
	Fire extinguishers	IP/FP	O/W	Major	Verify number, type, size, location and serviceability.
	Accident Hazard Analysis				
	Completeness	IP	O	Major	Verify AHA is complete IAW Work Plan requirements and SOW
	Currentness	FP	W	Major	Verify AHA is updated to include Work Plan SOW revisions.
	MSDSs				
	Completeness	IP	O	Major	Confirm MSDS are current and readily accessible to personnel.
14	**Training**				
	Site specific				
	Records	PP/IP/FP	O/O/M	Major	Verify required personnel training documentation is completed.
	Content compliance	PP/IP	E	Major	Review training lesson plans/classes for required content.
	Hazard communication				
	Records	IP	E	Major	Verify documentation of communication of hazards to personnel.

Number	Definable Feature of Work with Auditable Function	QC Phase	Frequency of Audit	Degree of Non-compliance	Audit Procedure
	Explosives Training	PP/IP	O	Major	Verify completeness & currency of explosives training.

Frequency
D = Daily
W = Weekly
M = Monthly

O = Once
E = Each occurrence

QC Phases
IP = Initial Phase
PP = Preparatory Phase
FP = Follow-up Phase

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Attachment 2
Quality Control Plan
Risk Assessment Code (RAC) Guidelines

Hazard Severity

Category: I
Description: Catastrophic
Definition: Death or permanent total disability, system loss, major property damage.

Category. II
Description: Critical
Definition: Permanent partial disability or temporary disability in excess of 3 months, major system damage, significant property damage

Category: III
Description: Marginal
Definition: Minor injury, lost workday accident, or compensable injury or illness; minor system damage; minor property damage.

Category: IV
Description: Negligible
Definition: First aid or minor supportive medical treatment, minor system impairment.

Accident Probability

Description. Frequent
Level: A
Individual item: Likely to occur frequently in life of system, item, facility, etc.
Fleet or inventory: Continuously experienced

Description: Probable
Level. B
Individual Item: Will occur several times in life of item
Fleet or inventory: Will occur frequently.

Description: Occasional
Level: C
Individual Item: Likely to occur sometime in life of item.
Fleet or inventory: Will occur several times

Description: Remote
Level: D
Individual Item: Unlikely but possible to occur in life of item
Fleet or inventory: Unlikely, but can reasonably be expected to occur.

Description. Improbable
Level: E
Individual Item: So unlikely it can be assumed occurrence may not be experienced.
Fleet or inventory Unlikely to occur, but possible.

Risk Assessment Code Matrix (AR 385-10)

Hazard Severity	Accident Probability A	B	C	D	E
I	1	1	2	3	5
II	1	2	3	4	5
III	2	3	4	5	5
IV	3	4	5	5	5

Attachment 3
Quality Control Plan
Daily QCI Report

DAILY QUALITY CONTROL INSPECTION REPORT

PROJECT:

CONTRACT:

DATE:

QC SPECIALIST:

PART ONE - UXB QC

TASK INSPECTED[1]	RESULTS[2]	COMMENTS[3]

PART TWO - USAESCH QA

TASK INSPECTED	RESULTS[2]	COMMENTS[3]

[1] From QCI Schedule

[2] C - Conforms, N - Nonconformance, MI - Minor, MA - Major, CR - Critical, i.e., N-Minor

[3] Briefly describe Nonconformance(s)

TAB

11. Waste Management Plan

11.0 Waste Management Plan

11 0 1 This waste management plan describes the sampling, handling, manifesting, transportation, and disposal of wastes to be generated during the removal actions at Dunn Field. Waste disposal will be performed in accordance with this Waste Management Plan, the analytical procedures outlined in the CDQMP, and all applicable federal, state, and local regulations, including DOT, OSHA, TDEC and RCRA

11.0.2 UXB has the responsibility for assisting the Depot in the preparation of hazardous waste manifests and for coordinating hazardous waste transport and disposal. UXB will assist by handling and labeling wastes generated within the exclusion zone in accordance with this Waste Management Plan, and by providing this information to the UXB LCPM.

11 0.3 Intact non-CWM containers (bottles, drums, cans, etc.) will be sampled as per paragraph 12.2.0, *Sampling Program for Intact non-CWM Items.* Once the filler is identified, it will be handled as directed in this chapter for the appropriate type of waste.

11.1.0 Anticipated Waste Types

11.1 0 1 Wastes generated on-site may include the following:

1. soil and debris excavated from the mustard disposal trench;
2. wastewater generated during the decontamination of heavy equipment;
3. wastewater generated during the decontamination of sampling equipment;
4. wastewater generated during the decontamination of non-disposable PPE;
5. disposable PPE; and
6. miscellaneous solid wastes (i.e., empty boxes, cups, paper, etc.).

11.1.0.2. As indicated in previous sections of this Work Plan, UXB will sort all soil/debris and any CWM-related material will be recovered and segregated. Intact CWM will be handled and transported by TEU in accordance with the Interim Holding Facility Plan and the Transportation Plan (refer to Book 2 of this Safety Submission) The sorted soil will be collected inside a plastic lined roll-off container and covered with an additional plastic sheet when full.

11.1.0.3 UXB will be responsible for placing liquid wastes generated during the decontamination of heavy equipment, sampling equipment, non-disposable PPE, and scrap in DOT-approved containers and labeling the containers. At the completion of the project, these liquid wastes will be sampled for waste characterization purposes as described in the Sampling Plan, Section 12 of the Work Plan.

11.1.0.4 Disposable PPE used on-site during the removal action will be drummed and the headspace monitored for the CWAs H and L to ensure the PPE has not been contaminated by CWM. All non-CWM contaminated PPE will be disposed properly. If contaminated, the PPE must be decontaminated by UXB in accordance with Appendix H of the SSHP (Book 2 of this Safety Submission) prior to removal from the exclusion zone for off-site disposal.

11.1.0.5. Non-hazardous solid wastes unrelated to excavation activities (such as garbage, rubbish, and miscellaneous debris) will be collected in appropriate staging areas, placed in suitable containers, and moved to a pickup point which is regularly emptied or to a disposal area indicated by the Depot Manager. It will be the responsibility of UXB to maintain the work area in a neat and orderly condition.

11.2.0 Hazardous Waste Definitions

11.2.0 1 Wastes will be classified as hazardous wastes if any of the following criteria set forth in the Code of Federal Regulations (40 CFR 261 3) apply:

1. it exhibits any of the four criteria of hazardous waste as identified in 40 CFR 261, Subpart C (i e , it is a *characteristic* hazardous waste exhibiting the characteristic of ignitability, corrosivity, reactivity, or toxicity);

2. it is listed in 40 CFR 261, Subpart D and has not been excluded under the regulatory petition process (i.e., it is a *listed* hazardous waste);

3. it is not excluded under 40 CFR 261.4(b) which lists twelve categories of solid wastes such as household waste, mining overburden returned to the mine site, cement kiln dust waste, etc. that are excluded from being categorized as hazardous waste; or

4. it is a mixture of a solid and hazardous waste and has not been exempted under 40 CFR 261.36

11.2.0.2 Hazardous waste designations set forth in the Tennessee Department of Solid Waste Management (SWM) Rule 1200-1-11-.03, and -.04 are consistent with those set forth in the Code of Federal Regulations (CFR), with the exception of those associated with CWAs (CWAs are not federally regulated) In Tennessee CWAs are regulated as if they were covered under the CFR.

11.2.0.3 Those materials that exhibit detectable concentrations of CWM in laboratory samples or exhibit detectable concentrations of CWM using on-site monitoring equipment must be treated (decontaminated) on-site until vapor concentrations are no longer detectable. This will occur prior to shipment and disposal of the material off-site. (Refer to Section 3 of the Work Plan which describes the procedure for the treatment of CWM—contaminated soils) The appropriate waste code will be applied following the neutralization of the material once it has been confirmed the wastes exhibit no detectable concentrations of agent.

11.2.0 4 UXB will collect and submit soil samples to an independent laboratory that will conduct analysis for TCLP organics. VOCs sampling of soil for RI purposes will be conducted with the assistance of CH2M Hill. Sample results will be included in the soil waste profile prior to soil departing Dunn Field

11.2.1 Characteristic Hazardous Wastes

11.2.1.1 A solid waste is considered a characteristic hazardous waste under 40 CFR 261, Subpart C if it exhibits one or more of the following characteristics:

1 <u>Ignitability</u>. The material is defined as ignitable if it is capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes (40 CER 261.21) Materials classified as ignitable are assigned the EPA Hazardous Waste Number DOO 1;

2. <u>Corrosivity</u>. If the material has a pH of less than or equal to 2 or greater than or equal to 12.5 (as determined by the approved test method), or corrodes steel at a rate greater than 0.25 inches per year at 55 degrees Centigrade (40 CFR 261.22), it is considered corrosive. Materials classified as corrosive are assigned the EPA Hazardous Waste Number D002;

3. <u>Reactivity</u>. If the material readily undergoes violent change, including explosion or the generation of toxic gases, it is defined as reactive (40 CFR 261.23). Materials classified as reactive are assigned the EPA Hazardous Waste Number D003; or

4 Toxicity. If the extract of a representative sample of the waste, when leached according to the Toxicity Characteristic Leaching Procedure (TCLP, 40 CFR 261, Appendix II), contains one or more of the compounds identified in Table 1 of 40 CFR 261.24 at levels equal to or greater than the promulgated limits, it is considered toxic. Materials are assigned EPA Hazardous Waste Numbers from D004 to D043, depending on the compound

11.2.2 Listed Hazardous Wastes

11.2.2 1 A solid waste is considered a hazardous waste if it is listed in 40 CFR 261, Subpart D. Following is a summary of the "listed" groupings:

1. F-Listed Wastes Hazardous wastes from non-specific sources;
2. K-Listed Wastes Hazardous wastes from specific sources;
3. P-Listed Wastes Discarded commercial chemical products, off-specification species, container residues, and spill residues that are identified as acute hazardous wastes; and
4. U-Listed Wastes. Discarded commercial chemical products, off-specification species, container residues, and spill residues that are identified as toxic wastes.

11.3.0 Waste Characterization Procedures

11.3.1 Waste Sampling

11.3.1 1 Two types of waste sampling will be conducted as part of the investigation/removal action at Dunn Field to ensure that proper waste disposal practices are followed. They include TCLP sampling (IAW 40 CFR 261, Appendix II) and investigation-derived waste (IDW) sampling. Characterization sampling may also be conducted if site conditions warrant.

11 3.1.2 Prior to commencing with the excavation activities, characterization samples may be collected to establish a waste profile of the contaminated soil and debris to be excavated from the disposal trench, and to facilitate the identification of applicable waste codes for proper transportation and disposal (refer to Section 12 of this Work Plan). If the nature of the buried debris changes during the course of the excavation based on either visual inspection or air monitoring, the atypical soil/debris will be segregated and additional characterization samples may be collected.

11 3.1.3 If agent-contaminated material is detected during excavation activities (via monitoring or the characterization samples), composite samples may be collected from individual roll-off containers and analyzed for the presence of agent to assess which hazardous waste code is applicable and to document the concentrations of agent potentially being transported and disposed of off-site, if present

11.3.1 4 Waste characterization sampling of the equipment and personnel decontamination liquids generated during the investigation/removal action also will be performed. Water used for decontamination will be drummed and one composite sample will be collected for every five drums of wastewater generated. Field collection and sample identification procedures are defined in Section 12.0 of this Work Plan.

11.3.2 Waste Testing

11.3.2.1 The soil/debris characterization samples will be analyzed for the contaminants of potential concern identified in Table WP 1-3 in Section 1.0 of this Work Plan.

11 3.2 2 The IDW characterization samples, at a minimum, will be analyzed for corrosivity and total arsenic Additional analytical parameters will be added if they were detected in the soil/debris characterization samples or during site monitoring

11.3.3 Turn-Around Time

11 3.3.1 The turn-around time for waste characterization analyses will not exceed 7 working days from the date of collection. If composite samples are collected from individual roll-off containers and analyzed for CWA and their associated breakdown products, the turn-around time for these analyses will be 24 hours, so that roll-off containers can be transported off site as quickly as possible.

11.3.3.2 Characterization sample results will be compared to the criteria and regulatory levels specified in 40 CFR 261, Subpart C to determine whether the wastes should be classified as a characteristic hazardous waste. Analytical results will also be evaluated relative to the application of hazardous waste codes identified in 40 CFR 261, Subpart D.

11 3 3.3 A waste profile sheet will be prepared by UXB on behalf of Depot which describes the contents of the wastes, their concentrations, and applicable waste codes. This document will be provided to the Depot and CEHNC for review and concurrence prior to any off-site shipment or disposal. These results will also be used by the receiving landfill facility to determine any need for pretreatment or other disposal requirements, and for comparison to samples collected by the landfill facility. The landfill facility may collect samples from randomly selected roll-off containers to ensure that the material is similar to what was originally characterized.

11.4.0 Waste Handling

11.4.0.1 All sorted soil and debris will be transferred into 20-yard or smaller roll-off containers for temporary storage on-site and subsequent shipment to the landfill Each container will meet the requirements of 49 CFR 179 and will be equipped with disposable liners. Intact CWM segregated from the soil will be packaged and stored separately by TEU according to the procedures described in the TEU Support Plan, Interim Holding Facility Plan, and Transportation Plan (refer to Book 2 of this Safety Submission). At the completion of daily activities, each container of soil/debris located outside of the filtered-air structure will be covered with a 10-mil high-density polyethylene (HDPE) cover. All EPA "listed wastes" will be handled in accordance with OSHA safety requirements.

11.4 0 2 Liquid wastes generated during the decontamination of heavy equipment, sampling equipment, and non-disposable PPE will be placed in DOT-approved 55-gallon drums or larger volume storage tanks, if appropriate. The containers will be free of contaminants, and will not crack, split, readily corrode, or leak. At the completion of daily activities, each drum of liquid waste will be covered with its appropriate lid. The containers will be staged on pallets in a location on-site for temporary storage pending disposal.

11.4.0.3 All waste containers removed from the exclusion zone will be staged on Depot property in an approved area until they are transported off-site for disposal. The area will be fenced on all sides and shall be secured (locked) when daily operations have ceased. A night security guard provided by UXB will also be on-site to ensure that the contents of these containers are not tampered with.

11.5.0 Labeling

11.5.0.1 All containers used to store wastes will be labeled so the contents can be identified without opening them. At a minimum, the source (e.g., 24-A), the date filled, a description of the contents (e.g., soil and metallic debris), and a statement which reads "Analytical Data Pending" will be included on each container using a label or permanent marking pen. Each roll-off container or drum containing wastes will be labeled with a weather-resistant chalk or similar marker to identify the number of the roll-off. This information will also be summarized by the UXB Field Team Leader on a Waste Inventory Log (see Figure WP 11-1) that will be provided to the Depot for tracking purposes.

11.6.0 Manifesting

11.6.0.1 UXB will assist the Depot with the preparation of the bill of lading and manifest, as requested by the Depot Manager. An example of a completed manifest is provided as Figure WP 11-2. The following items must be completed:

1. generator's USEPA identification number;
2. transporter/company name and USEPA identification number;
3. USDOT description of the waste, including proper shipping name, hazard class, and ID number;
4. number of containers and type;
5. applicable waste code numbers;
6. any additional description of the material; and
7. special handling instructions and additional information (e.g., emergency numbers)

11.6.0.2 A representative from the Depot, or other authorized representative, will sign each manifest. All appropriate regulations pertaining to shipment of hazardous wastes (i.e., manifesting, etc.) will be complied with.

11.7.0 Scheduling

11.7.0 1 The transportation of roll-off containers to an off-site disposal facility will be coordinated so that all site workers have sufficient working room and that unnecessary safety hazards will be minimized due to the confusion and physical obstacles presented by excessive numbers of containers.

11.8.0 Transporting

11 8.0.1 CEHNC and UXB will coordinate with a designated company to provide transportation services for the soil and debris that will be excavated from Dunn Field. The designated company will be chosen as the transportation firm because they are a permitted hazardous waste hauler.

11.8.0.2 Before leaving the work area, all roll-off containers will be fully covered and will remain covered until arrival at the landfill. The containers may be weighed before loading and prior to departure from the Depot. The transporter will use the self-serve truck scale, if available and serviceable, located at the Main installation. Weights will not exceed TDOT limits. The containers will be removed from the project site, transported, and disposed of in accordance with 40 CFR 263 and 40 CFR 264.

11.9.0 Receiving Facilities/Points of Contact

11.9.0.1 UXB will coordinate with the designated facility and contractor to provide for disposal of soil and debris that is excavated from Dunn Field. This facility will be notified of the types of wastes to be delivered and will acknowledge that CWM by-products may be readily present. A signed memorandum of agreement will be obtained from the disposal facility prior to the release of any wastes. The disposal facility will be selected based on its proximity to the Depot, competitive disposal rates, and appropriate permit for disposal of the soil and debris excavated from the burial sites at Dunn Field. The facility will possess a RCRA Part B Permit for the disposal of hazardous waste and is in compliance with the CERCLA Off-Site Policy. This policy dictates that the facility is in compliance with the Part B Permit and does not have any outstanding violations.

Figure WP 11-1

Waste Inventory Log

Personnel On-site:

Roll-off Container Identification Number	Date Filled	Contents (Soil, Water, PPE, etc)	Location Within the Excavation	Additional Information

Defense Distribution Depot Memphis, TN
Dunn Field
Waste Inventory Log

Figure WP 11-2
Waste Manifest (Sample)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No: UT9210020922
Manifest Document No
2. Page 1 of
Information in the shaded areas is not required by Federal law

3. Generator's Name and Mailing Address: Defense Distribution Depot Ogden
500 West 12th Street, Ogden Utah, 84407-5803
ATTN: DE-R.SMITH
4. Generator's Phone (801) 399-7848

A. State Manifest Document Number
B. State Generator's ID

5. Transporter 1 Company Name: U.S.P.C.I
6. US EPA ID Number
C. State Transporter's ID
D. Transporter's Phone

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Transporter's ID
F. Transporter's Phone

9. Designated Facility Name and Site Address: USPCI
Grassy Mountain Facility
3 mi E, 7 miles North of exit 41, off I-80 Clive, Utah
10. US EPA ID Number: UTD991301748
G. State Facility's ID
H. Facility's Phone

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	12. Containers No	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No
a. RQ Hazardous Waste Solid, N.O.S, 9 NA3077 PG III (Methylene Chloride, Xylene, Toluene, Tetrachloroethylene)	X	001	CM			F999 F001, F002 F003, F005
b.						
c.						
d.						

J. Additional Descriptions for Materials Listed Above: GM 94-0815 OU3-CWA
Soil + Debris from OU3 (Cercla cleanup) Area

K. Handling Codes for Wastes Listed Above.

15. Special Handling Instructions and Additional Information: 24 Hr # 801-399-7546 in case of emergency call 800-877-0457 RQ = 100 LB (Tetrachloroethylene)
Response Guide 31

16. GENERATOR'S CERTIFICATION. I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Month	Day	Year

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

GENERATOR
TRANSPORTER

TAB

12 Sampling Plan

12.0 Sampling Plan

12.0.1 Sampling programs to be conducted as part of the investigation/removal action at Dunn Field include.

1) Soil/debris characterization sampling;

2) characterization of intact non-CWM items (if encountered),

3) soil compliance (verification) sampling; and

4) investigation-derived waste sampling.

12.0.2 Sample types are described in the paragraphs that follow. The rationale for each sampling program and the data quality objectives are presented in Table WP 12-1. For reference, a summary-level sampling schedule indicating the samples anticipated to be collected during the remedial action at Dunn Field is presented in Table WP 12-2. Note that soil samples collected during the investigation/removal action will be analyzed for Lewisite (L), mustard (H), thiodiglycol (TDG), 1 ,4-dithiane, and 1 ,4-oxathiane onsite by ECBC. Once cleared for the presence of CWM, duplicate samples will be sent off-site to an independent laboratory for RCRA compliance which will include TCLP metals.

12.1.0 Soil/Debris Waste Characterization Sampling Program

12.1.1 Soil/Debris Waste Characterization Program Rationale

12.1.1.1. Characterization sampling of the soils/debris to be excavated will be performed to ensure that proper waste disposal practices are followed in accordance with the Tennessee Department of Environment and Conservation (TDEC) Rule: Chapter 1200-1 Initially, two discrete grab samples may be collected by UXB following the procedure described in Section 3.1.2. prior to commencing with the excavation activities. These samples may be used to establish a waste profile of the contaminated soil and debris, and to facilitate the identification of applicable waste codes for proper transportation and disposal. Waste management activities are described in detail in Section 11.0 of this Work Plan (Waste Management Plan).

12.1 1.2. Additional characterization samples may be collected of soil/debris prior to shipment for off-site disposal if the nature of the excavated soils/debris changes based on either visual observations (i.e., the presence of broken glassware, stained soils, etc.) or monitoring equipment data.

12.1.1.3. If an unknown or suspect item is found, TEU and UXB will remove the anomaly. UXB will collect all soil that has been in contact with the anomaly if there is the appearance of contamination. Soil samples will be taken from sufficient locations surrounding the anomaly and at various depths to provide information on the characteristics of the surrounding soil. Soil samples will be composited from at least two locations and will include soil from depths of at least 1 foot below the anomaly (after it has been removed from the burial location). In each case, these materials will be segregated from the previously excavated soil/debris, and containerized separately until analytical results are received.

12.1.1.4. UXB will collect additional waste characterization samples from the suspect material at a frequency dependent on the volume of soil/debris removed. Typically, this would be one two-part composite for every 500 cubic feet of soil (approximately equivalent to the volume of soil which could be contained within a single 20 yard roll-off container). The suspect material would then be transported and disposed of based on its waste characteristics. If the waste profile does not differ from that of the initial waste characterization samples, the suspect soil/debris will be containerized with the previously excavated material.

12.1.1.5. Waste debris potentially associated with CWM containers (such as scrap metal from suspect drum carcasses or broken glass fragments from chemical agent identification sets [CAIS] bottles) will be monitored by ECBC for the presence of the chemical agents H and L. If the debris is contaminated with agent at concentrations above the airborne exposure limit (AEL), defined as 0.003 mg/m^3 for H and L, the item will be decontaminated on-site by UXB (see procedures outlined in Section 3.16 5 of the work plan).

12.1.2 Soil/Debris Waste Characterization Sampling Locations and Rationale

12.1.2.1. UXB may collect two samples prior to commencing with the excavation activities. If collected, they will be collected from the surface within the boundaries of the burial pits. The analytical results from these samples would be used to establish an initial waste profile of the excavated soil and debris, and to facilitate the identification of applicable waste codes for proper transportation and disposal.

12.1.2.2. Each of the two soil samples collected from the burial pits would consist of a two-part composite If visual observations indicate that the nature of the waste debris is substantially different in areas within the boundaries of the subject pit, an additional composite characterization sample would be collected from each of these areas.

12.1.3 Waste Characterization Sampling Equipment and Procedures

12.1.3.1. Characterization samples will be composited from two subsamples collected at each location. Subsamples will be collected from each location by the following procedures. Soil will be removed with the bucket of the excavator to a depth of at least 1 foot beneath the external surface of the soil/debris pile. If excessive quantities of glass are present or suspected, the sample will be collected manually using a shovel. The first subsample will be collected with a stainless steel trowel and transferred to a stainless steel bowl. In the event that a sample cannot be collected by these means, samples will be collected from the bucket of the excavator. Soil from the top of the bucket or soil that has come into contact with the sides of the bucket will not be collected for samples.

12 1.3.1.1 Sample collection will be done manually. Sample collection at site 1 will be taken from the side walls and bottom of the excavation consistent with the sampling schedule shown in WP table 12-2 using a stainless steel trowel or split spoon. Samples at the remaining two excavation sites will be taken from the bucket of the excavator as it removes soil from the sides and bottom of the excavation. If it is necessary for personnel to enter the excavations at sites 24A or 24B, samples may be taken by hand as at site 1.

12.1.3.2. For each environmental subsample collected, an additional sample will be collected (i.e., a replicate) and placed in a plastic bag. The bag will be labeled with the corresponding sample designation for tracking Samples will be screened for the presence of VOC vapors using a flame-ionization detector (FID) Screening and subsequent testing of samples will be done only after ECBC has released the sample as being clear of CWM contamination.

12.1.3.3. The excavator will then be used to remove an additional 2 feet of soil from the sampling location. The second soil subsample will then be collected with a stainless steel trowel and transferred to the stainless steel bowl. An additional sample (i.e., a replicate) will also be collected at this depth and placed in a plastic bag for headspace monitoring of VOCs and CWA. All equipment that will contact soil during collection of samples (including the excavator bucket, if used) will be thoroughly decontaminated prior to use as described in Section 12.6.0 and Section 13.0 of the SSHP.

12.1.3.4. An equal volume of the individual soil subsamples will then be homogenized in the stainless steel bowl with a stainless steel spoon until homogenous to form one single soil composite from each sample location. A representative aliquot of the composite sample will be placed in the sample containers (Table WP 12-3) in a manner which eliminates headspace and voids. Immediately after sample collection, the filled sample container will be sealed with Teflon-lined lids, placed in a resealable bag, and handled as described in Section 12.5.0.

12.1.3.5 Initially, two composite characterization samples will be collected for waste profiling purposes. However, as stated in Section 12.1.1.4, additional characterization samples will be collected from the suspect material at a frequency dependent on the volume of soil/debris removed (i e one two-part composite for every 500 cubic feet of soil).

12.1.3.6 Each sample must contain a quantity adequate to support three separate analyses·

- One for on-site off-gas headspace readings to insure H and L are not present.
- One for on-site analysis of CWA and associated degradation products
- One for off-site analysis for contaminants of potential concern for health based and land disposal requirements.

12.1.3.7 Each field sample will be assigned a unique sample designation that identifies the excavation area and the type of sample (i.e. compliance, characterization, etc.). To properly identify and track each sample, the unique sample designation will be recorded on the sample label, affixed to the sample container, and recorded on the chain of custody form Sample labeling handling, custody, and shipping are discussed in detail in Section 12.5.

12.1.3.8 Each sample designation will consist of three alphanumeric sections set apart by hyphens as defined below:

Dunn Field/23-B/1-SDC-2

Site Name	Excavation Site Designator	Pit Number	Sample Type	Numeric Order

12.1.3.10 An anticipated sample schedule for the investigation/removal action at Dunn Field and the associated sample designations are provided in Table WP 12-2

12.1.3 11Quality control (QC) samples will be submitted along with the environmental samples to assess the precision, accuracy, and representativeness of sampling and analysis. The types of QC samples are described in Section 8.9 of the CDQMP (Section 8.0 of this Work Plan). Quality control samples will be designated based on their type. Blind replicate samples will be submitted with a fictitious sample number to prevent the laboratory from recognizing any replicate sample. All acronyms used to name blind replicates will be recorded in the field logbook. Each matrix spike/matrix spike duplicate (MS/MSD) sample will have the same designation as its associated environmental sample, except that "MS/MSD" will be added to the sample identification number (e.g., "Dunn Field/23-B/1-WC-2-MS/MSD"). Typical QA/QC sample designations are also listed in Table WP 12-2.

12.1.3.12 Characterization samples will be analyzed for contaminants of potential concern for Dunn Field (refer to Table WP1-2 in Section 1.0 of this Work Plan). As stated previously, characterization soil samples will be analyzed on-site by ECBC for H, L, TDG, 1 ,4-dithiane and 1 ,4-oxathiane in order to analytically detect quantities of chemical agents in the soil that are below the detection range of field monitoring instruments. Monitoring, soil sampling, and testing will be performed in accordance with this section, Section 8.0 (Chemical Data Quality Management Plan), and ECBC SOPs.

12.1.3.13 Once it has been confirmed that no detectable concentrations of CWA are present in the soil samples, the characterization samples will be shipped off-site to the Contract Laboratory for analysis of those contaminants of potential concern which are not classified as CWA (refer to Table WP 12-1). In addition, each characterization sample will be analyzed for the toxicity characteristic based on metals constituents, and for the characteristics of corrosivity, reactivity, and ignitability.

12.1 3 14 The analytical methods to be used to gather this data are also identified in Table WP 12-1. Characterization samples will not be analyzed for Adamsite unless the concentration of arsenic in the sample exceeds the soil cleanup goal of 35 mg/kg

12 1.3.15 If agent is detected in the characterization samples or during monitoring activities at Dunn Field a two-part composite sample shall be collected from individual roll-off containers. The sample will be analyzed for CWA and associated breakdown products.

12.2.0 Sampling Program for Intact Non-CWM Items

12.2.0 1. During excavation activities at Dunn Field, intact bottles or containers of unknown liquids or solids (i.e., bottles which have no labels, identifiable markings, or distinguishable physical characteristics) may be encountered. When such an "unknown" is encountered, TEU will assess the item to determine if it is CWM. Non intrusive means such as x-ray or PINS will be tried first. If not successful, a sample will be taken of the contents and tested by ECBC. If the item is CWM, it will be removed by TEU for packaging and transport to the IHF. If it is determined that the item is not CWM, TEU will give the item to UXB who will characterize the contents by having a sample analyzed.

12.2.0.2. A series of chemical and physical tests may be conducted which will provide information on what the content of the container is and on some basic chemical characteristics, such as pH, whether it is an oxidizer or ignitable, contains chromium or arsenic, etc. This will be performed by using the HazCAT® Chemical Identification System. This commercially available kit is specifically designed for the characterization of unknown liquid or solid materials.

12.2.0.3. The analysis will be performed on each container of recovered non-CWM items. Each item will then receive a waste designation based on those results.

12.3.0 Compliance (Verification) Sampling Program

12.3.1 Compliance Sampling Program Rationale

12.3 1.1. After the contents of the disposal trench(s) within the limits of the containment structure are completely excavated and all monitoring and visual observations indicate that the contaminated soil/debris has been removed, compliance samples will be collected by UXB from the floor of the excavation. Compliance samples will be collected to verify that the soil cleanup goals for Dunn Field have been met. Should a compliance sample fail to meet the soil cleanup criteria, additional soil will be removed from the excavation and additional confirmation samples will be collected. This process will be repeated until all compliance samples meet the soil remediation goals for Dunn Field (refer to Section 12.3 5. for further details on this process). Only at that time shall the containment structure be moved to the next location.

12.3.2 Compliance Sampling Locations and Rationale

12.3.2.1. Two compliance samples will be collected after excavation activities are completed. The floor of the excavation will represent the surface area to be sampled. Each compliance sample will be a discrete grab sample of the soil at that location. Due to the expected length and width of the trenches, the exact sampling location will be selected by on-site personnel just prior to sampling activities.

12.3.3 Compliance Sampling Equipment and Procedures

12.3.3.1. Compliance samples will be collected from the first 6 inches of soil using a stainless steel trowel and transferred to a stainless steel bowl. In the event that a sample cannot be collected by these means, samples will be collected from the middle of the bucket of the excavator. For each sample collected, an additional sample will be collected (i e , a replicate) and placed in a plastic bag. The bag will be labeled with the corresponding sample designation for tracking The compliance sample will be screened for the presence of VOC vapors using a flame-ionization detector (ED).

12.3 3.2. Each of these samples will then be placed in a heater box and heated to approximately 80 ^{0}F for a period of 15 minutes The headspace of the sample will then be screened for H and L using either DAAMS tubes or the MIINICAMS. Soil samples will not be removed from the exclusion zone if these analyses indicate that the samples exhibit vapor concentrations exceeding the AELs for H and L (defined as 0.003 mg/m^3 in air). If agent is present above this level, the soil/debris associated with this sample must be segregated and decontaminated (treated) by UXB in accordance with guidance provided by the State of Tennessee prior to removal from the exclusion zone and transportation off-site for disposal.

12.3.3 3. A representative portion of the soil sample will be placed in the sample containers (Table WP 12-3) in a manner which eliminates headspace and voids. Immediately after sample collection, the filled sample container will be sealed with Teflon-lined lids, placed in a resealable bag, and handled as described in Section 12.5.0.

12.3.4 Compliance Sampling Frequency, Designation, and Analysis

12.3.4.1. Each compliance sample designation will consist of three alphanumeric sections set apart by hyphens The first alphanumeric section of the sample number will identify the site name for this project, "Dunn Field" followed by a / and Site 24-A/24-B or 1 to identify the specific area of concern. An additional character preceded by a / is used to identify which pit from 24-B the sample came from). The second alphanumeric section will refer to the sample type (e.g., "CVS" for compliance verification sample). The third alphanumeric section will refer to the numeric order in which the sample was collected. An anticipated sample schedule for the removal action at Dunn Field and the associated sample designations are provided in Table WP 12-2.

12.3.4.2. Compliance soil samples will then be analyzed by ECBC for H, L, TDG, 1 ,4-dithiane and 1 ,4-oxathiane in order to analytically detect quantities of chemical agents in the soil that are below the detection range of field monitoring instruments Monitoring, soil sampling, and testing will be performed in accordance with this section, Section 8.0 (Chemical Data Quality Management Plan), and ECBC SOPs.

12.3.4.3. Once it has been confirmed that no detectable concentrations of CWA are present in the compliance samples, the compliance samples will be shipped off-site to the Contract Laboratory for analysis of those contaminants of potential concern which are not classified as CWA (refer to Table WP 12-1).

12.3.4.4. QC samples will be submitted along with the environmental samples to assess the precision, accuracy, and representativeness of sampling and analysis. The types of QC samples are described in Section 8.9 of the CDQMP (Section 8.0 of this Work Plan).

12.3.4.5. The analytical methods to be used to gather this data are identified in Table WP 12-1. These methods may be modified based on the results of the soil/debris characterization program. Because these soil samples are to be collected for the purpose of verifying site cleanup, compliance samples will not be analyzed for the waste characteristics of toxicity, corrosivity, reactivity, or ignitability. Furthermore, because PCBs are not expected to be found at Dunn Field, PCBs will not be analyzed for in the compliance samples unless they were detected in the waste characterization samples. In addition, the compliance samples will not be analyzed for adamsite unless the concentration of arsenic in the sample exceeds the soil cleanup goal of 35 mg/kg (refer to Section 12.1.4.8.).

12.3.5 Soil Cleanup Goals

12.3.5.1. The soil cleanup goals for the COCs are provided in Table WP 1-3 (Section 1 0 of this Work Plan). Due to the difficulties associated with performing a statistical analysis on data where the detection limit is also the cleanup goal, a "Hot-Measurement Comparison" to the cleanup goals rather than a statistical approach will be used to assess whether any contamination remains on site. This approach is discussed in the *Statistical Methods for Evaluating the Attainment of Cleanup Standards* (EPA, 1992).

12.3.5.2. In the event that confirmation sampling indicates that the excavated area does not meet the soil cleanup goals, areas within the excavation above these goals will be over-excavated and additional confirmation samples will be collected The location exceeding cleanup levels shall be manually probed to visually identify the extent of contamination, and field screened with monitoring equipment to identify the presence of contaminants. Additional grab samples may be collected at discrete locations to determine the specific areas that require over-excavation. Additional sampling and follow-up excavation will not proceed without approval from the Contracting Officers and the Memphis Depot BRAC Environmental Coordinator.

12.3.5.3. Findings from the above mentioned activities will then be used to direct over-excavation Following any over-excavation, additional confirmation samples will be collected from discrete locations in the same location as the original compliance samples to verify that no contamination exists above the soil cleanup goals. These compliance samples will be analyzed only for those parameters that exceeded the soil cleanup goals

12.4.0 Investigation-Derived Waste Sampling Program

12.4.1 IDW Sampling Program Rationale

12.4.1.1 Samples will be collected of equipment and personnel decontamination wastewater to ensure that proper waste disposal practices are followed. Wastewater from the decontamination of equipment will be pumped from the temporary decontamination pad sump into drums and analyzed for those parameters identified in Table WP 12-1. The IDW would then be transported and disposed of based on its waste characteristics. Waste disposal will be performed in accordance with RCRA regulations, the project SSHP, and other applicable local, State, and Federal regulations.

12.4.1.2 Disposable personal protective equipment (PPE) used on-site during the removal action will be drummed and the headspace monitored for the presence of CWAs L and H to ensure the PPE has not been contaminated by CWM. All non-CWM contaminated PPE will be disposed of with the excavated soil. If contaminated, the PPE must be decontaminated by UXB in accordance with Section 13.0 of the SSHP (Book 2 of this Safety Submission) prior to removal from the exclusion zone for off-site disposal.

12.4.2 IDW Sampling Locations and Rationale

12.4.2.1 One grab sample will be collected for every 10 drums of wastewater generated(this is approximately equivalent to one sample for every 500 gallons of wastewater) The total number of samples collected over the project will be dependent on the total volume of wastewater generated.

12.4.3 IDW Sampling Equipment and Procedures

12.4 3.1 Decontamination water samples will primarily be rinsate water from heavy equipment, sampling equipment, PPE, and personnel decontamination activities. In order to characterize the drum contents for disposal, waste profiling samples are to be collected by following procedure:

1) Remove the top of the drum to be sampled. Waterproof outer gloves will be worn outside chemical resistant liners (in addition to standard Level D PPE).

2) If the decontamination water has an oily sheen, a disposable bailer will be used to sample the drum. The bailer should be inserted down through the center of the drum contents to obtain a representative sample of its contents.

3) If the decontamination water is homogeneous, the water may be sampled by collecting the sample with a clean (decontaminated) glass beaker.

4) The sample is then decanted into the appropriate sample jar(s) for the analyses requested.

5) Securely replace and re-seal the top of the drum.

12.4.4 IDW Sampling Frequency, Designation, and Analysis

12 4.4.1 Each sample designation will consist of three alphanumeric sections set apart by hyphens. The first alphanumeric section of the sample number will identify the site name for this project, "Dunn Field" followed by a / and 23-A (or 23-B; 1) to denote the specific excavation site. An additional character preceded by a / is used to identify which pit from 23-B the sample came from). The second alphanumeric section will refer to the sample type (e.g., "LDW" for investigation-derived waste). The third alphanumeric section will refer to the numeric order in which the sample was collected. An anticipated sample schedule for the remedial action at Dunn Field and the associated sample designations are provided in Table WP 12-2 The analytical methods to be used to gather this data are identified in Table WP 12-1. At this time, it is expected that the only contaminants of potential concern that would persist in decontamination waters would be total arsenic and the characteristic of corrosivity.

12.5.0 General Sampling Guidelines

12.5.0.1. The following represents general sampling guidelines which will be followed during each of the sampling programs described above:

- Samples are regarded as perishable and will be collected, handled, and transported prior to analysis in a manner that safeguards the integrity of the particular constituents or properties to be examined.
- A single sample will neither be so large as to mask the effects of significant variability within the sample, nor be so small as to be influenced by the inherent variability between small portions of any bulk material.
- Actual sample locations will be reflected on the site map of the area for reference, and recorded in the field logbook.
- Number of samples collected will be recorded in the field logbook.
- Samples will be kept at their in ground temperature, or lower, by placement in a cooler with ice until received by the laboratory. Storage of samples at 4 ^{0}C, in most cases, will reduce chemical degradation.
- Exposure to direct sunlight will be avoided.
- The following types of sampling and monitoring equipment will be available on-site at all times:
  - Sterile Glass Jars and Lids
  - Labels

- Stainless Steel Mixing Bowls, Spatulas, and Spoons
- Shovel
- Bleach
- Deionized Water
- Liquid Dish Detergent
- Field Logbook
- RTAP
- MEAP
- LEL/O_2/CO/CO_2 Direct Reading Instruments

• Sampling equipment will be decontaminated after each sample is taken to prevent cross contamination

• If heavy equipment is used for excavation, non-operator personnel are to remain at least 20 feet away from the mechanical equipment until the operator secures all moving parts and authorizes approach. Approach may be authorized by the operator either verbally (positive oral communication) or manually by making visual contact with the non-operator and raising both hands away from the equipment controls.

• If sampling requires that personnel enter the excavation, all necessary precautions will be taken to protect the safety of the workers. Under no circumstances will personnel enter an unshored, vertical walled excavation over 4 feet deep.

12.5.0.2 The following standard protocols for sample labeling, handling, custody, and shipment apply to all four of the sampling programs described above in Sections 12.1.0 through 12.4.0.

12.5.1 Sample Containers

12.5.1.1. Samples will be collected in laboratory-provided containers appropriate for the specified analytical method. The containers will conform to the requirements of volume, container and lid material, and preservative as specified in Table WP 12-3. Appropriate measures will be taken by UXB field personnel to ensure that a sufficient number of containers are available for the project prior to the initiation of any sampling activities. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Once the sample has been collected, each glass container will be wrapped with tape so as to prevent loss of the sample should the glass break.

12.5.2 Sample Labels

12.5.2.1. A sample label will be affixed to each soil and/or water sample container prior to transport to the laboratory. In most cases, sample labels will be affixed in the field by UXB field personnel during sample collection, rather than prior to the initiation of the sampling event. This will minimize the time spent finding the appropriate container for a given sample when any container with appropriate preservatives could be used. These labels may be supplied by either the Contract Laboratory or by UXB. Each sample label will be marked in waterproof ink with the following required information:

1. Project name and location;

2 Date and time of sample collection,

3 Sample identification number,

4. Type of preservative, if applicable;

5. Analyte(s) requested (method number if more than one method is available); and

6. Initials of sampling personnel.

12.5.2 2 To assure that the samples are representative of the environment from which they are collected, chain of custody records will be used as control documents for ensuring that samples are handled properly and sample custody is maintained An example chain of custody record is shown in Figure WP 8-1 of the CDQMP. The chain of custody form includes project identification, project location, sample designation and requested analyses. In addition, there are spaces for entry of the sample collection date and time, sample depth, and sample matrix. The chain of custody record will be initiated by the field sampling personnel upon collection of a sample, and will accompany each sample cooler. Each individual who has had the samples in his/her possession will sign the chain of custody. UXB will retain a copy of the custody record prior to release to the courier. UXB will in turn provide a copy to UXB's Project Chemist. Shipping receipts for samples shipped to the HTRW Contract Laboratory will also be retained as evidence of custody transfer between the sampler and the courier.

12.5.2.3 The UXB Field QC Supervisor will also generate a sample register in the field. The function of the sample register is to provide a comprehensive record of collected samples to be used for shipment tracking, tracking receipt of analytical data, and to provide a foundation for information management. All information will be recorded daily in indelible ink. Daily entries will include information on the date and time sampled, sampling location, headspace readings, sample identification number, sample type, matrix type, laboratory destination, date shipped, shipment tracking number, and associated QAIQC samples.

12.5.3 Sample Preservation and Holding Times

12.5.3.1 Appropriate measures will be taken by UXB field personnel to ensure that storage requirements with respect to temperature are maintained in the field and during transport to the HTRW Contract Laboratory. All samples will be placed on ice immediately after sample collection and cooled in ice chests to approximately 4 degrees Celsius (°C) pending on-site analysis or shipment off-site.

12.5.3.2 Upon receipt at the HTRW Contract Laboratory, the laboratory will record both the temperature and condition of the samples at the time of receipt on the cooler receipt form and on the chain of custody record. The Contract Laboratory will accept samples whose temperatures are within the range of 2 to 6 °C Samples with temperatures between 6 and 19 °C, or less than 2 °C, will be analyzed and the temperature deviation noted within the case narrative of the Certificate of Analysis. The UXB Project Chemist will be notified and new samples may be collected and resubmitted for analysis.

12.5.3.3 At the laboratory, samples will be stored in controlled, locked refrigerators at 4 °C until analyzed. The Contract Laboratory will follow the procedures specified in SW-846 to ensure that storage requirements are maintained at the laboratory and that documentation is available to support the maintenance of these requirements. The Project Chemist will consider deviations to these temperature guidelines on a case-by-case basis.

12.5.4 Sample Shipping

12.5.4.1 Samples will be shipped to the HTRW Contract Laboratory at the end of each day of work. The handling and shipment of samples to the Contract Laboratory will be performed according to the Department of Transportation (DOT), EPA, and U.S. Army regulations, such that damage to, loss of, or unacceptable deterioration of samples is prevented. International Air Transportation Association (IATA) regulations will be adhered to when shipping samples using air courier services. Transportation methods will be selected to assure that the samples arrive at the laboratory in time to permit testing in accordance with established holding times and project schedules. No samples will be accepted by the receiving laboratory without a properly prepared chain of custody record and properly labeled and sealed shipping container(s). Prior to shipment, samples will be certified free of airborne agent above AELs in accordance with U.S. Army Pamphlet (DA PAM) 385-61. In addition, the Laboratory shall be notified that the samples are from a suspect CWM site, and that they have been analyzed for agent prior to shipment.

12 5.4 2 Procedures for packaging and transporting environmental and QC samples to the laboratory are described below:

- An ice chest of sturdy construction will be used as the shipping container. In preparation for shipping samples, the drain plug will be taped shut from the outside. Approximately 1 inch of packing material, such as vermiculite or bubble wrap, will be placed in the bottom of the cooler.
- Each sample will be wrapped separately in "bubble-wrap" or other protective material. Sufficient packing material will be used to prevent sample containers from making contact during shipment. If brass or stainless steel tubes are used, bubble wrap is not required.
- Samples will be cooled to 4 °C with ice during shipment. The ice will be contained such that water will not fill the cooler as the ice melts.
- The COC record will be placed inside a plastic bag, sealed, and taped to the inside of the cooler lid if a carrier (e.g., Federal Express or UPS) is used.
- The cooler will be closed and taped shut with strapping tape (filament type) around both ends.
- Two custody seals consisting of security tape will be placed on the cooler (one over the front and one on the side, overlapping the strapping tape if possible). The initials of the sampler and the date will be written on each custody seal. The seals will be placed such that they must be broken to gain access to the contents. Additional seals may be used. if the sampler and shipper think more seals are necessary Custody seals will be placed on each cooler prior to their release to a second or third party (i.e., shipment to the laboratory).
- The cooler will be handed over to the overnight carrier, typically a cargo-only air service, for shipment to the Contract Laboratory within 24 hours of sample collection. This transportation method was selected to ensure that the samples arrive at the laboratory in time to permit testing in accordance with established holding times and project schedules. The airbill will be filled out before the samples are handed over to the carrier.
- The Contract Laboratory will be contacted immediately upon shipment, or as soon as possible thereafter, and notified of the date and method of shipment, number of ice chests, and any additional instructions.

12.5.4.3 The HTRW Contract Laboratory will be required to acknowledge sample receipt within 48 hours either by fax or by telephone. At that time, the Contract Laboratory will notify the UXB Project Chemist of any handling problems such as broken sample containers, insufficient sample volumes, missed holding times, etc.

12.6.0 Sampling Equipment Decontamination

12.6.0.1 All hand equipment and tools used inside the exclusion zone will be staged in the contaminant reduction zone and decontaminated prior to leaving the contaminant reduction zone. Decontamination of hand-held tools/equipment will as a minimum receive a three stage wash and rinse in accordance with the procedures outlines in Section 13.1.0 of the SSHP (Book 2 of this Safety Submission) The first stage is a wash solution based on the contaminant of concern (refer to Table WP 12-4). The second stage is a wash consisting of hot soapy water. The third step involves rinsing the item in clean water After this three-stage wash/rinse cycle, hand tools/equipment can be reused or removed from the contaminant reduction zone upon inspection and approval by the SSHO.

Table WP 12-1

Field Program Description, Rational, and Data Quality Objectives

Task	Section Reference	Field Program Description	Data Quality Objectives	Data Acquisition/Analytical methods(a)	Data Type	Data Reporting Level(b)	Data Uses
IDW Characterization Sampling	12 4	Collect and analyze characterization samples of investigation-derived waste (decontamination water).	To profile the waste characteristics of the excavated soil/debris prior to shipping to off-site disposal facility.	Lewisite (MEAP)	Definitive	III, IV	Remedial Action Report, Waste Manifesting
				Mustard (MEAP)	Definitive	III, IV	
				Thiodiglycol (MEAP)	Definitive	III, IV	
				1, 4-Dithiane (MEAP)	Definitive	III, IV	
				1, 4-Oxathiane (MEAP)	Definitive	III, IV	
				Chloroform (Method 8260B)	Definitive	III, IV	
				Chloropicrin (Method 8270C)	Definitive	III, IV	
				Arsenic (Method 6010B)	Definitive	III, IV	
				TCLP Metals (Method 1311/6010B&7470A)	Definitive	III, IV	
				Reactivity (Sections 7 3.3 & 7.3.4)	Screening	I	
				Ignitability (Method 1030)	Screening	I	
				Corrosivity (Method 9045C)	Screening	I	

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Task	Section Reference	Field Program Description	Data Quality Objectives	Data Acquisition/Analytical methods(a)	Data Type	Data Reporting Level(b)	Data Uses
Excavate Trench Contents	NA	Excavate trench contents until the horizontal limits of the trench are defined.	To document the removal operations	Field operations	Screening	I	Remedial Action Report
				Physical characteristics of the soil/debris	Screening	I	
				Depth and volume of soil removed	Screening	I	
Characterize intact non-CWM items	12.2	Analyze the contents of recovered non-CWM bottles which have no labels or identifiable markings.	To profile the waste characteristics of the unknowns prior to shipping to off-site disposal facility.	HazCAT Field assessment	Screening	I	Remedial Action Report, Waste Manifesting
Soil Compliance (verification sampling)	12.3	Collect and analyze compliance samples from the side-walls and floor of the excavation.	To evaluate whether sufficient soils have been removed to meet cleanup criterion.	Lewisite (MEAP)	Definitive	III, IV	Verify Site Cleanup, Remedial
				Mustard (MEAP)	Definitive	III, IV	
				Thiodiglycol (MEAP)	Definitive	III, IV	
				1,4-Dithiane (MEAP)	Definitive	III, IV	
				1,4-Oxathiane (MEAP)	Definitive	III, IV	
				Chloroform (Method 8260B)	Definitive	III, IV	
				Chloropicrin (Method 8270C Mod)	Definitive	I	

Task	Section Reference	Field Program Description	Data Quality Objectives	Data Acquisition/Analytical methods(a)	Data Type	Data Reporting Level(b)	Data Uses
				Arsenic (Method 6010B)	Screening	III, IV	
IDW Characterization Sampling	12.4	Collect and analyze characterization samples of investigation-derived waste (decontamination water).	To profile the waste characteristics of the IDW prior to shipping to off-site disposal facility.	Arsenic (Method 6010B)	Definitive	III, IV	Remedial Action Report, Waste Manifesting
				Corrosivity (Method 9045C)	Screening	I	
Site Survey	NA	Survey the limits of the excavation	To document the removal action.	Location (Tennessee State Planar Coordinates)	Definitive	II	Remedial Action Report.
				Elevation Data (feet above NGVD)	Definitive	II	

(a) EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), (U.S. EPA Third Edition, September 1986; Final Update I, July 1992; Final Update IIA, August 1993; Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, Dec. 1996).

(b) Data levels and corresponding reporting criteria are described Section 8.1 and Table WP 8-1.

IDW investigation-derived waste

MEAP Mobile Environmental Analytical Platform

NA not applicable

NGVD National Geodetic Vertical Datum

TCLP Toxicity Characteristic Leaching Procedure

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Table WP 12-2
Anticipated Sample Schedule

Sample Designation (a)	Depth/Location (see Figure WP 12-4)	Sample Type (b)	Collection Method	Analytical Methods
Soil/Debris Characterization Samples (c)				
DUNN FIELD/24-B/1-SCD-1	24-B, Pit 1	Environmental	Two-Part Composite	Refer to Table WP 12-1
DUNN FIELD/24-B/1-SCD-1-MS/MSD	24-B, Pit 1	QC (MS/MSD)	Split from DUNN FIELD/24-B/1-SCD-1	Refer to Table WP 12-1
Soil Compliance (Verification) Samples (d)				
DUNN FIELD/24-B/1-CVS-1	24-B, Pit 1 Section 1, North side wall Depth 6 ft	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-2	24-B, Pit 1 Section 1, North side wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-2-MS/MSD	24-B, Pit 1 Section 1, North side wall Depth 10 ft	QC (MS/MSD)	Split from DUNN FIELD/24-B/1-CVS-2	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-3	24-B, Pit 1 Section 1, North side wall Depth 10 ft.	QC (Blind Replicate)	Split from DUNN FIELD/24-B/1-CVS-2	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-4	24-B, Pit 1 Section 1, South side wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-5	24-B, Pit 1 Section 1, South side wall	Environmental	Discrete	Refer to Table WP 12-1

Sample Designation (a)	Depth/Location (see Figure WP 12-4)	Sample Type (b)	Collection Method	Analytical Methods
	Depth 10 ft.			
DUNN FIELD/24-B/1-CVS-6	24-B, Pit 1 Section 1, East end wall Depth 6 ft	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-7	24-B, Pit 1 Section 1, East end wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-8	24-B, Pit 1 Section 1, Excavation floor Center, 3 ft from end wall	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-9	24-B, Pit 1 Section 1, Excavation floor Center, 6 ft from end wall	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-10	24-B, Pit 1 Section 2, North side wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-11	24-B, Pit 1 Section 2, North side wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-12	24-B, Pit 1 Section 2, South side wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-13	24-B, Pit 1 Section 2, South side wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-	24-B, Pit 1	Environmental	Discrete	Refer to Table WP 12-1

Sample Designation (a)	Depth/Location (see Figure WP 12-4)	Sample Type (b)	Collection Method	Analytical Methods
14	Section 2, Excavation floor 13 ft from East end			
DUNN FIELD/24-B/1-CVS-14-MS/MSD	24-B, Pit 1 Section 2, Excavation floor 13 ft from East end	QC (MS/MSD)	Split from DUNN FIELD/24-B/1-CVS-14	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-15	24-B, Pit 1 Section 2, Excavation floor 13 ft from East end	QC (Blind Replicate)	Split from DUNN FIELD/24-B/1-CVS-14	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-16	24-B, Pit 1 Section 2, Excavation floor 16 ft. from East end	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-17	24-B, Pit 1 Section 3, North side wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-18	24-B, Pit 1 Section 3, North side wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-19	24-B, Pit 1 Section 3, South side wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-19-MS/MSD	24-B, Pit 1 Section 3, South side wall Depth 6 ft.	QC (MS/MSD)	Split from DUNN FIELD/24-B/1-CVS-19	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-20	24-B, Pit 1 Section 3, South side wall Depth 6 ft.	QC (Blind Replicate)	Split from DUNN FIELD/24-B/1-CVS-19	Refer to Table WP 12-1

Sample Designation (a)	Depth/Location (see Figure WP 12-4)	Sample Type (b)	Collection Method	Analytical Methods
DUNN FIELD/24-B/1-CVS-21	24-B, Pit 1 Section 3, South side wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-22	24-B, Pit 1 Section 3, West end wall Depth 6 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-23	24-B, Pit 1 Section 3, West end wall Depth 10 ft.	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-24	24-B, Pit 1 Section 3, Excavation floor 3 ft. from West end	Environmental	Discrete	Refer to Table WP 12-1
DUNN FIELD/24-B/1-CVS-25	24-B, Pit 1 Section 3, Excavation floor 6 ft. from West end	Environmental	Discrete	Refer to Table WP 12-1
IDW Characterization Samples (c)				
DUNN FIELD/24-B/1-IDW-1	NA	Environmental	Composite	Refer to Table WP 12-1
DUNN FIELD/24-B/1-IDW-2	NA	Environmental	Composite	Refer to Table WP 12-1
DUNN FIELD/24-B/1-IDW-2-MS/MSD	NA	QC (MS/MSD)	Split from DUNN FIELD/24-B/1-IDW-2	Refer to Table WP 12-1

Sample schedule will be repeated for each pit (there are three pits in 24-B, one pit at site 24-A, and one pit at Site 1).

(a) Additional samples to be added as needed

(b) Blind replicate samples will be collected for 10% of the total number of compliance samples collected. Replicate samples will not be collected for waste characterization samples. MS/MSDs will be collected for 5% of the samples collected or at a minimum of one per sampling event. Additional blind replicate and MS/MSD samples to those listed in this table will be added as necessary in the frequencies described above if additional environmental samples are collected

(c) Each roll-off will be sampled, analyzed and cleared of CWM prior to transporting off-site for disposal

(d) Equipment blanks and trip blanks will be submitted at a frequency of one sample per sampling event.

(e) One composite sample will be collected for every 10 drums of wastewater generated

bgs	below ground surface	QC	quality control
SDC	soil/debris characterization		
CVS	compliance (verification) sample		
IDW	investigation-derived waste		
MS/MSD	matrix spike/matrix spike duplicate		

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Table WP 12-3

Sample Containers, Preservation Methods, and Analytical Holding Times

Matrix	Method	Container	Lid	Maximum Holding Time		
				Preservation	Extraction (a)	Analysis (b)
Soil	MEAP (Lewisite)	4 oz glass wide mouth jar	Teflon-lined lid	Ice to 4°C	10 days	40 days
	MEAP (Mustard)					
	MEAP (Thiodiglycol)					
	MEAP (1,4-Dithiane)					
	MEAP (1,4-Oxathiane)					
Soil	EPA Method 8260B (Chloroform)	4 oz glass wide mouth jar	Teflon-lined lid	Ice to 4°C		14 days
Soil	EPA Method 8270C Mod (Chloropicrin & Chloracetophenone)	8 oz glass wide-mouth jar	Teflon-lined lid	Ice to 4°C	14 days	40 days
Soil	EPA Method 6010B & 7074A (TCLP Metals)	8 oz glass wide-mouth jar	Teflon-lined lid	Ice to 4°C	28 days (Hg)	28 days (Hg)
	EPA Method 7060A (Arsenic)					180 days
Soil	SW-846 Sections 7.3.3 & 7.3.4 (Reactivity)	4 oz glass wide-mouth jar	Teflon-lined lid	Ice to 4°C		ASAP
	EPA Method 1030 (Ignitability)					
	EPA Method 9045C (Corrosivity)					
Water	EPA Method 9045C (Corrosivity)	500 ml polyethylene bottle	Teflon-lined cap	Ice to 4°C		ASAP
Water	EPA Method 7I060A (Arsenic)	500 ml	Teflon-lined	HNO3 to pH<2;		180 days

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		polyethylene bottle	cap	Ice to 4°C		

MEAP Mobile Environmental Analytical Platform

ml milliliter

oz ounce

(a) Starting from the date of collection

(b) Starting from the date of extraction; if no extraction is involved, starting from the date of collection.

Table WP 12-4
Decontamination Solutions for Sampling Equipment

Contaminant of Concern	First Wash	Second Wash
Mustard (H)	Household Bleach (5% solution)	Hot Soapy Water
Lewisite (L)	Caustic Soda and Water	Hot Soapy Water
Phosgene (CG)	Hot Soapy Water	Hot Soapy Water
Chloropicrin (PS)	5% Sodium Bisulfite Solution	Hot Soapy Water
All Others	Hot Soapy Water	Hot Soapy Water

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Table WP 12-5
Site Monitoring/Schedule Action Plan

Containment/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency	Action Level	Actions to be Taken
Mustard (H)	MINICAMS	CBDCOM	Continuous monitoring during intrusive soil or earth moving operations, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up.	0.003 mg/m^3	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP 3-2, 3-2A, and 3-2B
	DAAMS Tubes	CBDCOM	Tubes changed each hour, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up	0 003 mg/m^3	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP 3-2, 3-2A, and 3-2B.
Lewisite (L)	MINICAMS	CBDCOM	Continuous monitoring during intrusive soil or earth moving operations, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up.	0.003 mg/m^3	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP 3-2, 3-2A, and 3-2B.
	DAAMS Tubes	CBDCOM	Tubes changed each hour, 1st entry monitoring, TEU assessment, soil decontamination, unknown identification, and project set-up	0.003 mg/m^3	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP3-2, 3-2A, and 3-2B
Phosgene (CG)	Auto Step Plus	SSHO	Continuous monitoring during intrusive soil or earth moving operations, TEU assessment,	0 05 ppm	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP

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Containment/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency	Action Level	Actions to be Taken
			soil decontamination, unknown identification, and project set-up.		3-2, 3-2A, and 3-2B.
Chloropicrin (PS)	Draeger Tube	SSHO	Tubes changed each hour, TEU assessment, soil decontamination, unknown identification, and project set up.	0 3 mg/m^3	Evacuate the area and report reading to CHENC. Follow procedures outlined in Tables WP 3-2, 3-2A, and 3-2B
Organic Vapors	Direct reading FID	SSHO	Every 30 minutes in BZ during intrusive work, TEU assessment, soil decontamination, unknown identification, and project set-up.	>5 ppm in BZ for more than 5 minutes	Evacuate area and evaluate PPE Inform CIH to evaluate sampling.
LEL/Oxygen/Carbon Monoxide/Hydrogen Sulfide	Combination Combustible Gas Indicators (CGI)/Oxygen Monitor/Carbon Monoxide/H_2S	SSHO	During intrusive work, TEU assessment, soil decontamination, unknown identification, and project set-up.	Any alarm	Evacuate area and evaluate PPE Inform CIH to evaluate sampling
Dust	MINIRAM	SSHO	Continuously during soil moving operations	2 5 mg/m^3	Dust suppression using water
				5.0 mg/m^3	Increase PPE to Level C with HEPA filter.
Noise	Noise Dosimeter	SSHO	During operation of machinery or heavy equipment	85 dBA, 8 hr. TWA	Wear issued hearing protection
Arsenic	Low Volume Pump and MCE Filter	SSHO	During first three days of soil intrusive operations	>0.01 mg/m^3	Dust suppression using water. Increase PPE to level C with HEPA filter

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Containment/ Hazard to be Detected	Monitoring Equipment	Monitoring Responsibility	Monitoring Frequency	Action Level	Actions to be Taken
Silica	Low Volume Pump and PVC Filter	SSHO	During first three days of soil intrusive operations	>0 05 mg/m^3	Dust suppression using water. Increase PPE to level C with HEPA filter.

BZ breathing zone

CIH certified industrial hygienist

TWA time-weight

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Work Plan Appendix A:

STATEMENT OF WORK

Chemical Warfare Materiel Investigation/Removal Action At Defense Depot Memphis Tennessee (DDMT)

TAB

Appendix A

STATEMENT OF WORK

CHEMICAL WARFARE MATERIEL

INVESTIGATION/REMOVAL ACTION

DUNN FIELD

DEFENSE DEPOT MEMPHIS

TENNESSEE (DDMT)

1.0 **BACKGROUND and GENERAL STATEMENT OF WORK.** The work required under this Statement of Work (SOW) falls under the Base Realignment and Closure (BRAC).Chemical Warfare Materiel (CWM) is suspected to exist on this property formerly owned by the Department of the Army and currently owned by the Department of Defense. The project site is Dunn Field, Defense Depot Memphis Tennessee (DDMT).

1.0.1 Ordnance and explosives (OE) and CWM are a safety hazard and constitute a hazard to the public and the environment. These actions will be performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the National Priority List (NPL); the Federal Facilities Agreement (FFA) between DDMT, Environmental Protection Agency (EPA), and the State of Tennessee; and, the National Contingency Plan (NCP).For any actions on site, administrative requirements of Federal, State, or Local permits are not required, but the substantive permit requirements shall be fulfilled. The provisions of 29 CFR 1910.120 shall apply to all actions taken at this site.

1.0.2 This site is a suspected CWM site, possibly containing German WWII mustard-filled bombs and Chemical Agent

Identification Sets (CAIS).CAIS falls under the category of CWM.

1.03 The contractor shall prepare and coordinate with various government agencies the Work Plan, Site Safety and Health Plan (SSHP), and other plans as identified in this Scope of Work. The contractor shall also prepare: (1) the Department of Defense (DOD) Safety Submission (SS) for this site; (2) the site for intrusive/removal action; and, (3) be required to provide necessary engineering controls prior to intrusive actions. The contractor shall perform most initial intrusive work. Technical Escort Unit (TEU) of the Chemical and Biological Defense Command (CBDCOM) shall assist, as required, the contractor with initial excavation. TEU shall perform all removal, assessment, sampling, packaging and transport to the interim holding facilities (IHF) of determined or suspected CWM. TEU shall be on-site to assess CAIS and chemical warfare ordnance. If CWM is found during field operations, TEU shall control the site, and the contractor shall support TEU and notify the Corps of Engineers Huntsville Center (CEHNC) on-site Safety Specialist or contracting officer. If an explosive chemical munition is found, the contractor may be directed to continue operations in another location or suspend operations until further notice upon the direction of the CEHNC safety specialist or contracting officer. The contractor shall support TEU during TEU's intrusive excavations for removal, packaging and transport of non-explosive CWM. The contractor shall also remove and destroy conventional unexploded ordnance {UXO).Program Manager-Nonstockpile (PMNS) is responsible for transporting CWM from the site IHFs and its disposition. TEU shall conduct field monitoring for agent, and Edgewood Research, Development, and Engineering Center (ERDEC) of CBDCOM shall analyze samples for agent and related byproducts (i.e., agent degradation products and decontamination waste) by using ERDEC's on-site mobile laboratory. The contractor is responsible for sampling, characterizing, excavating, containerizing, documenting, transporting and disposal at an approved RCRA transport, storage and disposal (TSD) facility material (i.e. soil and scrap, and investigative waste (IW)) contaminated by agent. The contractor shall characterize, transport and dispose solid and hazardous waste (including soil and scrap) not contaminated by agent, and restore the site. The contractor shall prepare an Engineering Report, documenting all work undertaken during this project. The contractor shall maintain a detailed accounting of all ordnance encountered. This accounting shall include the amounts of ordnance, identification, condition, depth located, disposition and location/mapping, and shall be part of the Engineering Report.

1.1 SITE DESCRIPTION.

1.1.1 General. The Defense Depot Memphis Tennessee is located within the city limits of Memphis, Tennessee. The Depot is on the south side of the town on Airways Road. It is two miles northwest of the Memphis International Airport. The Depot **is** still actively used by the Department of Defense, operated by the Defense Logistics Agency (DLA) and under the control of the Defense Distribution Region East (DDRE) The depot is undergoing Base Realignment and Closure (BRAC) activities.

1.1.2 Main Depot Area. No evidence of burial or destruction of conventional ordnance or chemical warfare materiels on the main depot can be found. The pistol range has been removed. In 1946 the area where the boxcars containing German mustard bombs, which leaked mustard onto the ground, was decontaminated and tested with negative results.

1.1.3 <u>Dunn Field</u> All records indicate that only the Dunn Field Area was used to destroy or bury conventional ordnance and CWM. The first known destruction of CWM was in 1946 in Operable Unit 1 (OU-1, unnumbered site, and also shown in the Archive Search Report (ASR), Reference 8.32, as Area A) with the neutralization and destruction of the German Mustard Bombs. The last known disposal of CWM is the burial of CATS in 1955 or 1956, in OU–1, Site #1 (also shown in the ASR as Area B).Between 1946 and 1956, other chemicals associated with the Chemical Warfare Service were also buried. These include Impregnite (both CC-2 and XXCC-3), used for impregnating clothing against chemical agent and Decontamination Agent, Non-Corrosive (DANC) (consisting of RH195 and Acetylene Tetrachloride).In addition, food stocks (rations), acids (Nitric, Sulphuric, Hydrochloric, and Acetic), paints, herbicides, and medical waste were also destroyed or buried in pits. Conventional ordnance war trophies (ordnance souvenirs brought back from overseas) were also destroyed in the Dunn Field Area following World War II.

1.1.3.1Dunn Field, Operable Unit 1 (OU–1, ASR Area A), measures approximately 200 feet wide by 1350 feet long and approximately 6-1/2 acres. In July 1946, a rail shipment of 250 kg and 500 kg sulphur-mustard-filled German bombs, en route from Mobile, AL to Pine Bluff, AR, was diverted to DDMT due to some of the bombs leaking and contaminating the rail line. The leaking bombs (24 -500 kg and 5 -250 kg) were drained at DDMT by shooting into the bomb casing, draining the mustard into a slurry pit (40 feet long by 8 feet wide by 12 feet deep), and destroying the empty bomb casings by detonation (the 500 kg bombs did not have explosives, the 250 kg bombs did have an explosive burster) Pages 5 through 10 of the ASR mention an old cloth drawing of

Dunn Field was found and was barely readable; the outline of a trench was marked 'Mustard Gas."

1.1.3.2 Dunn Field, Operable Unit 1 (OU-1, ASR Area B), Site #1, measures approximately 200 feet wide by 1200 feet long and approximately 5–1/2 acres. In 1952–1953 and again in 1955–1956, Chemical Agent Identification Kits were buried (kit type unknown). Pages 5 through 11 of the ASR state that the CAIS sets in wooden boxes were put into the pits intact and covered up. Although the exact kit type is unknown, typically CAIS included viles containing agents listed in the following table, but additional CAIS agents may also be present.

Agent Abbr.	Agent Name and Description	Type of Agent
H or HD	Distilled Mustard (Sulphur)	Blister Agent
L or M–1	Lewisite	Blister Agent Choking Agent
PS	Chloropicrin or Tricloronitromethane	
CG	Phosgene	Choking Agent
CN	ChloroacetOphenOne or Chloromethyl Phenyl ketone	Tear Agent
DM	Adamsite or DiphenylaminochlOrOarsine	Vomiting Agent

2.0 <u>OBJECTIVE</u>. The objective is for the contractor, in conjuction with CBDCOM, to investigate and remove German Mustard Bombs, CAIS and any other CWM contamination, and to investigate and destroy conventional UXO at the Dunn Field Sites located at DDMT.

3.0 TASKS

3.1 (TASK 1) SITE VISIT. PREPARE WORK PLANS (WP), and SITE SAFETY AND HEALTH PLAN (SSHP).

3.1.1 The contractor shall prepare and submit a Work Plan. The Work Plan shall describe in detail the site background and history, investigation objectives, all proposed investigative activities, sampling techniques, personnel protective equipment (PPE), monitoring equipment, procedures, personnel, and schedule. A site visit is authorized to assist in preparing the Work Plan. The site visit team shall not exceed three persons, and shall include one Senior UXO Supervisor. The site visit shall be coordinated with the Contracting Officer (CO) 10 days prior to arriving on site. An abbreviated SSHP shall be prepared in accordance with (IAW) 29 CFR 1910.120 and 29 CFR 1910.134 for the site visit. An example of an abbreviated SSHP can be obtained from the CEHNC Safety Office. The abbreviated SSHP shall be forwarded to the CEHNC contracting officer for approval prior to the site visit.

3.1.2 Health and Safety Program (HSP) The contractor shall develop and maintain a Health and Safety Program in compliance with the requirements of OSHA standard 29 CFR 1910.120(b) (1) through (b) (4). Written certification that the HSP has been developed and implemented shall be submitted to the Contracting Officer, and the plans shall be made available upon request. The contractor shall develop a Site Safety and Health Plan IAW the requirements of Paragraph 5.0 of this SOW. The SSHP shall be submitted to the Contracting Officer for review and approval prior to starting any of the field work described in this SOW. All work shall be performed IAW the approved plan and this SOW.

3.1.3 Intrusive Excavation Plan. The contractor, in conjunction with TEU, shall prepare and submit an Intrusive Excavation Plan. This portion of the Work Plan shall propose methods for excavating as well as discuss equipment, materials, personnel (types and level of staffing), and procedures for intrusive excavation. The contractor and TEU will work as a team mutually supporting each other during intrusive excavations. The level of effort required to manage the DDMT project will be coordinated with TEU and defined in the Work Plan. For example, the contractor will perform most of the initial intrusive work, and TEU will provide support based on what level of effort is required.

3.1.3.1 Specific contractor responsibilities are:

The contractor shall remove and destroy conventional UXO IAW the Conventional UXO Disposal Plan.

The contractor shall maintain a detailed accounting of all ordnance encountered. This accounting shall include the amounts of ordnance, identification, condition, depth located, disposition and location/mapping, and shall be part of the Engineering Report.

The contractor, if an explosive chemical munition is found, may be directed by the CEHNC Safety Specialist to suspend operations until further notice. (TEU will step in and identify/ characterize the contents of the items of CWM.)

The contractor, with TEU support, shall safely excavate suspect CWM and debris. Excavated soil shall be placed in roll-off containers for its characterization.

The contractor shall identify soils contaminated with agent. These soils shall be containerized, manifested, transported, and disposed of by the contractor in accordance with local, state, and federal laws and regulations.

The contractor shall remove from the site glassware, containers, and soils identified as not containing agent, and disposed of them as HTW or solid waste. Soils identified as clean shall be used to fill excavated areas that are identified clean of agent.

The contractor shall be responsible for site grading and seeding of any disturbed areas following the removal activities. Specific TEU responsibilities are:
TEU shall be on site to assess CAIS kits and suspect chemical warfare ordnance.
If CWM items are found, TEU shall control the site, and the contractor shall support TEU.
TEU will over pack and transport to an interim holding facility any glassware, containers, and munitions identified or suspected as containing CWM. (The contractor will support TEU as necessary in these activities.)

3.1.4 Work, Data, and Cost Management Plan (WDCMP). The contractor shall prepare and submit a WDCMP which describes how the work will be managed and accomplished. The WDCMP shall contain a schedule for the accomplishing the tasks. The schedule shall contain milestones for delivery of all deliverables and associated costs, showing the components in their relative chronological positions, and state the intervals between milestones in terms of working days following the previous events. More detailed information in the WDCMP shall also consist of the organization structure, the assignment of functions, duties and responsibilities, and functional relationships among organizational elements that will participate in the accomplishing the tasks.

3.1.5 Quality Control (QC) Plan. Items addressed in the QC Plan should include as a minimum: testing and calibrating equipment; performing and documenting QC field inspections; monitoring proper functioning of all electronic equipment; and, ordnance and explosive (OE) identification. In addition, a QC Plan should be incorporated into the Sampling Plan and shall include chain-of-custody procedures. All QC checks shall be documented and audit trails established for each QC function and those audits available to the on-site COE representative. The contractor shall have a qualified geologist during field activities to determine that undisturbed soil has been encountered. This activity shall be initiated after intrusive activities and prior to backfilling the excavation. Some audits expected to be performed are: equipment calibration, property accountability, UXO-related tasks, equipment operator, PPE, sampling and analytical audits. The QCP will conform to DID OT-005 of the contractor's basic contract.

3.1.6 Site-Specific Environmental Protection Plan. The contractor shall address those measures to be taken to protect against further contamination and environmental damage that may result from the contractor's work.

3.1.7 Property Equipment Plan (PEP). The contractor, coordinating with TEU, shall prepare and submit a detailed PEP describing the equipment to be employed to perform all necessary operations. The PEP shall describe and quantify both field equipment (such as site trailers, backhoes, trucks, magnetometers, structures, etc.); office equipment (such a computers/printers, fax, copier, radios, etc.); and consumable supplies (both office and field) intended to be used. The PEP shall describe the source and rental/acquisition costs for all field and office equipment, and the PEP must indicate that the vendor with the lowest price quote was selected, or justify the use of an other vendor. The contractor shall indicate in the PEP when rental costs exceed acquisition cost for a particular piece of equipment over the life of the project. In these instances, the CO may direct the contractor to purchase that equipment. After CO approval of the Work Plan/Property Equipment Plan, additional field/office equipment and consumable supplies may not be rented or acquired in excess of $2,000.00 without CO approval.

3.1.8 <u>PM Non-Stockpile Plans</u>. The contractor shall, on concurrence with the Contracting Officer, be prepared to assist PMNS as needed in developing plans for the following tasks.

3.1.8.1<u>Recovered Chemical Warfare Materiel Interim Holding Facility Plan</u>.

3.1.8.2 <u>Recovered Chemical Warfare Materiel Transportation Plan</u>.

3.1.8.3 <u>Recovered Chemical Warfare Materiel Disposal Plan</u>.

3.1.9 <u>Scrap Monitoring and Disposal Plan</u>. The contractor, in conjunction with CBDCOM, shall develop and propose a plan for monitoring and disposing of all recovered scrap from intrusive operations in CWM areas. This plan shall consider requirements for monitoring, shall show alternatives for scrap disposal, and shall propose the safest and most cost-effective methods that will be followed. Items determined to be from CWM operations shall be placed by the contractor in a sealed box or container and heated to 70 degrees F. Head space samples shall be collected and analyzed by CBDCOM. If the item contains any solid or liquid residue, a sample shall be collected by the contractor and analyzed in accordance with the Chemical Data, Laboratory, and Field Work Sampling Plan. A soil sample shall be collected by the contractor from the precise location where the item was recovered and analyzed accordingly. If results of the air, soil, and residue sampling indicate no agent contamination, the contractor shall make provisions for disposal of these items. For scrap that is agent contaminated, the contractor shall recommend the Hazardous and Toxic Waste receiver, packaging and transport methodology. The contractor shall furnish the following statement for scrap released as non-hazardous: "I certify that the property listed hereon has been inspected by me, and to the best of my knowledge and belief, contains no items of a dangerous nature." The Senior UXO Supervisor shall sign the certificate.

3.1.10 Medical Training and Support Plan. This plan shall be provided by the Government.

3.1.11 Protective Action Plan. The protective action plan is prepared by the Corps of Engineers. The development of this plan requires input and coordination with the contractor, DDMT, CEHNC, CBDCOM, and PMNS. This plan shall include, but is not limited to, procedures used to protect civilian personnel against on-site contaminants, including evacuation procedures for civilian personnel, reimbursement of expenses for evacuees, the Maximum Credible Event (MCE), the down wind hazard calculations, and the No Significant Events (NOSE) distance. The contractor shall assist, as required by the Corps of Engineers in the development of this plan.

3.1.12 Chemical Data, Laboratory and Field Work Sampling Plan. The contractor shall describe methods and equipment for, and frequency and quantities of, soil sampling by the contractor.

This plan shall also include the number of samples of each matrix to be taken, the specific chemical parameters to be analyzed for, the standard EPA SW 846 methods or Government-approved methods for agent analysis, and the frequency of analyses to be performed. Composite samples (taken by the contractor) from the excavated soil shall also be analyzed for disposal. In the absence of analytical methods for agent related byproducts, the contractor shall identify and recommend analytical methods used in the commercial chemical laboratories and shall include the associated detection limits of the matrix. A complete copy of the agent and related-byproducts shall be included in the Work Plan with the associated detection limits. ERDEC shall analyze for agent and related-byproducts with ERDEC's on-site mobile laboratory. ERDEC will provide on–site screening of samples prior to shipping the samples from the site. Environmental samples, split from the original sample, shall be held pending ERDEC on-site analysis for agent and related byproducts. Samples identified as not contaminated by agent shall be released by the contractor to a valid CEMRD laboratory for environmental analysis. For quality control purposes, 10 percent of the samples shall be split into an additional sample to be sent to an ERDEC certified or CEMRD environmental laboratory for confirmation.

3.1.13 Investigative Waste (IW) Plan. The contractor shall describe how investigative waste shall be handled at the site. The plan shall describe if the 1W (i.e. agent contaminated media possibly with industrial chemicals, agent byproducts, and hazardous waste) must be containerized, type of containerization method, sampling and analytical strategy, acceptable disposal facilities, site storage and security, transportation, manifesting, and storage time limits. Regulatory acceptance of the IW Plan shall be obtained in writing prior to contractor field mobilization.

3.1.14 Field Monitoring Plan.

3.1.14.1 The contractor shall coordinate with the CO. CEHNC, and CBDCOM, in determining the amount and type of monitoring equipment. The contractor shall coordinate with CBDCOM as to the placement and the number of monitoring devices for this Task Order. CBDCOM shall provide monitoring for agent during field operations. The contractor shall be responsible for continuous monitoring of all other hazards associated with the sites. The contractor may coordinate information requests with CBDCOM and CEHNC on hazards believed to be present. The contractor is responsible for monitoring of all industrial chemicals. Air monitoring results shall be used to determine the appropriateness of Personnel Protective Equipment and the need to upgrade/downgrade the levels of protection based on established action levels. When applicable, National Institute for occupational Safety and Health (NIOSH) approved sampling and analytical methods must be used. Monitoring chemical agents shall be in accordance with ERDEC protocols. Only laboratories participating and meeting the requirements of the American Industrial Hygiene Association Proficiency Analytical Testing Laboratory Accreditation programs shall conduct necessary analyses for chemicals other than agent. For chemicals other than agent, all information on monitoring shall be included in the SSHP.

3.1.14.2 The contractor, in conjunction with CBDCOM, shall take periodic soil samples, and then send these samples to the on-site laboratory. The contractor shall provide soil sampling equipment, containers and packaging as required. The contractor shall coordinate with CBDCOM for assistance in sampling and sample packaging for the QC samples. All sample locations shall be annotated for future reference. The contractor shall plot each sample location, the corresponding sample number, and the X, Y and Z (distance above or below natural ground) coordinates on the map as approved and discussed in the Work Plan.

3.1.14.3 The contractor shall include all monitoring information (both contractor and Government) into a table in the SSHP. The table shall include information on action levels, actions to be taken, monitoring frequency, by whom, etc.

3.1.15 Conventional UXO Disposal Plan. The contractor shall be responsible for the destruction of conventional UXO and in accordance with the Work Plan. The plan, coordinated with TEU, should include types of demolition material, method of securing the site, demolition notification to local emergency management, and other details required to conduct demolition operations.

3.1.15.1 The procedures used during disposal of conventional UXO shall comply with those covered in Reference 8.33. The contractor shall provide UXO personnel support, and only CEHNC approved UXO personnel shall perform UXO-related tasks.

3.1.15.2 Explosives Management Plan. The contractor shall prepare an Explosives Management Plan IAW DID OT—005 of the basic contract. A system shall account for all demolition materials expended in the disposal of conventional UXO. The source and handling of explosives shall be addressed.

3.1.16 Community Relations Plan. The contractor shall assist Mobile District as required to prepare a plan for community relations. Any already existing plan shall be utilized. The plan shall be formulated in close consultation with the US Army Corps of Engineers, Mobile District, TEU, PMNS,DDMT, DLA and CEHNC public affairs personnel.

3.1.17 Site Mobilization/Demobilization and Support Plan. The contractor shall prepare a plan that details mobilization/ demobilization activities. These activities shall be those actions necessary to prepare the site for work prior to work crew arrival and those actions necessary to shut down the site at demobilization. Such activities shall include, but are not limited to, communications, power to site office(s), arrangement for office(s), sanitary requirements, and lodging arrangements.

3.2 (TASK 2) SAFETY SUBMISSION. (SS) As directed by CEHNC, the contractor shall compile, maintain, and submit the official SS for coordination and approval by the DA. The SS will consist of an Executive Summary, the Work Plan, a Site Safety and Health Plan, a Protective Action Plan, a Transportation Plan, an Interim Holding Facility Plan, Disposal Plan, a Technical Escort Unit Op-Plan, a Monitoring Plan, CWM Disposal Plan, and a Conventional UXO Disposal Plan. Though several of these documents are prepared by other agencies, the contractor shall be responsible for incorporating them into the SS, keeping all incorporated documents current, and preserving document control so that all copies remain identical throughout the life of this project.

3.3 (TASK 3) BRUSH CLEARING. The contractor shall perform brush clearing operations as required. Brush and vegetation will be cut and removed from the site as required to facilitate efficient and safe operations. Ground features necessarily altered to accomplish the mission shall be restored to their original state by the contractor.

3.4 (TASK 4) INTRUSIVE EXCAVATIONS.

3.4.1 The contractor and TEU shall excavate and screen soils IAW the approved Work Plan. TEU shall be on-site to assess CAIS and suspect CWM.

3.4.2 In the event a suspect chemical item is found, the contractor shall support TEU and notify the CEHNC on-site safety specialist or contracting officer. TEU shall take control of the area and assess the item. If an explosive chemical munition is found, the contractor may be directed to continue operations in another location or suspend operations until further notice upon the direction of the CEHNC safety specialist or contracting officer. If the item is CWM, TEU will remove, package and transport it to the IHF. The contractor shall support TEU during TEU's excavations for removal, packaging and transport of CWM.

3.4.3 The contractor shall be responsible for excavating all soil identified by soil sampling as contaminated with agent.

3.4.4 The contractor shall be responsible for screening debris, and for containerizing soils generated during intrusive investigations.

3.4.5 Agent contaminated media are the responsibility of the contractor to ensure that proper sampling, analysis (by ERDEC), containerization, labeling, manifesting, and transportation are conducted. DDMT shall identify a person responsible for the signing of the manifests.

3.4.6 The contractor shall be responsible for the identification of TSD facilities for the ultimate disposal of soils and debris contaminated with agent or hazardous waste.

3.4.7 The contractor shall be responsible for the coordination/disposition of all soils generated from excavation activities. Soil identified as containing agent shall be disposed of as hazardous waste. All soil identified as HTW shall be removed and disposed by the contractor at an approved TSD facility. Site areas disturbed by field operations shall be restored, including backfilling excavations with clean soil, grading and reseeding, by the contractor.

3.5 (TASK 5) FIELD MONITORING.

3.5.1 The contractor shall coordinate with CBDCOM in determining the amount and type of monitoring equipment. CBDCOM shall provide monitoring of agent. The contractor shall be responsible for monitoring all other contaminants. The contractor may coordinate information requests on hazards believed present on site with CBDCOM. Air monitoring results shall be used to determine the appropriateness of Personnel Protective Equipment and the need to upgrade or downgrade the established action levels.

3.5.2 Chemical Analysis of Samples. Samples of soil and any other materials suspected of agent contamination shall be analyzed by ERDEC at the ERDEC mobile on-site laboratory for the presence of agent. Samples field-identified as containing agent shall immediately be handled as described in the approved Work Plan. Soil samples identified as not contaminated by agent shall be analyzed for HTW by the contractor.

3.5.3 The Government assumes that there will be a continuous sampling effort, including within the excavations, as work progresses for containers, soils, glassware, munitions, and debris recovered and exposed by excavation. Additional sampling events shall be conducted by the contractor at the Government's discretion. Excavated suspected agent contaminated materials and soil, and the soil underlying the removed suspected CWM will be sampled by the contractor and tested for agent presence by ERDEC.

3.5.4 Samples collected shall be analyzed by ERDEC's mobile laboratory for agent, and agent related byproducts. Other environmental analytical parameters as the contractor shall propose to justify in the Work Plan shall be conducted by the contractor's environmental laboratory. One sample shall be collected, and split into a minimum of two samples, by the contractor at each proposed sample location or depth. One sample shall be analyzed by the on-site ERDEC laboratory for agent constituents/related products. The second sample shall be analyzed by the contractor's environmental laboratory for other Contaminants of Concern (COC) for health-based and land disposal requirements and ultimate disposal after the ERDEC mobile laboratory results indicate no ent. (This second sample shall be held in storage until the results from ERDEC are provided and declared agent free.) For approximately 10 percent of the sampling effort, a third sample all sent to a certified ERDEC or environmental laboratory for QA/QC purposes. The QA/QC samples shall be collected, monitored, packaged, and shipped by the contractor at the frequency as approved in the Work Plan.

3.5.5 EPA and state health-based standards for exposure the COC shall be used as a measure for defining the extent of ent or HTW contamination. Health-based exposure standards of the constituents of agent and related byproducts shall apply if compound specific standards are unavailable. If health-based standards are not available for the COC, land disposal contaminant level restrictions shall be applied to define the extent of the contamination.

3.5.6 The contractor shall electronically track a sample identification with the analytical results as soon as they become available. This electronic information shall identify sampling location, depth, sample number, time collected, person collecting sample and provide the analytical results. A report shall be presented weekly to the CO stating the contractors opinion of the data's completeness, accuracy, and possible contamination trends.

3.5.7 A separate letter report for containers containing agent, agent-contaminated media, and hazardous waste shall be submitted to the CO. The contractor shall identify, at a minimum, the container identification number and size, the location and total number of containers in each area and site wide, and the number of samples obtained to fully characterize the containers, the analytical methods used, and the analysis obtained. The letter shall also propose disposal options and cost for HTW. A preferred alternative for disposal for HTW shall be provided which includes, at a minimum, the proposed disposal location(s), associated treatment, time frame associated with storage, removal and treatment, regulatory impacts, and cost.

3.6 (TASK 6) INVESTIGATIVE WASTE (IW).

3.6.1 If directed by CEHNC, the contractor shall dispose of the bulk and/or containerized IW. The containers shall be located, secured, labeled, sampled (if necessary), and analyzed IAW the approved Work Plan. After receipt of the letter report recommending appropriate disposal actions, the CO shall direct the contractor in the disposal of 1W. The contractor shall perform the IW disposal in a timely manner.

3.6.2 All activities involving this work shall be conducted in full compliance with the State of Tennessee, the US Environmental Protection Agency (EPA), CEHNC, DDMT, USACE, DA, and DOD laws and regulations regarding personnel, equipment, and procedures.

3.6.3 The contractor shall obtain and submit competitive bids **in accordance with the FAR** to dispose of this type of hazardous waste. The contractor shall provide the basis of subcontract selection and provide a recommended subcontractor in the disposal of the hazardous waste. The contractor shall describe each subcontract activity and associated points of contact. **The selection of the TSD subcontract shall be in accordance with the FAR.**

3.6.4 The contractor shall obtain all necessary licenses and permits, and comply with all applicable federal, state, and local laws, codes, and regulations in connection with the execution of the work. Shipment or transportation shall be in accordance with Department of Transportation Hazardous Material Regulations 49 CFR 100–199.

3.6.5 The contractor shall furnish and prepare all required hazardous waste manifests, which shall include a correct description of all wastes to be shipped, in a complete and legible manner. The contractor shall provide all necessary information required for each manifest to satisfy all federal, state, and local regulations prior to shipment. Manifests shall be prepared in a manner as to comply with the format prescribed by the state and EPA regulations. The contractor shall coordinate all entries in the manifests with the TSDF, CEHNC, and DDMT. Completed copies of all manifests, showing DDMT as the generator, shall be forwarded to the CEHNC for review after coordination with the TSDF and at least ten (10) working days prior to waste shipment. Revisions requested by the Government shall be made by the contractor. No shipment will occur until the Government is satisfied that all entries are correct and the manifest has been signed by an authorized representative of DDMT. If requested by CEHNC, the contractor will set up and participate in one or more conference calls with CEHNC, DDMT, the TSDF, subcontractor, and any other party designated by CEHNC to resolve any and all questions pertaining to the manifests.

The contractor will provide the manifest signed by all necessary parties to CEHNC and DDMT within twenty (20) working days after the shipment of hazardous waste has left Government premises.

3.6.6 Waste Profile Sheets. The contractor shall prepare Waste Profile Sheet(s) and provide a copy to CEHNC and DDMT.

3.6.7 Weight Slips. A signed weight slip shall be furnished to CEHNC and DDMT indicating the actual weight of the waste that has been shipped to the approved disposal facility.

3.6.8 Notification of Waste Shipped. A Notification of Waste Shipped form required under the Land Ban Disposal restrictions shall be completed and furnished by the contractor to CEHNC and DDMT for review and approval. This sheet shall identify associated treatment standards required in 40 CFR 268. Any corrections required by CEHNC and DDMT shall be made by the contractor. A copy of the approved Notification of Waste Shipped shall be provided by the contractor to CEHNC and DDMT.

3.6.9 Hazardous Waste Disposal The contractor shall provide all personnel and equipment to dispose of hazardous waste in accordance with the approved Work Plan and this SOW. Disposal of the material shall be by a RCRA permitted TSD facility.

3.6.10 Certificate of Disposal. A Certificate of Disposal indicating acceptance of all items by the authorized TSDF shall be signed by an authorized representative of the TSDF and furnished to CEHNC and DDMT within 10 working days after final disposal action has been accomplished. Such certification at a minimum shall show:

- the material (by item and quantity) that was disposed,
- the specific method of treatment, and
- the date of treatment.

3.7 (TASK 7) PROCESS SCRAP METAL. All scrap metal recovered from excavations where agent has been identified shall be placed by the contractor in a container capable of being sealed and heated to 70 degrees F. After heating the container shall be monitored by CBDCOM for agent. If monitoring reveals agent, the contractor shall package it for shipment. The contractor shall provide a hazardous waste storage and/or disposal facility capable of accepting and treating waste. The contractor shall provide all necessary personnel and equipment to accomplish this task. Prior to beginning work, the contractor shall submit his proposed method of accomplishing this task for approval. If results of the air, soil, and residue sampling indicate no agent contamination, the contractor shall make provisions for disposal.

3.8 (TASK 8) CONVENTIONAL UXO DISPOSAL. The contractor shall provide all necessary personnel and equipment to dispose of all conventional UXO. Should the contractor discover UXO that is suspect CWM, or is unknown to them, they will "safe the hole" and immediately withdraw from the exclusion zone and revert to a support role for the Technical Escort Unit (TEU). TEU will perform the assessment of the item and, if it is CWM, they will package and transport the item to the IHF and turn the site back to the contractor to resume operations.

3.9 (TASK 9) Engineering Controls. Based upon the Maximum Credible Event (MCE), which is determined by the CEHNC, the down wind hazard calculations, and the No Significant Events (NOSE) distance, engineering controls will be required. The contractor, in conjunction with CBDCOM, shall make recommendations of engineering controls for consideration. The recommendations shall consider schedule, constructability, feasibility, agent compatibility, decontamination, and release control at a minimum. The engineering controls evaluation shall be documented in a letter report.

3.9.1 Structure and Filtering System. A structure shall be provided to control the release of agent to personnel outside the exclusion zone. The structure shall be pre-engineered, with capacity for agent filtration. The structure shall be erected to ensure intrusive operations do not result in a release outside the exclusion zone. The structure shall be capable of being decontaminated if a release occurs. The contractor, in conjunction with CBDCOM, shall identify the design requirements for the agent filtration system and it shall be selected based upon those design requirements. The contractor, assisted by CBDCOM, shall install and operate the agent filtering system. **The filtering system shall be Government Furnished Equipment (GFE).** The filtering system shall be periodically monitored to ensure that breakthrough has not occurred. The contractor shall be responsible for the decontamination of the structure and for the removal of the structure once intrusive operations are concluded.

3.9.2 The downwind hazard distances are computed using the D2PC computer model. This program will be provided to the contractor by TEU. Downwind hazard monitoring will be accomplished every two hours or if there are significant changes in meteorological conditions while intrusive activities are ongoing.

3.9.3 The MCE is two (1"-by-9") vials (40 ml) of phosgene, based on 951 and 952 type CAIS.

3.10 (TASK 10) MEETINGS AND PUBLIC INVOLVEMENT. The contractor shall provide a minimum of two professionals thoroughly familiar with the project to attend meetings as required. Assume three one-day meetings will be held at or close to DDMT, and one meeting will be held at CEHNC (Huntsville, Alabama). The contractor shall be prepared to show overheads or use other presentation techniques to convey to the Government, public and regulatory agencies their plans, findings, and recommendations.

3.11 (TASK 11) RECORD AND SUBMIT VIDEO TAPE.

3.11.1 The contractor shall furnish the necessary personnel and equipment to video tape a sample of each activity from all field tasks of this SOW. Taping shall be of typical activities and accurately depict all work accomplished.

3.11.2 The video tape shall be standard VHS 1/2–inch color tape with voice background describing the actions being filmed, containing a maximum of 120 minutes footage.

3.11.3 Two copies of the video tape shall be submitted as part of the Engineering Report.

3.12 (TASK 12) PROJECT MANAGEMENT. The contractor shall, during the life of the Task Order, manage the Task Order to accomplish the Scope of Work. All project management associated with this Task Order, with the exception of direct technical oversight of work described in the preceding tasks, shall be accounted for in this task. As part of this task, the contractor shall prepare and submit work task proposals that outline the manner in which the contractor intends to accomplish each task in this SOW. The work task proposals shall include the scope of work and level of effort required for the task, milestones, expected completion dates, and any other planning data the contractor will use to accomplish each task.

3.13 (TASK 13) ENGINEERING REPORT. The contractor shall prepare and submit an Engineering Report fully documenting the field work removal actions and subsequent evaluations and recommendations made by the contractor. The Engineering Report shall describe the site history, briefly describe previous work conducted at DDMT, the work conducted under this task order, and the results. The report shall also contain the conclusions as to the nature and extent of contamination at this site. The textual portions of the report shall be fully supported with accompanying maps, charts, and tables as necessary to fully describe and document all work performed.

4.0 SCHEDULE and SUBMITTALS. The contractor shall submit all deliverable data to the Contracting Officer and other reviewers identified in Section 4.2 in accordance with the following schedule. All submittals shall be delivered to all addressees no later than the close of business on the day indicated in this paragraph. In addition, submittals to regulatory reviewers shall be shipped by registered mail or other method where a signed receipt is obtained indicating the date received and the individual accepting the submittal.

4.1 Schedule:

DOCUMENT	DATE DUE Days after NTP
Work Task Proposal	TBD
Draft Work Plan	55 days after award
Comments on Draft Work Plan	TBD
Draft—Final Work Plan/Draft SS	21 days after draft comments recd
Comment on Draft-Final Work Plan/Draft SS	TBD
Final Site Safety Submission (SS)	TBD
Comment on SS	TBD
Letter Reports	TBD

Draft Technical Report/NFRAP	TBD
Comments on Draft Report	TBD
Final Technical Report/NFRAP	TBD
Monthly Report	NLT 10th of following month
Minutes of Meetings	NLT 2 days after each Meeting / Presentation
Color Photographs	TBD
Video Tape	TBD

The overall completion date of this Task Order is TBD.

* days are working days not calender days

4.2 Addresses. The following addresses shall be used in mailing submittals:

ADDRESSEE	Draft Submittals	Draft Final & Final Submittals
Commander US Army Engineering and Support Center, Huntsville ATTN: CEHNC-OE-DC, 4820 University Square Huntsville, Alabama 35816-1822	6	6
HQU SACE Attn.: CESO-E 20 Massachusetts Av, NW Washington, DC 20314-1000	4	4

USATCES Savanna Army Depot Attn: SIOAC-ESL Rt. 84 N Savanna, IL 61074	1	1
Program Manager for Chemical Demilitarization, Environmental Monitoring Attn: SFAE-CD-ME 0.0 APG—EA, MD 21010—5401	1	1
Program Manager for Chemical Demilitarization, Risk / Surety Management Attn: SFAE-CD-SQ APG—EA, MD 21010—5401	1	1
Program Manager for Chemical Demilitarization, Public Affairs Attn: SFAE-CD-P APG—EA, MD 21010—5401	1	1
Program Manager for Chemical Demilitarization, Project Manager, Non-Stockpile Chemical Material Attn: SFAE-CD-NM, Mr. Steven Bird APG—EA, MD 21010—5401	1	1
CBDCOM Risk Management 5232 Fleming Road ATTN: ANSCB-RA (Lt. Col. David Mukei) Aberdeen Proving Grounds, MD 21010—5423	1	1

COMMANDER CBDCOM 5232 Fleming Road ATTN: SMCTE-OP Aberdeen Proving Grounds, MD 210 10-5 4 23	1	1
ERDEC/ Chemical Support Division ATTN: SCBRD-ODC-M, Mr. Gary Lattin Aberdeen Proving Grounds, MD 21010-5423	1	1
COMMANDER USATEU ATTN: SMCTE-OP Aberdeen Proving Grounds, MD 21010-5423.	1	1
US Army Engineer District, Mobile ATTN: CESAM-PM-TA (Mr. Kurt Braun) P0 Box 228 Mobile , AL 36628-0001	1	3
U.S. Environmental Protection Agency ATTN: MR. Dann Spariosu 100 Alabama St. SW Atlanta, GA 30303	0	2
Defense Distribution Region East ATTN: ASCE-WP (Mr. Mike Dobbs) Bldg 1-1, 2nd Floor New Cumberland, PA 17070-5001	0	5

Defense Logistics Agency ATTN: Ms. Karen Moran 8725 John J. Kingman Road Suite 2533 Ft Belvoir, VA 22060-6219	2	2
Defense Logistics Agency Defense Distribution Depot Memphis ATTN: DDMT-DE (Mr. Glenn Kaden) 2163 Airways Blvd Memphis, TN 38114-5210	1	1
Defense Logistics Agency ATTN: DLA-WS Alexandria, VA 22303-6100	1	1

4.3 Format and Content of Technical Report. All drawings shall be of engineering quality with sufficient details. The report shall consist of 8 1/2″ X 11″ paper. The report covers shall consist of durable, hard cover with front and spine title, 3-ring binders that shall hold pages firmly while allowing easy removal, addition, or replacement of pages. A title shall identify the contents of the binder, the site, the contractor, the Huntsville Center, and the date. The contractor identification shall not dominate the title page.

4.4 Review Comments. The contractor shall review all comments received through the CEHNC Project Manager and evaluate their appropriateness based upon merit. The contractor shall incorporate all applicable comments and provide a written response to each comment no later than 21 days after the contractor receives the comment.

4.5 Identification of Responsible Personnel. Each submittal shall identify the specific members and title of the subcontractor and contractor's staff who had significant input into the report. All final submittals shall be sealed by the State of Tennessee registered Professional Engineer-In-Charge.

4.6 Presentations. The contractor shall make presentations of all work performed as directed by the Contracting Officer. The presentation shall consist of a summary of the work accomplished and will be followed by an open discussion.

4.7 Minutes of Meetings. Following the presentation and the public meeting, the contractor shall prepare and submit minutes of the meeting within 10 working days to the Contracting Officer.

4.8 Correspondence. The contractor shall keep a record of all phone conversations and written correspondence affecting decisions relating to the performance of this task order. A summary of the phone conversations and copies of written correspondence shall be submitted to the Contracting Officer with the monthly progress report.

4.9 Monthly Progress Report. The contractor shall prepare and submit monthly progress reports describing the work performed since the previous report, work currently underway, and work anticipated. The report shall state whether current work is on schedule. If the work is not on schedule, the contractor shall state what actions are taken in order to get back on schedule. The report shall be submitted to the Contracting Officer not later than the 10th day of each calendar month.

4.10 Computer Files. All final text files generated by the contractor under this task order shall be furnished to the contracting Officer in Microsoft Word (latest version), IBM personal computer (PC) compatible format. All drawings shall be on reproducible (mylar) and digitized 3D design file in Intergraph Corporation format, compatible with the CEHND Graphics System.

5.0 SAFETY REOUIREMENTS

5.0.1. The contractor shall prepare and submit a Site Safety and Health Plan (SSHP) to the CO for review and approval prior to commencement of any field work.

5.0.2 The SSHP shall be prepared in accordance with the requirements specified in this section and shall comply with all federal, state, and local health and safety requirements, e.g., the Occupational Safety and Health Administration (OSHA) requirements (29 CFR 1910 and 1926), the U. S. Environmental Protection Agency (USEPA) hazardous waste requirements (40 CFR 260 -270), the U. S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1), the U.S. Army Corps of Engineers Safety and Occupational Health Document Requirements for HTW and OE Activities (ER 385-1-92), and applicable Army regulations. The contractor shall submit versions of this document in accordance with the schedule provided in this SOW. The contractor shall revise and re-submit this document as necessary to address all comments and deficiencies.

5.0.3 The SSHP shall address the elements as described in this section. The level of detail provided shall be tailored to the type of work, complexity of operations to be accomplished, and the hazards anticipated. When a specific element is not applicable, state that adequate consideration was given the topic and provide a brief justification for its omission. Memorandums of Understanding (MOU) and Memorandums of Agreement (MOA) must be in place prior to contractor starting work.

5.1 General. The SSHP shall be reviewed, approved, and implemented by a board-certified or board-eligible Industrial

Hygienist with at least two (2) years hazardous waste site operations experience. Board certification or eligibility shall be documented by written confirmation from the American Board of Industrial Hygiene (ABIH) and submitted to the Contracting Officer for review. A fully trained and experienced site safety and health officer (SSHO) responsible to the contractor shall be delegated to implement the on-site elements of the SSHP. The SSHP shall be in a form usable by authorized U.S. Government representatives and other authorized visitors to the site during site operations.

5.2 <u>Staff Organization. Qualifications and Responsibilities</u>. The operational, health and safety responsibilities of each key person shall be provided. The organizational structure with lines of authority and overall responsibilities for safety and health of the contractor and all subcontractors, including government agencies and their contractors, shall be discussed. An organizational chart showing the lines of authority for safety shall be provided. Each person assigned specific safety and health responsibilities shall be identified and his/her qualifications and experience documented by a resume in the SSHP.

5.3 <u>Site Description and Contamination Characterization</u>. Provide a description of the site based on results of previous studies, site history, and prior site uses and activities. Describe the location topography and approximate size of the site, the on-site job tasks to be performed, and the duration of planned activities. Compile a summary of hazardous substances and safety and health hazards likely to be encountered on site. Include ordnance and chemical/biological names, concentration ranges, media in which found, locations on-site, and estimated quantities/volumes to be impacted by site work. The site descriptions shall be based on results of previous studies and the history of prior site uses and activities conducted under Task 1 of this Scope of Work.

5.4 Hazard Assessment and Risk Analysis. In the SSHP, the 1910.120 (e). In addition, site–specific, supervisory, refresher, visitor training, training IAW the aforementioned regulation, and training IAW DA PAN 385-61 shall be addressed. The content, duration, and frequency of all training shall be described. The contractor shall provide written certification to the Contracting Officer that the required training has been received by the contractor's affected personnel prior to engaging in on-site activities.

5.5 Accident Prevention. The SSHP may serve as the Accident Prevention plan provided it addresses all content requirements of both 29 CFR 1910.120 and EM 385-1-1 (Appendix A). All Accident Prevention Plan elements required by EM 385-1-1, but not specifically covered by these elements shall be addressed in this section of the SSHP. Daily safety and health inspections shall be conducted to determine if site operations are conducted in accordance with the approved plans and contract requirements.

5.6 Training. All general site workers shall receive 40 hours of initial off-site health and safety training (24 hours for non-exposed on-site personnel) which is relevant to hazardous waste site activities, plus three days of supervised field experience (one day for non-exposed personnel), in compliance with 29 CFR

1910.120 (e). In addition, site-specific, supervisory, refresher, visitor training, training IAW the aforementioned regulation, and training IAW DA PAM 385-61 shall be addressed. The content, duration, and frequency of all training shall be described. The contractor shall provide written certification to the Contracting Officer that the required training has been received by the contractor's affected personnel prior to engaging in on-site activities.

5.7 Personal Protective Equipment. A written Personal Protective Equipment Program shall be provided in the SSHP. The program shall address all the elements of 29 CFR 1910.120 (g) (5), 29 CFR 1910.132, and 29 CFR 1910.134. Minimum levels of protection necessary for each task/operation performed at each site will be based on probable site conditions, potential occupational exposure (including heat/cold stress), and the hazard assessment/risk analysis required above. Include specific types and materials, for protective clothing and respiratory protection. Establish and justify upgrade/downgrade criteria based upon the action levels as required.

5.7.1 As a minimum and as appropriate the following emergency and first aid equipment shall be immediately available for on-site use: (1) First aid equipment and supplies approved by the consulting physician; (2) Emergency eye washes/showers which comply with ANSI Z-358.1; **(3) Emergency use** respirators (worst case appropriate); (4) Spill control materials and equipment and (5) Fire extinguishes (specify type, size and locations)

5.7.2 The contractor shall prepare and submit for approval a PPE matrix to the CO through the Department of Army Safety Office. In this matrix the contractor shall discuss Level A protective equipment to use on site and use scenarios. The format for this matrix may be obtained from the CEHNC Safety Office. The PPE matrix is submitted separately from the Safety Submission. Several Level A suits have already been approved by the Army for use in CWM sites. The contractor may contact CEHNC Safety Office to obtain a list of the approved suites.

5.7.3 TEU will wear the DA equivalent to the levels prescribed for the activity engaged in. TEU will provide this information to the contractor.

5.8 Medical Surveillance. All personnel performing on-site activities shall participate in an ongoing medical surveillance program meeting the requirements of 29 CFR 1910.120, ANSI Z-88.2 and DA Pains 40-173, as applicable. The medical examination protocols and results shall be overseen by a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine, or who by necessary training and experience, is board eligible. Minimum specific exam content and frequency based on probable site conditions, potential occupational exposures, and required protective equipment shall be specified. A written medical opinion from the examining physician as to fitness to perform the required work shall be made available to the CO upon request for any site employee.

5.9 Environmental and Personal Monitoring. Where it has been determined that there may be employee exposure to on- and/or off-site migration airborne concentrations of hazardous substances, appropriate direct reading (real-time) air monitoring and integrated (time weighted average) air sampling shall be conducted in accordance with applicable federal, state, and local requirements. Both air monitoring and air sampling must accurately represent concentration of air contaminants encountered on and leaving the site. The types and frequency of monitoring/sampling to be performed shall be specified for on-site and perimeter, where applicable. Where perimeter monitoring is not deemed necessary, provide suitable justification for its exclusion. When applicable, NIOSH and/or EPA sampling and analytical methods shall be used. Personal samples, where necessary, shall be analyzed by laboratories successfully participating in and meeting the requirements of the American Industrial Hygiene Association's Proficiency Analytical Testing or laboratory Accreditation Program. Include, as appropriate, real-time (direct-read) monitoring and integrated Time Weighted Average sampling for specific contaminants of concern. Meteorological, noise, and radiation monitoring shall be conducted as needed depending upon the site hazard assessment. All monitoring and sampling protocols shall be specified to include instrumentation to be used and calibration of instruments. All monitoring results shall be compared to action levels to determine the need for corrective actions. Agent monitoring shall use ERDEC protocols. Action levels will be in accordance with AR 385—1 and DA PAM 385-1. The contractor shall coordinate with ERDEC and TEU through CEHNC.

5.10 Heat/Cold Stress Monitoring. Heat and cold stress monitoring protocols, as appropriate, shall be described in detail. Work/rest schedules shall be determined based upon ambient temperature, humidity, wind speed (wind chill), solar radiation intensity, duration and intensity of work and protective equipment ensembles. Minimum required physiological monitoring protocols which will affect work schedules shall be developed. In cases where impervious clothing is worn the NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" protocol for prevention of heat stress shall be followed and heat stress monitoring shall commence at temperatures of 70 degrees F and above. Where impervious clothing is not worn, the ACGIH heat stress standard shall be used. For cold stress monitoring to help prevent frostbite and hypothermia, the ACGIH cold stress standard shall be referenced and followed as a minimum.

5.11 Site Control. The contractor, coordinating with TEU, shall describe site control measures which include site maps, the work zone delineation and access points, the on/off site communication system, general site access controls, and security procedures (physical and procedural)

5.12 Personnel and Equipment Decontamination. The contractor, coordinating with TEU, shall develop and specify decontamination procedures in accordance with 29 CFR 1910.120, AR 385-61 and DA PAM 385-61 for personnel, personal protective equipment, monitoring instruments, sampling equipment, and heavy equipment. Decontamination procedures shall address specific measures to ensure that contamination is confined to the work site. Necessary facilities and their locations, detailed standard operating procedures, frequencies, supplies and materials to accomplish decontamination of site personnel and to determine adequacy of equipment decontamination shall be discussed.

5.13 Emergency Response and Contingency Procedures (On-site and Off-site). An Emergency Response Plan as required by 29 CFR 1910.120 and DA PAN 50-6 shall be developed and implemented by the contractor in coordination with TEU. As a minimum it shall address the following elements: (1) pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposure, personal injuries, fire/explosions, environmental spills and releases; (2) personnel roles, lines of authority, communications; (3) posted instructions and list of emergency contact: physician; nearby notified medical facility, fire and police departments, ambulance service, state/local/federal environmental agencies, CIR, and Contracting Officer; (4) emergency recognition and prevention; (5) site topography, layout and prevailing weather conditions; (6) criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distance, place of refuge, evacuation routes, site security and control; (7) specific procedures for decontamination and medical treatment of injured personnel; (8) route maps to nearest pre-notified medical facility; (9) criteria for initiating community alert program, contacts and responsibilities; and (10) critique of emergency responses and follow-up. Material Safety Data Sheets for each hazardous substances anticipated to be encountered on site shall be made accessible to site personnel at all times and shall be submitted in an appendix to the SSHP.

5.13.1 On–Site Emergency and First Aid Equipment. As a minimum and as appropriate the following emergency and first aid equipment shall be immediately available for on-site use: (1) First aid equipment and supplies approved by the consulting physician; (2) emergency eyewashes/showers which comply with ANSI Z–358.1; (3) emergency use respirators (worst case appropriate); (4) spill control materials and equipment and (5) fire extinguishes (specify type, size and locations) Specify in the plan the location(s) of these materials.

5.14 Standing Operating Procedures, Engineering Controls, and Work Practices. The contractor, coordinating with TEU, shall develop standing operating procedures to protect field personnel, prevent accidents, minimize hazards and to take action to correct hazards where necessary. Site rules and prohibitions for safe work practices shall be discussed and shall include such topics as use of the buddy system, smoking restrictions, material handling procedures, confined space entry, excavation safety, physiological and meteorological monitoring for heat/cold stress, illumination, sanitation, and daily safety inspections, etc. This list of topics is not intended to be all inclusive.

5.15 Logs, Reports, and Record Keeping. Record keeping procedures for training logs, daily safety inspection logs, employee/visitor registers, medical surveillance records and certifications, air monitoring results, and personal exposure records shall be specified. All personnel exposure and medical monitoring records shall be maintained in accordance with applicable OSHA standards, CFR 1904, 1910 and 1926. The contractor shall develop, retain, and submit training logs, daily safety inspection logs as part of the daily QC Reports, employee/ visitor registration and medical opinions/certifications as part of the final contract file. All recordable accidents/ injuries/illnesses shall be reported to the CO in accordance with EM 385-1-1 and AR 385-40 with USACE Supplement. A completed ENG 3394, Accident Investigation Report, shall be submitted within two working days in accordance with AR 385-40 and USACE Supplement 1 to that regulation.

5.16 Air Monitoring Plan. The contractor shall prepare and submit an Air Monitoring Plan as part of the SSHP. The contractor, coordinating with TEU, shall provide a description of equipment and procedures to be used for monitoring of air quality during all phases of work. At a minimum, air quality monitoring of the ambient air shall be carried out on a real-time basis using an organic vapor detection equipment capable of monitoring ambient air to local and state guideline standards. The plan shall identify specific air sampling equipment, locations, and frequencies. The contractor shall coordinate the Air Monitoring Plan with the CEHNC Safety Office, which will in turn coordinate with CBDCOM.

5.17 Conventional Q~ If UXO encountered is determined to be conventional UXO (i.e. have a high explosive, white phosphorous, or smoke charge), the contractor shall provide the necessary actions to dispose of it. The contractor shall mark the location and notify the COE on-site Safety Specialist. If not available, the contracting officer shall be notified. The contractor shall have on-site capability to evaluate any conventional UXO encountered.

6.0 CHEMICAL DATA AND LABORATORY REOUTREMENTS

6.1 Quality Assurance Project Plan (QAPP). The contractor shall use the generic QAPP for DDMT to the extent possible for all HTW sampling. A site specific Chemical Data Laboratory and Field Work Sampling Plan shall be prepared by the contractor. The plan shall describe field and laboratory procedures. The plan shall clearly describe how the contractor shall ensure that sample integrity and chain-of-custody of all samples are not compromised prior to delivery to an off-site laboratory. The plan should describe the procedures which will be used to document and report precision, accuracy, and completeness of data results. The plan shall be a brief and concise description of the field and laboratory work required. Previously prepared Work Plans for similar type of work shall be used as much as possible in the preparing the plan. The data quality and quality control applies to both the field and laboratory efforts. Results of the field and laboratory controls shall be evaluated and placed in the analytical data submittal, and the draft and final Technical Reports. The contractor shall provide the laboratory QA/QC plan as an appendix to the QAPP. The plan shall address each requirement as identified in ER 1110-1-263 (Reference 8.17).

6.2 Laboratory Qualifications. The analytical laboratory used by the HTW contractor for COC analysis must be validated or certified by the Corps of Engineers' Missouri River Division (CEMRD) and ERDEC, and must have the capability to perform the analytical methods required by this SOW. The laboratory shall be an EPA contract lab or be familiar with the Contract Laboratory Program (CLP) requirements and can perform CLP work.

6.3 Coordination with Government Quality Assurance Laboratory. The contractor must provide coordination and quality assurance samples to the Government Quality Assurance (GQA) lab. Each field control sample collected shall be divided equally, one portion sent to the GQA lab and the remainder sent to the contractor's lab. GQA samples include all sample matrices and analysis parameters. The contractor shall provide the GQA laboratory a two week notice of sample shipment. The Government will identify the GQA laboratory.

6.4 Data Reporting Requirements. The contractor shall provide the following data reporting elements: sample ID, sample receipt, organic and inorganic reporting, internal quality control reporting (lab blanks, surrogate spike samples, lab duplicates or matrix spikes) and field duplicates and blanks. Data shell be provided IAW USACE requirements and USEPA requirements. This data shall be included in the raw data submittal as well as in electronic form in the Technical Reports. The contractor laboratory must hold and make available all project raw data for a period of five years after completion of this contract. The contractor must validate all the data. Complete data validation shall be performed on 10% of the sample analysis packages.

6.4.1 Minimum Raw Data Reporting Requirements:

6.4.1.1 · Sample Identification (ID). The contractor shall prepare a tabular presentation which matches contract laboratory sample ID to QA laboratory sample ID. This table shall identify all Field Duplicates and Field Blanks (including rinsates and trip blanks) as such. This table shall also match all rinsates with their corresponding field samples as well as matching each trip blank with the samples that accompanied it during shipment.

6.4.1.2 Sample Receipt. The contractor shall complete and report a "Cooler Receipt Form" for all shipments for purposes of noting problems in sample packaging, chain-of-custody, and sample preservation. An example form is available from CEMRD-EDGL.

6.4.1.3 General Organic and Inorganic Reporting. For each analytical method run, the contractor shall report all analytes for each sample as a detected concentration or as less than the specific limits of quantitation. Generally, all samples with out-of-control spike recoveries being attributed on matrix interferences shall be designated as such. All soil/sediment and solid waste samples shall be reported on a dry-weight basis with percent moisture also reported. The contractor shall also report dilution factors for each sample as well as the date of extraction (if applicable) and date of analysis.

6.4.1.4 Internal Quality Control Reporting (at a minimum, internal quality control samples shall be analyzed at rates specified in the specific methods or as specified in the SOW if higher rates are required to meet project specific Data Quality Objectives)

6.4.1.4.1 Laboratory Blanks (Method Blanks and Instrument Blanks). All analytes shall be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

6.4.1.4.2 Surrogate Spike Samples. Surrogate Spike Recoveries shall be reported with all organic method reports where appropriate (i.e. when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results as well as the spiking concentration. Any out-of-control recoveries (as defined in the specified method) shall result in the sample being rerun (both sets of data are to be reported) or data being flagged.

6.4.1.4.3 Matrix Spike Samples. Matrix Spike Recoveries shall be reported for all organic and inorganic analyses. All general sample results shall be designated as corresponding to a particular matrix spike sample. The report shall indicate which field sample was spiked even if it was not a Corps of Engineers project sample. The report shall also specify the control limits for matrix spike results for each method for each matrix.

6.4.1.4.4 Laboratory Duplicates and/or Matrix Spike Duplicate Pairs. Relative Percent Difference shall be reported for all duplicate pairs as well as analyte/matrix specific control limits.

6.4.1.4.5 When run for internal quality control, Laboratory Control Standard's (LCS) results shall be reported with the corresponding field sample data. Control limits for LCSs shall also be specified.

6.4.1.5 Field Duplicates and Field Blanks. These samples shall be identified as such by the contractor and reported as any other field sample. Relative Percent Differences shall be reported for all field duplicate pairs.

6.5 Data Quality. The contractor shall provide a data quality level that is compatible with a RI/FS, study. The data quality must be sufficient to be utilized in the site wide RI/FS, Risk Assessment, and Remedial Action Plans that will be prepared by the US Army Corps Of Engineers.

7.0 Public Affairs. The contractor shall not publicly disclose any data generated or reviewed under this contract. The contractor shall refer all requests for information concerning the site condition to the CEHNC Project Manager. Reports and data generated under this task order are the property of the Department of Defense and distribution to any other sources by the contractor, unless authorized by the Contracting Officer, is prohibited.

8.0 References

8.1 "U.S. Army Corps of Engineers Safety and Health Requirements Manual", U.S. Army Engineer Manual EM 385-1-1, 3 September 1996.

8.2 "Engineering Transmittal Letter 385—1—1, Safety Concepts and basic Considerations for Unexploded Ordnance (UXO) Operations", 16 Feb. 1996, Huntsville Division, U.S. Army Corps of Engineers.

8.3 "Environmental Chemistry and Fate of Chemical Warfare Agents". Southwest Research Institute. Prepared for Corps of Engineers, Huntsville Division, March 3, 1994.

8.4 "Field Manual on Environmental Chemistry and Fate of Chemical Warfare Agents". Southwest Research Institute. Prepared for Corps of Engineers, Huntsville Division, July 7, 1994.

8.5 Army Regulation 385-40, Accident Reporting and Records with USACE Supplement, 1 November 1994 w/changes.

8.6 Ammunition and Explosive Standards, TM 9-1300-206 30 August 1973 w/changes.

8.7 "Safety and Occupational Health Document Requirements for Hazardous Waste Site Remedial Actions", Engineer Regulations 385-1-92, 18 March 1994.

8.8 "Chemical Data Quality Management for Hazardous Waste Remedial Activities", Engineer Regulation 1110-1-263, 1 Oct 90.

8.9 Occupational Safety and Health Administration Standards (29 CFR 1910 and 1926)

8.10 "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", NIOSH/OSHA/USCG/EpA, October 1985.

8.11 "Emergency Eyewash and Shower Equipment", ANSI Z-358.1, 1990.

8.12 "Practices for Respiratory Protection", ANSI Z-288.2, 1980.

8.13 RCRA Ground water Monitoring Technical Enforcement Guidance Document.

8.14 "Test Methods for Evaluating Solid Wastes," USEPA Pub. No. SW- 846, Latest Ed.

8.15 "Annual Book of ASTM Standards", Current edition.

8.16 "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" EPA/540/G-89/004, October 1988.

8.17 Engineering Regulation (ER) 1110-1-263 "Chemical Data Quality Management for Hazardous, Toxic Radioactive Waste Remediation Activities " U.S. Army Engineering Regulation, April 1996.

8.18 "CERCLA Compliance With Other Laws Manual. Parts I and II", U.S. Environmental Protection Agency (EPA). 1988b.

8.19 "Methods for Evaluation the Attainment of Cleanup Standards. Volume I - Soils and Solid Media", U.S. Environmental Protection Agency (EPA). 1989e.

8.20 "Methods for the Determination of Organic Compounds in Drinking Water", U.S. Environmental Protection Agency (EPA), December 1988

8.21 "Cost Engineering Policy", U.S. Army Engineering Regulation No. 1110-3-1301, April 1994.

8.22 Code of Federal Regulations. 40 CFR, Parts 190-299. Latest edition.

8.23 "Hazardous Waste Operations and Emergency Response." Code of Federal Regulations. [n.d.] CFR 1910.120, Final Rule.

8.24 "Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects." U.S. Army Corps of Engineers Memorandum, CEMRD-ED-GL. August 1989.

8.25 "Compendium of Superfund Field Operations Methods", U.S. Environmental Protection Agency (EPA). 1987

8.26 "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", U.S. Environmental Protection Agency (EPA). EPA 540/g89/004. October 1988.

8.27 "Army Toxic Chemical Agent Safety Program", AR 385-61, 28 February 1997.

8.28 "Toxic Chemical Agent Safety Standards", DA PAM 385-61, 31 March 1997.

8.29 "Chemical Accident or Incident Response and Assistance (CAIRA) Operations", DA PAM 50-6, 17 May 1991 w/changes.

8.30 "Occupational Health Guidelines for Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT", DA PAM 40-173, 30 August 1991 w/changes.

8.31 "Chemical Surety", AR 50-6, 1 February 1995

8.32 Archive Search Report for Defense Depot Memphis Tennessee, U.S. Army Corps fo Engineers, St. Louis District, January, 1995.

8.33 General Information on EOD Disposal Procedures and CEHNC Safety Concepts and Basic Considerations for UXO, TM 60A-1-1-31.

** Additional References may be incorporated and will be finalized at the completion of negotiations.

9.0 Acronyms

AIHA	American Industrial Hygiene Association's
AR	Army Regulation
BRAC	Base Realignment and Closure
CAIRA	Chemical Accident or Incident Response and Assistance
CATS	Chemical Agent Identification Sets
CBDCOM	Chemical and Biological Defense Command
CEHNC	Corps of Engineers, Huntsville Center
1.0	CEMRD Corps of Engineers' Missouri River Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CK	Cyanogen chloride
CN	Chloroacetophenone or Chloromethyl phenyl ketone
CO	Contracting Officer
COC	Contaminants of Concern
CWM	Chemical Warfare Materiel
DA	Department of the Army
DDMT	Defense Depot Memphis Tennessee
DM	Adamsite or Diphenylaminochloroarsine
DoD	Department of Defense
DOT	Department of Transportation
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ERDEC	CJyewooa k~.esearcn, ueveluH±LLent, and Engineering Ccnter
GFE	Government Furnished Equipment
GQA	Government Quality Assurance
HD	is also called HS –sulfur mustard–Bis–(2–chloroethyl) sulfid
IAW	In accordance with
ID	Identification

IW	Investigative Waste
LCS	Laboratory Control Standard's
MCE	Maximum Credible Event
MSDS	Material Safety Data Sheets
NFRAP	No Further Remedial Action Planned
NIOSH	National Institute for Occupational Safety and Health
NOSE	No Significant Events
NTP	Notice to Proceed
OE	Ordnance and Explosive
OSHA	Occupational Safety and Health Administration
PAM	Pamphlet
PAT	Proficiency Analytical Testing
PELs	protective exposure levels
PC	Personal Computer
PMNS	Program Manager Non-Stockpile
PPE	Personnel Protective Equipment
PS	Chloropicrin or Trichloronitromethane
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SOW	Statement Of Work
SSHO	site safety and health officer
SS	Safety Submission
SWMU	Solid Waste Management Units
TEU	Technical Escort Unit
TSDF	Treatment, Storage, or Disposal Facility
TWA	Time Weighted Average
USACE	US Army Corps of Engineers

2.0	UXO	Unexploded Ordnance
3.0	WDCMP	Work, Data, and Cost Management Plan

TAB

Appendix B

Appendix B: Resumes

KEY PERSONNEL EXPERIENCE FORM (RESUME)

William "Randy" Reed **Job Title:** Life Cycle Project Manager

Years Experience with Firm: *2* Years

Years of Program and Project Management Experience: *5* years

Years of Military Chemical Operations Experience: *4.5* years

Education (Degrees, year, specialization)

- Bachelor of Science, Natural Resources Management, University of Maryland @ College Park, 1992
- U.S. Army Chemical School, Distinguished Honor Graduate, 1994
- Primary Leadership Development Course, Distinguished Honor Graduate, *1995*
- U.S. Army Technical Escort Training, Honor Graduate, *1995*
- Live Chemical Agent Training, Ft. McClellan, 1996
- Environmental Compliance Officer Certification, 1996
- Biological Integrated Detection Systems Training, 1997
- DOD Instructor/Trainer Certification, 1997

Experience and Qualifications: Mr. Reed has over 5 years of documented success in technical project management and field operations. A proven performer with drive and tenacity.

- Selected and recognized as the U.S. Army Chemical School, Distinguished Instructor of the Year, 1997.
- Extensive experience managing environmental compliance programs supporting military operations.
- Success in support of International chemical operations and demilitarization projects.
- A dedicated, performance-oriented team leader who accepts all assignments and seeks to achieve the objective in the most efficient manner.

Civilian experience:

01/98-Present **Life Cycle Project Manager, Chemical Warfare Materiel Program,** UXB International, Inc. As Life Cycle Project Manager for UXB International, Inc., Mr. Reed is responsible for successful management of a variety of Chemical Warfare Material related projects. These projects require the concurrent management of planning, logistical and administrative requirements. Mr. Reed has a strong track record of success in both technical and administrative project management gained while working in the Army's Chemical Operations field. Mr. Reed's projects include:

- **Chemical Warfare Materiel Remediation:** U.S. Army Chemical Activity Pacific, Johnston Island, HI: Managed a multi-million dollar project resulting in the successful transfer and disposal of over 50,000 gallons of hazardous brine solutions. Communicated directly with subcontractors to ensure cost schedules were maintained. Instituted cost-saving measures that led to the successful completion of the operation one-month ahead of schedule.

- **Biological Defense, Programs of Instruction:** U.S. Army Chemical School, Ft. McClellan, AL: Redeveloped Chemical Corp lesson plans on Biological defense, bringing program in line with current doctrine. Courses of instruction taught to American, Middle-Eastern and European military personnel and incorporated into International peacekeeping operations.
- **Environmental Compliance Operations Consulting:** Ft. McClellan, AL: Requested to provide environmental compliance inspections for the country's only "live chemical agent" training facility. Inspections and suggested corrections led to a successful U.S. Army, Chemical Surety Inspection.
- **HAZMAT/HAZWASTE Operations:** Johnston Atoll, HI: Projects involved assessment and institution of several HAZMAT minimization programs which led to substantial savings to the government. Programs contributed to Federal environmental compliance, resulting in a "No-Deficiencies" inspection by the EPA.
- **Chemical Weapons Demilitarization Operations:** Johnston Atoll, HI: Provided operational support and oversight in the destruction and storage of chemical weapons and associated materials. Effort resulted in the safe transport, destruction and demilitarization of all stockpiled 155mm toxic chemical munitions.

1992- 1993 **Biological Technician,** U.S. Forest Service, Missoula, MT: Researched scientific literature and reports documenting effects of wildfires on the environment. Compiled information into concisely written reports. Authored 9 individual reports within 1 year of obtaining Bachelor of Science degree.

Military experience:

1997- 1998 **Instructor/Writer,** USACMLS, Ft. McClellan, AL: Provided instruction to chemical specialists in basic and advanced chemical and biological defense courses. Developed, authored and revised lesson plans. Conducted presentations to national and international dignitaries. Selected "Distinguished Instructor of the Year, 1997".

1996 – 1997 **Hazardous Materials Manager,** U.S. Army Chemical Activity Pacific, Johnston Atoll, HI: Directly responsible for environmental compliance of EPA-permitted storage facilities. Managed unit MSDS program. Ensured compliance with OSHA, RCRA, and Army regulations. Successfully managed over 1 million pounds of toxic chemical and hazardous wastes. Served as emergency response program manager. Trained all new Army personnel in 4-hour hazard communication/safety course.

1994 – 1996 **Chemical Operations Specialist,** Ft. Riley, KS: Direct supervisor for 11-perso team. Served as emergency response program manager and environmenta compliance officer. Responsible for management and maintenance of ove $1,000,000 worth of chemical, biological, and radiological detection equipment Implemented a training program that led unit to a 90% readiness rating in chemica and biological preparedness. Unit was selected to deploy overseas to participate i International peacekeeping operations. Specially selected for "high-visibility assignment overseas.

TAB

Site Safety and Health Plan

Site Safety and Health Plan

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LIST OF ACRONYMS

AA	Authorized Attendant
ACGIH	American Conference of Governmental Industrial Hygienists
AE	Authorized Entrants
APGEA	Aberdeen Proving Ground - Edgewood Area
APR	Air Purifying Respirator
APR	Air Purifying Respirator
BATF	Bureau of Alcohol, Tobacco, and Firearms
BIP	Blown-in-place
CAIS	Chemical Agent Identification Sets
CC1	Chlorinating Compound Number 1
CEHNC	US Army Engineering and Support Center
CESAM	US Army Corps of Engineers, Mobile District
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CIH	Certified Industrial Hygienist
CO	Contracting Officer
COPC	Chemicals of Potential Concern
COR	Contracting Officer's Representatives
CRZ	Contamination Reduction Zone
CSC	Confined Space Coordinator
CTD	Cumulative Trauma Disorder
CWM	Chemical Warfare Materiel
DAAMS	Depot Area Air Monitoring System
DANC	Decontaminating Agent, Non-corrosive
DDMT	Defense Depot Memphis Tennessee
ECBC	Edgewood Chemical and Biological Center
EDS	Equipment Decontamination Station
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
EPDA	Emergency Personnel Decontamination Station
ES	Entry Supervisor
EZ	Exclusion Zone
HSP	Health and Safety Program
HTRW	Hazardous, Toxic, and Radiological Waste
IDLH	Immediately Dangerous to Life or Health
IHF	Interim Holding Facility
LCPM	Life Cycle Project manager
LEL	Lower Explosive Limit
MINIRAM	Miniature Real-Time Aerosol Monitor
NEW	Net Explosive Weight
NFPA	National Fire Protection Association
NIOSH	National Institute of Safety and Health
OE	Ordnance and Explosive
OSHA	Occupational Safety and Health Administration
PAP	Protective Action Plan
PAPR	Powered Air Purifying Respirators
PDS	Personnel Decontamination Station

PDS	Personnel Decontamination Station
PEL	Permissible Exposure Limits
PID	Photoionization Detector
PMNSCM	Project Manager for Non-Stockpile Chemical Materiel
PPE	Personal Protective Equipment
PPM	Parts Per Million
RAC	Risk Assessment codes
RCWM	Recovered Chemical Warfare Materiel
RI/FS	Remedial Investigation/Feasibility Study
RTAP	Real Time Analytical Platform
SAR	Supplied Air Respirator
SCBA	Self-Contained Breathing Apparatus
SLM	Sound Level Monitor
SOP	Standard Operating Procedure
SOW	Scope (Statement) of Work
SSHO	Site Safety and Health Officer
SSHP	Site Safety & Health Plan
SZ	Support Zone
TDEM	Time Domain Electro Magnetic
TEU	Technical Escort Unit
TLV	Threshold Limit Value
USACE	US Army Corps of Engineers
USCG	US Coast Guard
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WBGT	Wet-Bulb Globe Temperature
WW2	World War II
WWI	World War I

1.0 Introduction

1 0 1 Approvals

Prepared by: Frank Johnson	Date
UXB Project Engineer (703) 724-9618	
Approved by: Lori Arent Certified Industrial Hygienist (703) 724-9600 or (919) 789-9152	Date

1.1.0 Site-Specific Safety and Health Plan

1.1.0.1 This SSHP establishes the responsibilities, requirements, and procedures for the protection of personnel during removal activities at the former Defense Distribution Depot Memphis, Tennessee (DDMT), herein referred to as " The Depot." The area of concern involves an adjacent section north of the main installation known as Dunn Field. The purpose of this plan is to provide the field teams with a safe working environment during field activities Specifically, the SSHP is developed to prevent and minimize personal injuries and illnesses and physical damage to equipment, supplies, and property.

1.1.0.2 The Occupational Safety and Health Administration (OSHA), requires employers involved in hazardous waste activities to comply with Title 29 (OSHA) of the Code of Federal Regulations, Part 1910, Section 120 (29 CFR 1910.120), Hazardous Waste Operations and Emergency Response. Employers involved in construction activities are also required to comply with 29 CFR 1926, Safety and Health Regulations for Construction. This document complies with OSHA standards; the U.S. Army Corps of Engineers (USACE *Safety and Health Requirements Manual* (EM 385-1-1) and *Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste* (HTRW) *Activities* (ER-385-1-92); the NIOSH/OSHA/USCG/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site* and local health requirements. Working conditions may necessitate modification of this plan. Except in emergency situations, no deviations from this plan may be implemented without the prior notification and approval of the UXB International (UXB) Certified Industrial Hygienist (CIH) and the U.S. Army Corps of Engineers, Engineering and Support Center Huntsville (CEHNC)

1.1.0.3 This project is a coordinated work effort between the U.S. Army Corps of Engineers, Mobil District (CESAM), CEHNC, and key supporting agencies U.S. Army Technical Escort Unit (TEU), the Project Manager for Non-Stockpile Chemical Materiel (PMNSCM), the Edgewood Chemical Biological Center (ECBC) and UXB International, Inc. All on-site personnel are required to employ safe work practices at all times and comply with this SSHP. In addition, all employers are required to maintain a written safety program that, at a minimum, complies with the provisions of 29 CFR 1910.120.(b)1-(b)4(ii) and ER 385-1-92.

1.1.0.4 This SSHP is tailored to the working environment anticipated at the Depot with full consideration given to the level of effort required to accomplish the tasks as outlined in the Scope of Work (SOW) and the anticipated hazards associated with on-site operations. The SSHP describes the procedures and control measures to protect personnel from these hazards. Adherence to these procedures will significantly reduce, but not eliminate, the potential for occupational injury and illness. Should operational circumstances substantially differ from those described and/or anticipated, operations shall be temporarily terminated until the suspect hazards are evaluated and appropriate health, safety, and operational precautions are implemented.

1.0 Health and Safety Program (HSP)

1.1.1 Introduction

1.2.1.1 UXB places the highest priority on a safe working environment. To substantiate its commitment, UXB has developed and implemented a Corporate Safety and Health Plan that provides general health and safety guidance to.

1. qualified individuals performing Ordnance and Explosive (OE)/Chemical Warfare Materiel (CWM) operations;
2. qualified individuals performing Hazardous, Toxic, and Radiological Waste (HTRW) operations; and
3. approved visitors to a site potentially containing OE or HTRW.

1.1.2 Regulatory Compliance

1.2.2.1 UXB's HSP complies with federal, state, and local laws, statutes, directives, and ordinances that relate to worker safety and health, and the protection of the environment, including:

1. 29 Code of Federal Regulations (CFR) 1910.120 (Occupational Safety and Health Administration (OSHA) standards);
2. 29 CFR 1926.65 (OSHA standards); and
3. EM 385-1-1 and ER 385-1-92.

1.1.3 Plan Certification and Availability

1.2.3.1 This Corporate Safety and Health Plan, most recently updated in July 1998, is available for review upon request. A copy of the plan's signature/approval page is located in Figure SSHP-1-1 to certify that the plan has been developed and implemented. The Contracting Officer may obtain a copy for review from UXB's Director of Quality.

Figure 1-1 SSHP
Corporate Safety and Health Plan Signature Page

CORPORATE SAFETY AND HEALTH PLAN

UXB EMERGENCY TELEPHONE NUMBER
1-800-724-9628

Richmond H. Dugger III, PhD President	7-2-98 Date
Bernard J. Godek Vice President Director of Quality and Corporate Operations	7-2-98 Date
Steven P. Clay, CIH, CSP Manager of Industrial Hygiene & Safety	7-2-98 Date

TAB

SSHP 1. Introduction

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Corporate Safety and Health Plan Signature Page

CORPORATE SAFETY AND HEALTH PLAN

UXB EMERGENCY TELEPHONE NUMBER
1-800-724-9628

7-2-98

Richmond H. Dugger III, PhD
President

Date

7-2-98

Bernard J. Godek
Vice President
Director of Quality and Corporate Operations

Date

7-2-98

Steven P. Clay, CIH, CSP
Manager of Industrial Hygiene & Safety

Date

TAB

SSHP. 2. Staff Organization, Qualifications and Responsbilities

2.0 Staff Organization, Qualification, and Responsibilities

2.0.1 Direction and administration of our safety program is a corporate responsibility; implementation is the overall and direct responsibility of the project managers, who will provide the guidance, support, and resources necessary to promote compliance with all aspects of the safety program. The functional organizational structure for our technical operations and health and safety issues is depicted in Figure SSHP-2-1.

2.1.0 Responsibilities

2.1.0.1 This section outlines the responsibilities of these key personnel.

2.1.1 Sector Director, Chemical Warfare Materiel (CWM)

2.1.1.1 Technical Responsibilities

This position:

1. Advises the Contracting Officer of progress and promptly implements CEHNC-approved and authorized changes;
2. Communicates and directs instructions for scoping, negotiating, or modifying delivery order costs and schedules;
3. Coordinates and manages all aspects of the project;
4. Ensures resource availability (personnel, facilities, and equipment);
5. Oversees task identification and resolutions;
6. Achieves the contractual cost and schedule targets;
7. Coordinates the preparation of detailed work order specifications and schedules; and
8. Implements project quality procedures.

2.1.1.2 Safety and Health Responsibilities:

1. Implements the project's safety and health procedures.

2.1.2 Certified Industrial Hygienist (CIH)

2.1.2.1 Project CIH: Is certified by the American Board of Industrial Hygiene (ABIH) and experienced in hazardous waste site operations.

2.1.2.2 Safety and Health Responsibilities: In coordination with UXB Senior Management the CIH develops, implements, and oversees UXB's Health and Safety Program and Site-Specific Safety and Health Plans. The CIH shall:

1. Give final approval of the SSHP (inconjunction with UXB's Sector Director, Chemical Warfare Materiel and SSHO);
2. Ensure compliance with all parts of this program;

3. Provide site monitoring, if required and approved by the UXB Sector Director, Chemical Warfare Materiel;

4. Provide instruction and oversight of air monitoring, as required,

5. Review site safety logs and air monitoring logs/interpret air sampling results,

6. Evaluate, draft, and authorize any changes to the SSHP, in conjunction with the SSHO;

7. Assist as liaison with government officials regarding safety and health-related site matters;

8. Maintain frequent communications with SSHO regarding site activities; and

9. Perform periodic site visits (coordinated through the CEHNC Project Manager) after mobilization to ensure compliance with SSHP, if required.

2.1.3 Life Cycle Project Manager (UXB LCPM)

2.1.3.1 Technical Responsibilities:

The UXB LCPM reports directly to UXB's Sector Director, Chemical Warfare Material and directly interfaces with the CEHNC Technical Project Manager This position:

1. Advises the Contracting Officer of progress and promptly implements CEHNC-approved and authorized changes;

2. Communicates and directs instructions for scoping, negotiating, or modifying delivery order costs and schedules,

3. Coordinates and manages all aspects of the project;

4. Ensures resource availability (personnel, facilities, and equipment);

5. Oversees task identification and resolutions;

6. Achieves the contractual cost and schedule targets;

7. Coordinates the preparation of detailed work order specifications and schedules;

8. Implements project quality procedures;

9. Directs personnel, and

10. Directs subcontractors with the assistance of the Senior UXO Supervisor.

2.1.3.2 Safety and Health Responsibilities:

1. Implements the project's safety and health procedure.

2.1.4 Site Safety and Health Officer (SSHO)

2.1.4.1 Safety and Health Responsibilities. Reporting to UXB's Director of Quality, the SSHO has Stop Work authority when warranted by on-site safety conditions. This position:

1 Implements and ensures compliance with the on-site elements of the SSHP;

2. Recommends changes to PPE levels to the CIH (as site conditions warrant),

3 Evaluates potential safety problems and implements safety-related corrective actions,

4. Conducts random safety audits of the operations and documents findings in the Safety Inspection Log (UXB Form 1.0024);

5. Conducts safety inspections, documents findings, and implements corrective actions;

6. Provides weekly safety updates to the CIH, investigates, and reports accidents/incidents as soon as possible; maintains daily safety log;

7. Provides and documents employee training regarding site specific hazards,

8 Conducts and documents the daily morning safety meetings;

9. Conducts and documents visitor briefings; and

10. Completes Confidential Personal Data forms (UXB Form 1.0033) on UXB employees.

2.1.5 Senior UXO Supervisor

2.1 5.1 Technical Responsibilities. As the senior UXO-qualified on-site representative, the Senior UXO Supervisor.

1 Monitors all aspects of the project;

2. Ensures compliance with federal, state, and local regulations;

3. Monitors on-site project expenditures, finances, equipment use, and maintenance;

4. Submits daily progress reports to the LCPM; and

5. Directs personnel.

2.1.5 2 Safety and Health Responsibilities. This position has Stop Work authority to correct safety deficiencies and is responsible for:

1. Coordinating with the SSHO to ensure all site safety considerations are being enforced;

2. Ensuring compliance with all safety and work related Standard Operating Procedures (SOPs); and

3. Ensuring compliance with this SSHP.

2.1.6 UXO Specialist

2.1.6.1 Technical Responsibilities. Reporting directly to the Senior UXO Supervisor, this position:

1. Directs field operations for assigned tasks and teams;

2 Supervises assigned personnel;

3. Meets budgetary and time line schedules; and

4. Oversees task/team equipment and vehicles

2.1.6 2 Safety and Health Responsibilities. The UXO Specialist maintains continuous communication with the Senior UXO Supervisor during UXO operations, and has the authority to temporarily stop work to resolve and correct unsafe conditions. In addition, this position:

1 Ensures team compliance with all safety and work-related SOPs,

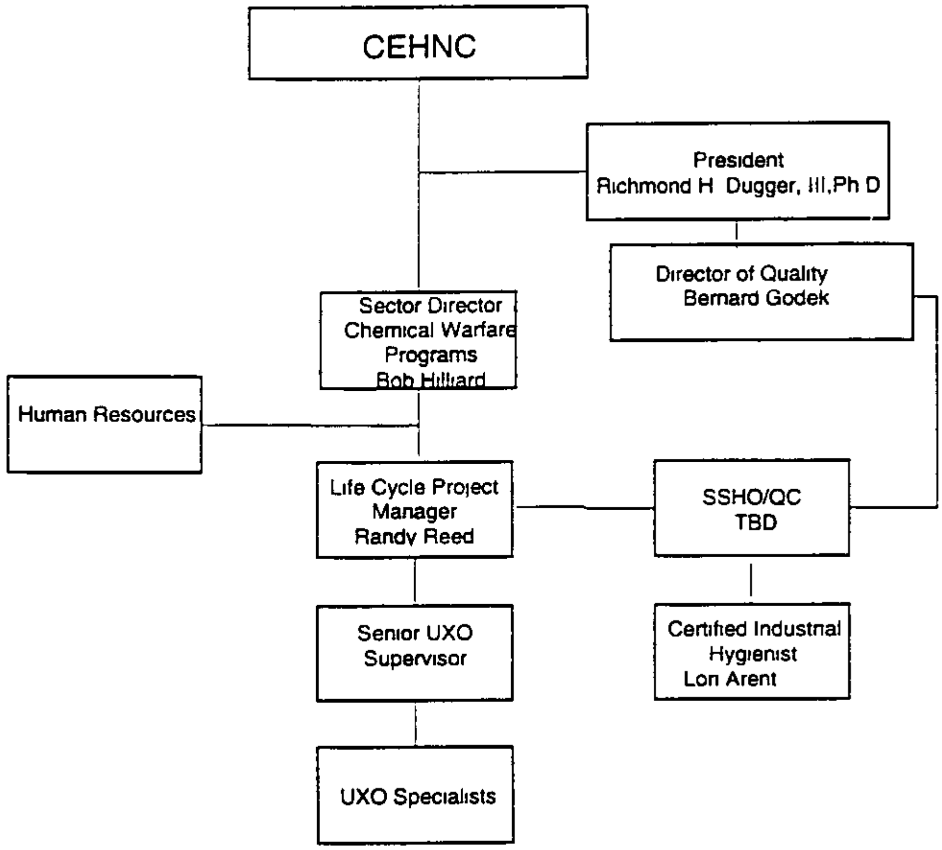
2. Ensures team compliance with this SSHP; and

3. Coordinates with the SSHO to ensure all site safety considerations are being enforced.

2.1.7 Personnel Qualifications

2.1.7.1 All assigned personnel are trained, qualified, and experienced. Resumes for selected personnel are located in Appendix C of the Work Plan (Book 1 of 2) for the Safety Submission).

Figure 2-1
Technical Operations and Safety and Health
UXB Organizational Structure



TAB

SSHP 3. Site Description and Contamination characterization military personnel in the use of chemical warfare materiel detector kits. The kits reportedly buried at this location pose a serious health concern as they contain small quantities of dilute agent for real-time training Further compounding the concern, the agent is packaged in glass ampoules. Though deterioration of the glass containers over time is not a factor, breakage during excavation is a real and present danger. Documents reviewed indicate that ampoules (glass vials) were buried intact without decontamination agents.

3.2.4 Exact Location of Pits

3.2.4.1 The exact coordinates for the boundaries of each pit were NOT established during the EE/CA. Instrument readings taken during the EE/CA revealed areas of sub-surface disturbance within the four areas of Dunn Field (A, B, C and D) The EE/CA also contains magnetometer readings for those areas. The suspect areas (24-A, 24-B and 1) are annotated in Figure WP 1-2. Boundaries of the disturbed areas are indicated on Figures WP 1-3 and WP 1-4. A UXB survey team will physically mark the boundaries of each disturbed area prior to commencement of work. UXB will also evaluate the magnetometer data and attempt to determine the location of the buried bomb casings and the CAIS kit containers within the disturbed areas 24-B and 1. Procedures for determining the location of the neutralization trench within the disturbed area of site 24-A have not yet been determined. If necessary, the entire disturbed area will be excavated.

3.3.0 Results of Previous Studies

3.3.1 UXO Hazards

3 3.1.1 A review of the Scope of Work and available documentation indicates that there are UXO hazards associated with this site. Refer to chapter 5 of the SSHP for a description of potential UXO hazards.

3.3.2 CWM Hazards

3.3.2.1 A review of the Scope of Work and available documentation indicates that there are CWM hazards associated with this site. Refer to chapter 5 of the SSHP for a description of potential CWM hazards.

3.3.3 Radiological Hazards

3.3.3.1 A review of the Scope of Work and available documentation indicates that there are no radiological hazards associated with this site.

3.3.4 Hazardous Waste/Public Health Hazards

3.3.4.1 A review of the Scope of Work and available documentation indicates that there is a multitude of information available assessing the hazardous wastes and public health hazards associated with this site. Specific information concerning these hazards can be found in:

- *Installation Assessment of Defense Depot Memphis, Tennessee Report No 191*, U.S Army Toxic and Hazardous Materials Agency, March 1981.
- *Final Environmental Assessment for Master Interim lease at Defense Distribution Depot Memphis*, U.S. Army Corps of Engineers and Tetra Tech, Inc. September 1996.
- *Final Field Sampling Plan Addendum for Operable Unit (OU) 1*, U.S Army Engineering and Support Center, Huntsville and CH2M Hill, October 1998

3.4.0 Site History

3.4.1 Refer to Section 1 of the work plan for a brief description of historical events that occurred at the Depot that have a bearing on this project.

military personnel in the use of chemical warfare materiel detector kits. The kits reportedly buried at this location pose a serious health concern as they contain small quantities of dilute agent for real-time training Further compounding the concern, the agent is packaged in glass ampoules Though deterioration of the glass containers over time is not a factor, breakage during excavation is a real and present danger. Documents reviewed indicate that ampoules (glass vials) were buried intact without decontamination agents

3.2.4 Exact Location of Pits

3 2 4.1 The exact coordinates for the boundaries of each pit were NOT established during the EE/CA. Instrument readings taken during the EE/CA revealed areas of sub-surface disturbance within the four areas of Dunn Field (A, B, C and D) The EE/CA also contains magnetometer readings for those areas. The suspect areas (24-A, 24-B and 1) are annotated in Figure WP 1-2. Boundaries of the disturbed areas are indicated on Figures WP 1-3 and WP 1-4. A UXB survey team will physically mark the boundaries of each disturbed area prior to commencement of work. UXB will also evaluate the magnetometer data and attempt to determine the location of the buried bomb casings and the CAIS kit containers within the disturbed areas 24-B and 1. Procedures for determining the location of the neutralization trench within the disturbed area of site 24-A have not yet been determined. If necessary, the entire disturbed area will be excavated.

3.3.0 Results of Previous Studies

3.3.1 UXO Hazards

3 3.1.1 A review of the Scope of Work and available documentation indicates that there are UXO hazards associated with this site. Refer to chapter 5 of the SSHP for a description of potential UXO hazards.

3.3.2 CWM Hazards

3.3.2.1 A review of the Scope of Work and available documentation indicates that there are CWM hazards associated with this site. Refer to chapter 5 of the SSHP for a description of potential CWM hazards.

3.3.3 Radiological Hazards

3.3.3.1 A review of the Scope of Work and available documentation indicates that there are no radiological hazards associated with this site.

3.3.4 Hazardous Waste/Public Health Hazards

3.3.4.1 A review of the Scope of Work and available documentation indicates that there is a multitude of information available assessing the hazardous wastes and public health hazards associated with this site. Specific information concerning these hazards can be found in:

- *Installation Assessment of Defense Depot Memphis, Tennessee Report No 191,* U.S. Army Toxic and Hazardous Materials Agency, March 1981.
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3.4.0 Site History

3.4.1 Refer to Section 1 of the work plan for a brief description of historical events that occurred at the Depot that have a bearing on this project.

Table 3-1 SSHP Site Correlation Table

EE/CA Site Number	RI/FS Number	New Site Number	Area Significance
A-1	24	24-A	Mustard bomb burial trench
A-2	24	24-B	Chlorinated lime pits – Mustard agent neutralization area
B-2	1	1	CAIS burial pit

TAB

SSHP 4. Project Description

4.0 Project Description

4.1.0.1 Tasks to be Performed

4.1.0.1 Table 4-1 lists the tasks summary of events to be performed during the on-site operations. The time line is located in the Work, Data, and Cost Management Plan located in Section 5 of the Work Plan.

4.1.0.2 A description of the expected hazards associated with these tasks is included in the Hazard Assessment and Risk Analysis located in Appendix B of the SSHP.

4.2.0 Work Performance Time Frame

4.2.0.1 These tasks are planned to commence in May 2000 and complete in September 2000.

Table SSHP-4-1
Summary of Events

EVENT	PURPOSE
Erect Containment Structure	A containment structure will be constructed around each excavation site. The structure will be configured with four filter units to prevent the atmospheric release of toxic agent(s). The structure will be dismantled and moved to each location, as necessary.
Personnel and Equipment Decontamination Station	Decontamination stations will provide a means of decontaminating personnel and equipment in the event hazardous material is encountered.
Excavation	Sites 24-A. 24-B, and 1 will be excavated using both mechanical and manual means. Observers will continuously monitor for the presence of CWM material, UXO, and other recovered material that may present a hazard to personnel or the environment. Heavy equipment operating manuals, safety bulletins, and other pertinent documents pertaining to the safe operation of heavy equipment will be available at the work site.
Sampling	Soil samples will be collected and submitted to ECBC for chemical warfare materiel screening. Additional samples will be submitted to an approved laboratory to determine the presence of other OSHA hazardous material as identified through TCLP and SW846 standards. Air monitoring will be conducted throughout the excavation process.
Recovery of CWM/UXO	All intact CWM or UXO will be positively identified. CWM material and Chemical UXO will be turned over to TEU. Conventional UXO with 20 lbs or less net explosive weight (NEW) will be disposed of by detonation on Dunn Field by UXB. Conventional UXO with an NEW of greater than 20 lbs will be turned over to the active duty EOD unit UXO that is determined to be unsafe to move will be destroyed in place (Blown in Place – BIP). If a BIP procedure will cause unacceptable damage or danger to personnel, emergency response will be requested from the active duty EOD unit.
Confined Space Entry	Excavations are planned to a depth of 13 feet below ground surface. It is not anticipated that personnel will enter the excavations at Site 24-B; however entry may be required to facilitate removal of bomb casings in Site 24-A and at Site 1 to remove CAIS. All excavation and confined space procedures will be conducted in accordance with EM 385-1-1 and OSHA regulations.

TAB

SSHP 5. On-site Hazzards and Preventative Measures

5.0 On-Site Hazards and Preventative Measures

5.1.0 On-Site Hazards

5.1.0 1 Based upon a review of available information, personnel can expect to encounter the hazards identified in Table SSHP-5-1, On-Site Hazards.

5.1.0.2 All known or potential chemical, physical, safety, biological, and chemical hazards that may pose a threat to the health and safety of site workers have, to the extent possible, been identified and the risk of exposure assessed to ensure workers are adequately informed and protected. Emphasis has been placed on identifying situations and tasks that have known or may create Immediately Dangerous to Life or Health (IDLH) conditions, or any other condition with the potential for serious safety or health effects.

5.1.0.3 The overall hazards and risks associated with participation in operations on this site are considered **LOW** to **MEDIUM**. The anticipated hazards and the risks are discussed in this section and summarized in the Certification of Activity Hazard Analysis Forms located in Appendix B of this plan—task-specific evaluations of the known or potential hazards associated with performing individual tasks within the Scope of Work (SOW). These forms ensure compliance with the revised OSHA standard 29 CFR 1910.132, which requires assessment of tasks and operational hazards where personal protective equipment (PPE) is required to protect personnel. Each form contains task-specific information related to hazard control and mitigation, including specific engineering control measures; specific standard operating procedures; equipment requirements; specialized training requirements; and the PPE requirements.

5.1.0.4 Evaluation of work site characteristics and hazards is an ongoing process, and on-site personnel will play a major role in continuing this evaluation throughout the duration of the project. All site workers must be vigilant in identifying and informing their supervisor of hazards. This section will be modified whenever new hazards are encountered.

5.1.0.5 This section:

1. Describes the operations to be performed at each site;
2. Identifies the chemical, physical, safety, and biological hazards for each task/site operation;
3. Identifies, specifies, and justifies action levels for engineering controls and practice controls, emergency evacuation, and prevention/minimization of public exposure.

5.1.0.6 Project Site. Table SSHP 5-2 illustrates the hazards that are present when conducting the project-specific tasks.

5.2.0 Chemical Hazards

5.2.1 General

5.2.1.1 Based on a review of the SOW (Appendix A to the Work Plan) and available documentation, this is a suspected CWM/OE site. If personnel encounter suspected CWM/OE outside of the containment structure, they shall immediately withdraw upwind of the anomaly and notify the CEHNC Safety Specialist and Technical Escort Unit (TEU) personnel. UXB personnel shall not handle explosive ordnance that contains or is suspected of containing CWM. Handling of suspected CWM/OE encountered inside the containment structure during normal operations is detailed in the work plan (Book 1 of 3 of this Safety Submission).

5.2 1 2 Considering the procedures used to neutralize the filler from the leaking 29 German mustard bombs, there is little reason to expect to find live agent at Sites 23-A or 23-B. Trace amounts of breakdown chemicals may be expected at these two sites. Site 1 offers the greatest possibility of encountering live chemical agent due the presence of CAIS. Refer to Table WP 1-2 and WP 1-3 for lists of chemicals of concern and breakdown chemicals. Though CWM agents rightfully demand our focus, decontaminating agents can present serious consequences to the environment. The following paragraphs briefly describe some of the most serious chemicals of concern.

5.2.2 Specific Chemical Hazards

5.2.2.1 Chlorinated Lime

5.2.2.1.1 Chlorinated lime is also referred to as bleach and bleaching powder and is a chlorinating agent. Chlorinating agents have been used to decontaminate mustard, Lewisite, and nerve agents. Chlorinated lime was the most commonly used decontaminate used during WWI.

5.2.2 1.2 When introduced into the environment, these inorganic chlorinating agents will react and yield calcium, chloride, and hydroxide. Naturally occurring organic compounds in the environment will be oxidized by these chlorinating agents. The hydroxide will be neutralized in soil and ground water, and neutralized and diluted in surface water. Environmental impact from use of these chlorinating agents is expected to be localized and short term.

5.2.2.2 DANC

5.2.2.2.1 DANC is the abbreviation for Decontaminating Agent, Non-Corrosive DANC was a chlorinating agent and has been used to decontaminate mustard, lewisite, VX, and other agents which can be destroyed by chlorinating. At least two organic chlorinating compounds have been used in DANC. The first used was CC1, and the decontaminate solution was referred to as DANC(M3). CC1 is an abbreviation for chlorinating compound number 1. The identity of this compound is not known, but it is known to have been an N-chloroamide. The second used RH-195 as a chlorinating agent, and was referred to as DANC(M4). This second compound was more commonly used and the DANC suspected of being buried on Dunn Field is expected to be of this type. Solutions of DANC typically contained 90-95% by weight 1,1,2,2-tetrachloroethane.

5.2.2.2.2 Introduction of DANC into the environment would have involved the solvent 1,1,2,2-tetrachloroethane, the N-chloroamide, and the amide. The N-chloroamide, being an oxidizing agent, would have been reduced in the environment, with the amide being the expected degradation product.

5.2.2.3 RH-195

5.2.2.3.1 RH-195 was the military designation for the compound 1,3-dichloro-5,5-dimethylhydantoin, which is a white powder.

5.2.2.4 Impregnite, Unstabilized (CC2)

5.2.2.4.1 CC2 or Impregnite, unstabilized (Type 1) was used to impregnate clothing used to protect personnel against the action of vesicant-type chemical agents. It was made up of volatile matter (exact type unknown), chloroform, chlorides (NaCl), and active chlorine. Improperly stored impregnite can spontaneously combust.

5.2.2.5 Phosgene

5.2 2.5.1 The compound phosgene is an easily liquefied gas, which has an odor like new-mown hay, moldy hay, or corn when dilute Other chemical names for this compound are carbonic dichloride, chloroformyl chloride, carbon oxychloride, and carbonyl chloride, with the latter name being the most commonly used alternate name. The military abbreviation for phosgene is CG. Phosgene is noncombustible under normal conditions It is not corrosive to iron or steel when dry, but is very corrosive in the presence of water due to the acid formed by hydrolysis Phosgene reacts violently with aluminum, potassium, sodium, and isopropyl alcohol. The median lethal concentration via inhalation for humans is 3200 mg/m^3. Concentrations of 3-5 ppm in air cause irritation of the eyes and throat. A level of 25 ppm in air is dangerous for 30-60 minute exposures, and 50 ppm is rapidly fatal after even a short exposure. The exposure to toxic concentrations of phosgene causes little irritation and therefore little warning of fatal exposure. The toxic action of phosgene is through the hydrolysis of the phosgene in the tissues of the lungs, thus forming hydrochloric acid which results in pulmonary edema. Symptoms of exposure usually occur 2-24 hours later, and death may occur within 36 hours after a severe exposure.

5.2.2.6 Mustard

5.2.2.6.1 Mustard is the common name for the vesicant dichlorodiethyl sulfide. Mustard is an amber to dark brown oily liquid with garlic or horseradish-like odor. Mustard has been used by the military as a vesicant chemical agent. It was developed and first used as such during WW1. Various military abbreviations have been used to designate "mustard oil". During the period from shortly after WW1 until approximately WW2, mustard was referred to by the abbreviation "HS", for sulfur mustard, and "DHS" was used for distilled mustard. The abbreviations "H" and "HD" were used for undistilled and distilled thiodiglycol mustard during the WW1 and WW2 timeframe. Mustard will react vigorously with oxidizing agents, and may be ignited. Reaction products associated with mustard are formed during manufacturing, and also during decontamination and disposal. Mustard is a very dangerous vesicant. Exposure of eyes to vapor causes conjunctivitis and may cause blindness. Exposure my also cause edema, ulceration, and necrosis of the respiratory tract and exposed skin. The mortality rate from exposure is low, but permanent eye damage and severe respiratory impairment may result.

5.2.2.7 Thiodiglycol

5.2.2.7.1 The compound thiodoglycol is a syrupy colorless liquid with a characteristic odor. Thiodiglycol reacts with oxidants in much the same manner as mustard. It is reported to have low toxicity. Because of only low to moderate toxicity, and biodegradability, thiodiglycol would not normally be a contaminant of concern. Concentrations resulting from hydrolysis of mustard in the environment are very unlikely to be significant from a toxicological standpoint.

5.2.2.8 Lewisite

5.2.2.8.1 Lewisite is the name of the vesicant chemical agent dichloro(2-chlorovinyl)arsine. Lewisite is a colorless oily liquid when pure, but production quality Lewisite normally is amber to dark brown in color. Lewisite is reported to have a geranium-like odor, but as with mustard, the odor is primarily due to impurities. Lewisite was developed during WW1, but was not produced until after the war had ended. It was manufactured on a large scale during WW2, but was never actually used, and is now considered obsolete as a chemical warfare materiel. Lewisite is primarily a vesicant, but also acts as a powerful lung irritant and systemic poison. The military abbreviation for Lewisite during and prior to WW2 was "M_1 " or "M-1". The designation in recent times has been "L", which was originally used by the British. As little 0.5 mL on the skin may cause death. The median concentration in air which is detectable by humans is 0.011 mg/L, which cause faint irritation. Lewisite is recognized as a carcinogen.

5.2.2.9 Chloropicrin

5.2.2 9.1 The compound chloropicrin is a colorless, slightly oily liquid with a strong sweet odor. Other chemical names for chloropicrin are trichloronitromethane, nitrotrichloro-methane, nitrochloroform, and acquinite. An obsolete name for chloropicrin is chlorpicrin Chloropicrin was produced and used as a chemical agent during WW2. It was stockpiled at APG-EA into the post WW2 period, but was not considered to be a principal military chemical agent after the 1920s. Chloropicrin has been used by industry in organic synthesis, and has been produced for use in fumigants, fungicides, insecticides, and rodenticides. Chloropicrin reacts with, and is decontaminated by, aqueous ammonium sulfide, sodium sulfide, or an alcoholic solution of sodium sulfite The reaction can be violent, and produces nitrogen oxide, carbon monoxide, carbon dioxide, nitrogen, carbon disulfide, sulfur, and sodium chloride. When exposed to light, it takes on a greenish yellow color, due to decomposition into chlorine and oxides of nitrogen Chloropicrin causes lachrymation, vomiting, bronchitis, and pulmonary edema. It also causes irritation to the skin. An additional toxic effect is its reaction with SH-groups in hemoglobin, interfering with oxygen transport In most persons, 2 mg/m^3 causes closing of the eye lids and tearing in 3 to 30 seconds. Higher concentrations lead to stomach distress, vomiting, and stupor. Damage to the respiratory organs occurs at concentrations above 100 mg/m^3, and a concentration of 200 mg/m^3 is lethal within a few minutes. Chloropicrin is relatively persistent as a chemical warfare agent, and will persist in soil and water for moderate periods of time Because of moderate persistency and high toxicity, a spill of chloropicrin in the environment could have significant impact However, because of volatility and slow hydrolysis, chloropicrin will not persist for many years or decades under normal circumstances. Persistence would be greatly increased if it were mixed with a more persistent organic compound.

5.2.3 Physical Hazards

5.2.3.1 Heat/Cold Stress

5.2.3.1.1 Heat/Cold Stress disorders and monitoring procedures are detailed in Section 8 of this plan.

5.2.3.2 Tornado

5.2.3.2.1 A tornado appears as a rotating, funnel-shaped cloud that spins like a top – striking the ground with winds that can exceed 200 miles per hour. While they can occur at any time of the year, tornadoes appear most often in the late afternoons of April, May, and June.

5.2.3.2.2 A "Tornado Watch" means that tornadoes, severe thunderstorms, or both are possible. Stay tuned to area radio/television reports and keep a watch on the sky. Stay tuned to area radio/television reports and keep a watch on the sky A "Tornado Watch" means that tornadoes, severe thunderstorms, or both are possible. A "Tornado Warning" means that tornadoes have been sighted; take immediate shelter.

5.2.3 2.3 When a tornado is sighted:

1. Take immediate shelter and stay away from windows, doors, and outside walls.
2. Go to the lowest interior level of a building and seek shelter under a study table.
3. If in a vehicle, immediately exit and seek more substantial shelter.
4. If there is no shelter nearby lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.

5.2.3.3 Thunderstorm

5.2.3.3.1 Severe thunderstorms are one of the most common natural hazards.

5 2.3.3.2 Large hail can cause serious injury, so avoid the outdoors while a storm is in progress. Shelter vehicles to prevent costly damage

5.2 3.3.3 Flash floods often occur without warning following heavy upstream rainfall. Drainage canals, streambeds, canyons, or areas downstream from a dam are potential flood areas. Monitor current weather conditions and review evacuation plans. Roads and trails that parallel existing drainage systems may be swept away by floodwaters. When a flash flood warning is issued, or you realize a flash flood is coming, go to high ground immediately. DO NOT drive through already flooded areas, and do not attempt to cross a flowing stream on foot where the water is above your knees.

5.2.3.4 Lightning

5.2.3.4.1 Electrical storms occur during the spring, summer, and fall. Since the storms are often fast moving, field personnel should watch for indications of electrical storms (forecasts should be covered in the morning safety briefing).

5.2.3.4.2 The distance to an electrical storm can be estimated by observing the interval between the lightning flash and the sound of the thunder. Since sound travels approximately 1,100 feet per second, an interval of 5 seconds corresponds to a storm distance of approximately 1 mile.

5.2.3.4.3 If caught in the open by an electrical storm, all personnel will immediately seek shelter in their vehicle and proceed to the site office for further instructions. In the event that their vehicle is inaccessible, personnel should follow these rules:

1. Move to a topographically low area, away from tall objects and conductors (trees, transformers, fences, pipelines, power lines, metal sheds) and wait for the storm to leave the area, and
2. If you feel your hair stand on end (an indicator that lightning is about to strike), drop to your knees and bend forward, putting your hands on your knees. Do not lie flat on the ground.

5.2.3.5 Exertion

5 2.3.5.1 Each day and more often if environmental conditions warrant, the LCPM (in consultation with the SSHO) shall establish a work/rest regimen that is conducive to the on-site conditions. Personnel are to adhere to this regimen to alleviate impacts from over exertion.

5.2.3.6 Repetitive Motion

5 2.3.6.1 Repetitive motion injuries or, more specifically, occupationally related motion disorders, are now common problems. Numerous terms, including cumulative trauma disorder, overuse syndrome, repetitive stress injury, and repetition strain injury, have been used to describe this disorder. In the United States, cumulative trauma disorder (CTD) is the preferred label.

5.2.3.6.2 Many different symptoms can arise from the accumulation of small injuries or stresses to the body. CTD is not so much a disease as it is a response to excessive demands that we place on our bodies - without giving them adequate time to recover between. CTD results from a combination of muscle tension, repetitive motion, over use, and incorrect motion.

5.2.3 6 3 Forward head posture is one of the leading risk factors for CTD. It is also known as slouching, or rounded-shoulders. In this posture, the weight of the head is no longer being carried directly over the spine. Instead, the head is moved forward ahead of the spine. This mechanically increases the weight of the head on the neck by about 300 percent. The rounding forward of the shoulders produces a stretch weakness of the posture muscles of the upper back which must also work to hold the head upright. Therefore, the load on these muscles is dramatically increased while their strength is significantly decreased. This can lead to several chronic muscle problems in the upper back.

5.2.3.6.4 When the upper back is rounded forward, the head must bend backward slightly on the neck to restore level vision. This can cause pressure to the soft tissues at the base of the skull and can lead to chronic headaches.

5 2 3.6.5 The forward posture of the head on the neck causes the muscles under the chin to be pulled tight, which can pull the jaw back, causing pressure and irritation in the joint where the jaw attaches to the skull. Forward head posture also moves the shoulder joint from the side of the body toward the front of the body, causing pressure on the shoulder joint tendons, risking shoulder tendonitis. Finally, this position of the head on the neck can cause the lateral neck muscles to shorten, causing pressure on the nerves and blood vessels passing through these muscles on their way to the working arm.

5.2.3 6.6 Another commonly overlooked but very significant CTD risk factor is lack of upper extremity support. Some tasks require the holding of arms up slightly all day, fighting gravity. This is hard work for the neck and shoulder muscles and magnifies the stresses described for forward head posture. One of the best ways to reduce excessive work fatigue and forward head posture stresses is to arrange the work so that there is some space available for the arms to rest, even if only for a split second. This can greatly reduce the physical work of sustained posture.

5.2.3.6.7 Posture plays a significant role in CTD. Slouching with the spine or leaning with the head puts the body out of balance and causes the limbs to be stretched or bent awkwardly. The neutral spine position starts with the three natural curves of the spine - the inward curve of the neck (cervical) region, the outward curve of the mid back (thoracic) region, and the inward curve of the lower back (lumbar) region. Too much bending (flexing) or straightening (extension) in either the cervical or lumbar region takes the spine out of its neutral position and increases the risk of injury.

5.2.3.6 8 In summary, to avoid CTD, exercise the following precautions:

1. Instead of leaning with the head, rotate the upper body forward at the hips;
2. Instead of slouching, rotate the upper body forward at the hips;
3. Instead of bending or lifting with a flexed lumbar spine, rotate the upper body forward at the hips;
4. Take breaks as required;
5. Don't be a statue; and
6. Avoid caffeine and tobacco.

5.3.0 Safety Hazards

5.3.1 UXO

5.3 1.1 Safety is a primary concern. The most obvious safety requirements are to protect personnel, the general public, and the environment from the effects of fire, blast, noise, fragmentation, premature detonation, and toxic releases.

5.3.1.2 UXO escort is required for non-UXO personnel in areas that have not been previously cleared of UXO/CWM. Non-UXO personnel will follow the directions of their UXO escort.

5.3.1.3 Refer to the following sections for safety precautions related to:

1. UXO Safety – Section 6, Work Plan (Conventional Ordnance Handling Plan)
2. Intrusive/Excavation Safety – Section 3, Work Plan (Intrusive Excavation Plan)
3. UXO Disposition Safety – Section 6, Work Plan (Conventional UXO Handling Plan)

5.3.2 Slips, Trips, and Falls

5.3.2.1 Protruding objects, careless movements, and placement of materials on pathways can cause slips, trips, and falls To prevent these injuries.

1. Be alert to obstacles in your path
2. Maintain proper footing
3. Remove tripping hazards, when encountered
4. Maintain three points of contact when working on elevated equipment

5.3.3 Cuts

5.3.3.1 Personnel shall wear, inspect, and maintain designated PPE equipment and supplies. Personnel shall ensure cutting devices are properly stored when not in use.

5 3 3.2 The following shall be used to control minor bleeding:

1. Wear surgical gloves or some other barrier, place sterile gauze/cloth over the bleeding area and apply direct pressure. Do not removed blood-soaked bandage; add more to the top.
2. If bleeding persists, elevate the area to help reduce blood flow and continue applying direct pressure to the bleeding area.
3. If bleeding still continues, apply pressure at a pressure point (brachial or femural) and continue with direct pressure over the wound.
4. Seek medical attention.

5.3.4 Biological

5.3.4.1 Spiders

5.3.4.1.1 Use extreme caution when lifting manhole covers, sumps, etc., since spiders are typically found in these areas.

5.3.4.1.1 Black Widow Spider (Latrodectus mactans)

5.3 4 1.1.1 Determining whether a Black Widow Spider has bitten a person is difficult. The victim will experience:

1. A sharp pinprick of the spider's bite may be felt, although some victims are not even aware of the bite In no more than 15 minutes, a dull, numbing pain develops in the bitten area.
2. A faint red bite mark appears.
3. Muscle stiffness and cramps—usually affecting the abdomen when the bite is in the lower part of the body or legs, and affecting the shoulders, back, or chest when the bite is on the upper body or arms.
4. Headache, chills, fever, heavy sweating, dizziness, nausea, vomiting, and severe abdominal pain.

5.3 4.1.1 2 First Aid.

1. If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification.
2. Clean the bitten area with soap and water or rubbing alcohol. Do not apply a constricting band because the black widow venom's action is swift; there is little to be gained by trying to slow absorption with a constriction band.
3. To relieve pain, place an ice pack over the bite.
4. Keep the victim quiet and monitor breathing.
5. Seek immediate medical attention.

5.3.4.1.2 Brown Reclusa or Violin Spider (Lox Osceles reclusa)

5.3.4.1.2.1 This is a brown spider that resides primarily in the Midwest. Its color markings are light tan to brown with a violin-shaped figure on its back. With legs extended it is approximately the size of a quarter.

5 3.4.1.2.2 Signs and Symptoms

1. The initial pain may be slight enough to be overlooked.
2. A blister at the bite site, along with redness and swelling, appears after several hours.
3. Pain, which may remain mild but can become severe, develops within two to eight hours at the bite sight.
4. Fever, weakness, vomiting, joint pain, and a rash may occur.
5. An ulcer forms within a week; gangrene may develop in some cases.

5.3.4.1 2.3 First Aid.

1. If possible, catch the spider to confirm its identity. Even if the body is crushed, save it.
2. Clean the bitten area with soap and water or rubbing alcohol.

3 To relieve pain, place an ice pack over the bite.

4. Keep the victim quiet and monitor breathing.

5 Seek immediate medical attention.

5.3.4.2 Ticks

5.3.4.2.1 Lyme Disease is caused by a bacterium, which may be transmitted by the bite of a tick. Ticks carrying Lyme Disease may be found throughout the U. S. living in grassy and wooded areas, and feeding on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies If detected early, Lyme Disease can be treated with antibiotics

5.3 4.2.2 Remove ticks with small tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, but firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite with antiseptic and seek medical attention as soon as possible.

5.3.4.2.3 The illness typically occurs in the summer months and is characterized by a slowly expanding red rash that develops a few days to a few weeks after the bite of an infected tick. The illness can be accompanied by flu-like symptoms, headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician is usually effective; but if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis; other problems include meningitis, neurological, and cardiac abnormalities. NOTE: some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of follow-on symptoms is more difficult than early symptoms and is not always successful.

5.3.4.2.4 Rocky Mountain Spotted Fever is another tickborne disease. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. Early detection and treatment significantly reduces the severity of illness The disease responds to antibiotic therapy with tetracycline or chloramphenicol.

5.3.4.2.5 Precautions:

1. Wear long pants and long sleeved shirts that fit tightly at the ankles and wrists; tape cuffs if necessary
2. Wear light colored clothing so ticks can be easily spotted.
3. Tick repellents may be useful
4. Inspect clothing frequently while in tick habitat.
5. Inspect head and body thoroughly when you return from the field.
6. Remove any ticks by tugging with tweezers. Do not squeeze or crush the tick

5.3.4.3 Poison Ivy/Poison Oak/Poison Sumac

5.3.4.3.1 Poison Ivy, Poison Oak, and Poison Sumac may cause severe skin reaction on contact. The plants are poisonous to the touch, frequently producing severe inflammation and blisters.

These are woody shrubs or vines, and the leaves are arranged in an alternate pattern on the vine.

5.3 4.3.2 These plants grow throughout the United States. The shrubs or vines sometimes run horizontally and underground for several yards Their most distinctive features are their leaves, which are composed of three leaflets that are 1-2 inches long and pointed at the tip (Figure SSHP-5-1). They may be toothed, smooth, or lobed, all occurring on the same plant. In the fall, the foliage turns bright red or reddish yellow.

5.3.4.3.3 These plants have greenish-white flowers and clustered berries.

5.3.4.4 Snakes and Reptiles

5.3.4.4.1 Rattlesnake

5.3.4 4.1.1 Several varieties of rattlesnakes are indigenous to the work area, and each of these is venomous. Venoms are complex poisons that vary greatly in composition and potency among species and individuals. In addition to rattles, all rattlesnakes share some common physical characteristics including a triangular shaped head, a facial pit, elliptical pupils and foldable fangs Refer to Table SSHP 5-3; Snake Identification Features.

5.3.4.4.1.2 A venomous snakebite is usually characterized by pain and swelling at the site of the bite and a general skin discoloration. The manifestations of the bite include general weakness, rapid pulse, nausea and vomiting, and shortness of breath.

5 3.4.4.1.3 First Aid – Get the victim to the hospital and professional medical care Meanwhile, the following first aid measures should be taken:

1. Calm and reassure the patient. Keep the patient as still as possible and do not allow him to run, or move about unnecessarily.
2. Remove any constricting items, such as jewelry, from the affected limb.
3. When practical immobilize the affected limb at approximately heart level, keeping it lower than the heart, if possible.
4. The victim should remain in a comfortable prone position and body temperature should be stabilized to minimize shock.
5. The bitten area may be washed with soap and water and blotted dry with sterile gauze. Dressings and bandages may be applied.
6. Transport to a medical facility for evaluation and treatment. Do not delay evacuation.

5.3.4.4.1.4 Prevention of Snakebite—The best snakebite treatment is to avoid getting bitten. The following suggestions will help in this process:

1. Watch where you sit, and where you put your hands and feet.
2. Avoid rock piles, stacks of old boards, and brush in wooded areas. If movement is necessary, use a remote means to initially relocate the material. Prior to entering a heavily wooded or brush area, look and listen carefully.
3. Never handle "dead" snakes; they may not be completely dead.
4. Do not attempt to capture or kill snakes.

Figure 5-1 SSHP Poison Ivy/Poison Oak/Poison Sumac

Poison Ivy	Poison Oak	Poison Sumac
		

Table 5-1 SSHP On-Site Hazards

Hazard	Concentration Range	Media	On-Site Location	Estimated Quantity/ Volume
Ordnance				
Based on historical documentation several large bomb fragments are located in the area of excavation. Additionally there is a potential for low ordered UXO and small arms projectiles to be found in the excavation area	Unknown	Unknown	Unknown	Unknown
Chemical				
Based on a review of the Scope of Work (Appendix 1 to Work Plan) and available documentation, this is a suspected Chemical Warfare Materiel (CWM) site.				
Radiological				
Based on a review of the Scope of Work and available documentation, there are no radiological hazards associated with this site.				
Biological				
Based on research conducted on Dunn Field Depot the following species of plants and animals may pose a potential safety hazard: Rattle Snake, Copperhead Snake, Water Moccasin Snake, Black Widow Spider, Brown Recluse Spider, Ticks, Poison Oak, Sumac, Ivy. However, a site visit conducted shows the work area to be an open mowed field, and the likelihood of any of the above referenced animal or plant safety hazards is remote. No biological warfare materiel is associated with this site				

Table 5-2 SSHP Event-Specific Hazards

Event	Hazards												
	Chemical	Physical				Safety				Biological			
		Heat/Cold Stress	Thunderstorm, Lightening	Exertion	Repetitive Motion	UXO	Slips, Trips, Falls	Cuts	Wildlife	Snakes	Insects	Spiders	Rodents
Assy/Dis-Assy Containment Structure		✔	✔	✔	✔		✔	✔		✔	✔	✔	✔
Personnel Decontamination Station	✔	✔	✔				✔						
Excavation	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Sampling	✔	✔	✔			✔			✔	✔	✔	✔	✔
Recovery of CWM/UXO	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Confined Space Entry	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔
Quality Control	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Table 5-3 SSHP Snake Identification Features

Feature	Poisonous	Non-Poisonous
Eye Pupils	Elliptical, or cat-like	Round
Sensing Pits	Pit between the eyelids and nostrils	No pit between the eyelids and nostrils
Teeth	Two enlarged teeth (fangs) in front of the upper jaw	All teeth are approximately the same size
Scales	Form a single row on the underside and below the tail	Arranged in a double row on the underside of the tail
Head	Head much wider than the neck	Head slightly wider than the neck
Tail	Single anal plate	Divided anal plate

TAB

SSHP 6. Accident Prevention

6.0 Accident Prevention

6.0.1 This Accident Prevention Plan outlines occupational safety and health policy, responsibilities, and program requirements.

6.1.0 Accident Investigation, Reporting, and Record Keeping

6.1.0.1 All on-site and off-site accidents, regardless of severity, will be reported, investigated, and analyzed. The UXB Sector Director Chemical Warfare Materiel and Senior UXB staff members (selected by UXB's President) will investigate the accident, analyze the cause, and identify the corrective action to be implemented to prevent similar occurrences.

6.1.0.2 Employees are responsible for immediately reporting all injuries, occupational illnesses, abnormal conditions, or disorders caused by exposure to environmental factors associated with the work site. The immediate supervisor will notify the LCPM, document the report; and provide medical treatment regarding the nature and cause of the illness. Within 24-hours, the LCPM will notify UXB Headquarters and the on-site CEHNC Safety Specialist of the report.

6 1.0.3 The ENG Form 3394 (the U. S. Army Corps of Engineers Accident Investigation Report) and UXB's Employee Injury/Property Damage Report Form (UXB Form 1.0034) will be completed and forwarded to the Corps of Engineers and UXB Headquarters within two working days of the injury.

6.1.0.4 The following reporting criteria will be used:

1. Death (regardless of the length of time between the injury and death);
2. One or more lost workdays;
3. Restriction of work or motion,
4. Loss of consciousness;
5. Transfer to another job site;
6. Medical treatment required (other than first aid).

6.1.0.5 The SSHO will maintain records on all health and safety issues and assure reportable accident and incident reports are submitted in a timely manner – Spot Report (UXB Form 1.0048). Injury and illness records (OSHA Reporting Logs) will be maintained at UXB's Human Resources Department in Ashburn, Virginia.

6.2.0 Inspections

6.2.0.1 A key element in preventing accidents is an aggressive inspection program. Upon mobilization, the SSHO will establish an inspection schedule that will efficiently cover the inspection requirements for UXO/CWM operations, as outlined in Table SSHP 6-1.

6.3.0 Training

6.3 0.1 All personnel will receive safety and health indoctrination, site-specific training, and continuing training to enable them to perform their assigned tasks safely and efficiently, as noted in Table SSHP 6-2. At least two employees will be trained and currently hold a certification to administer first aid/CPR. Applicable training certificates for on-site personnel are included in

Appendix C of the Work Plan. Documentation for site-specific attendance will be maintained on-site and available to the Contracting Officer for review.

6.4.0 Personnel Protective Equipment (PPE)

6.4.1 General

6.4.1.1 This section addresses: 29 CFR 1910.120(g)(5), 29 CFR 1910.134, and 29 CFR 1910.132. The use of PPE serves as a final protective measure to be used when established engineering controls, isolation of hazards, and substitution of efforts cannot collectively provide a 100 percent protection to personnel. Though stringent engineering controls and preventative measures are in place for this removal action, these initiatives alone cannot provide adequate protection to personnel without the proper selection and use of PPE.

6.4.1.2 Personnel will be physically able, medically qualified, and trained to wear the PPE required at the project site. Personnel will be proficient in proper PPE wear, maintenance, inspection, and testing. They must be knowledgeable of the PPE limitations and reduced performance levels.

6.4.2 Maintenance/Upkeep of Protective Equipment.

6.4.2.1 Protective equipment must be maintained in a serviceable condition at all times. Defective equipment will not be used. Before being stored or reissued to another person, equipment must be cleaned, disinfected, inspected, and repaired (if necessary).

6.4.3 Selection Criteria

6.4.3.1 PPE will be selected to reduce contaminant levels below published occupational exposure limits, e.g., OSHA Permissible Exposure Limits (PELs) or ACGIH Threshold Limit Values (TLVs). This goal is to keep potential exposure levels as low as reasonably achievable. If operations proceed as planned, the concentration of contaminants will always be less than PEL. PPE are necessary in case there is a leak or system failure. As a conservative measure, PPE shall be worn at any time there is a potential for exposure. The following were evaluated in selecting appropriate PPE levels:

1. Routes of Potential Exposure;
2. Eye and skin contact;
3. Inhalation;
4. Performance and durability of PPE materials;
5. Skin absorption;
6. Task specific conditions;
7. Ingestion.

6.4.4 Minimum Levels of Protection

6.4.4.1The minimum levels of protection for each task are noted in Table SSHP 6-3.

6.4.5 PPE Upgrade/Downgrade Criteria

6.4.5.1 It is not anticipated that PPE upgrades will be required. If site conditions change and warrant an upgrade, personnel will stop work, evacuate the area, and the SSHO (in conjunction with the CIH and in consultation with the CEHNC Safety Specialist) will direct required PPE upgrades

6.4.5.2 There will be no downgrade from Level D.

6.4.6 Employee-Provided Equipment

6.4.6.1 Employee-provided equipment must meet or exceed the standards UXB is required to meet at the job site.

6.4.7 Emergency and First Aid Equipment

6.4.7.1 First Aid Equipment and Supplies (ANSI Z308.1) -- will be located at each operational area and in the office and shall be immediately available in the event of an emergency. Per the USACE Safety and Health Requirements Manual (EM 385-1-1), there will be one first aid kit for every 25 persons on-site. The SSHO will maintain one kit at all times. Kits will be inspected on a weekly basis, and missing components immediately replaced.

6.4.7.2 Eye Wash Stations (ANSI Z-358.1) – Eye wash stations are applicable to this delivery order and will be available for immediate use at the excavation and decontamination area.

6.4.7 3 Emergency Showers (per ANSI Z-358 1) – Emergency shower requirements are applicable to this delivery order and will be available at the decontamination area.

6.4.7.4 Emergency Use Respirators – Chemical Warfare Materials do present a serious concern at this project work area. Except for personnel in EPA Level A or B PPE, each person entering the containment structure will have an escape mask, either ready at their side or donned. Personnel wearing EPA Level A or B will be provided an emergency escape bottle in lieu of the escape mask.

6.4.7.5 Spill Control Materials – Spill Control Measures are detailed in Section 7 of the Work Plan.

6.4.7.6 Fire Extinguishers – Classification 2-A:10-B:C fire extinguishers (5 pound) will be maintained in the personnel transport vehicles at each work location.

6.4.7.7 Eye and Face Protection (ANSI Z87.1) – When mandated by PPE requirements, personnel must wear appropriate eye and face protection; personnel requiring corrective lenses will wear eyeglasses with approved corrective lenses, goggles over normal eyeglasses, or goggles fitted with corrective lenses.

6.4.7.8 Hearing Protection -- Required for personnel conducting site preparation with chain saws and weed whackers, or personnel operating or in the vicinity of heavy equipment operations

6.4.7.9 Head Protection (ANSI Z89.1) -- Personnel working in or visiting a hard hat area will be issued and required to wear protective headgear. Hard hats will not be required during ordnance operations unless head injury is possible. Hard hats will be inspected daily for signs of cracks, dents, or other defects that may reduce effectiveness.

6.5.0 Emergency Evacuation

6.5.0 1 In the unlikely event that an emergency evacuation is required, radio or one long steady horn blast will communicate notification for 30 seconds or more on an air horn, which indicates an evacuation is imminent. UXB personnel will immediately assemble at UXB's on-site office or at a pre-designated upwind location (if chemical release). The LCPM shall maintain a proper accounting of all personnel working on the site and any visitors on the site. In the event an evacuation is imposed, the LCPM will ensure all personnel on the attendance list are physically present at the evacuation muster site or accounted for at a known and safe location. UXB personnel will then proceed as directed by the SSHO.

6.6.0 Prevention/Minimization of Public Exposure

6.6.0 1 The UXO team will report unauthorized personnel entering the work area to the LCPM, who in turn will request assistance from The Depot's Security department in removing the unauthorized personnel from the area. UXO operations will halt until unauthorized personnel have vacated the work area.

Table 6-1 SSHP
SSHO UXO Operation Inspections

DESCRIPTON	AMOUNT	TYPE	FREQUENCY
Construction of Containment Structure	1	Visual Observation	After each construction and Daily
Excavation Effort	1	Visual Observation	Daily
Sampling	1	Visual Observation	Daily
Day Box	1	Visual Observation	Daily
Recovery of CWM/UXO	1	Visual Observation	During Operation
Inert UXO and Related Scrap Turn-In	1	Visual Observation	Daily
Personal Protection	1	Visual Observation	Daily
Work Practices	1	Visual Observation	Daily
Site Control	1	Visual Observation	Daily
Emergency Response/First Aid Equipment	1	Visual Observation	Weekly

Table 6-2 SSHP
Training Requirements for On-Site Personnel

Training/Content	Duration	Frequency	Personnel Categories: Client	UXO Supervisors	UXO Specialists	Technical	LCPM	Operational Support	Office Personnel	Visitors	As Mandated By Exposure
Health and Safety for Hazardous Waste Operations and Emergency Response – 29 CFR 1910 120	40-Hours	Once	✔	✔	✔	✔	✔	✔			
Excavations, Fall Protection, Permit-required Confined Space 29 CFR 1926 Subparts B, P, and M 29 CFR 1910 146	2-Hours	Mobilization	✔	✔	✔	✔	✔	✔		✔	
Health and Safety for Hazardous Waste Operations and Emergency Response – 29 CFR 1910 120	8-Hours	Annual	✔	✔	✔	✔	✔	✔			
Supervised Field Experience	3-Days	Once in Career			✔	✔		✔			
Site-Specific SSHP, Responsibities, Hazards, PPE, Safe Work Practices & Equipment Use, Medical Surveillance, Decontamination, Emergency Response, UXO Refresher	2-Hours	Mobilization		✔	✔	✔	✔	✔			
Supervisor's Health and Safety for Hazardous Waste Operations and Emergency Response – 29 CFR 1910 120	8-Hours	Once		✔							
Hazard Communication 29 CFR 1910 1200 - Hazards of materials used/encountered	1-Hour	Mobilization		✔	✔	✔	✔	✔			
Hearing Conservation 29 CFR 1910 95 - Physical/psychological effects of noise levels - Noise exposure limits - Selection/use/limitations of protection	1-Hour	Mobilization									✔
First Aid and CPR (minimum of 2 trained UXB personnel on-site) - Equivalent to American Red Cross training	3-Days	Every 3 Years		✔	✔						
Bloodborne Pathogen – 29 CFR 1910 1030 - Protective Equipment - Containment and Disposal of Waste	2-Hours	With First Aid/CPR		✔	✔						
Visitor - Operational Activities & Hazards - Boundaries of Work Area and Entry/Exit - Emergency Evacuation & Assembly Points - PPE	15-Minutes	Once per visit								✔	
Morning Safety Meetings - Potential hazards and risks - Encounters with hazardous materials to date	15-Minutes	Daily, Prior to Operations		✔	✔	✔	✔	✔			
Supervisor's Safety Meeting	30-Minutes	Weekly		✔							

Table 6-3 SSHP
Minimum Levels of Protection

Task	PPE	Level A Suit (w/supplied air)	Level B Suit (w/ supplied air)	Modified Level D	Escape Mask	Coveralls/Pants	Work Boots (protective boots if foot hazard)	Work Gloves	Hearing Protection (Near machinery)	Protective Eyewear (as required)	Protective Chaps (as required)	Face Shield	Hard Hat (Near overhead hazards)
Site Management	D					✔	✔						✔
Site Preparation (structure& equip construction)	D					✔	✔	✔	✔	✔			✔
Characterization Sampling*	Mod D			✔	✔	✔	✔		✔				
Intrusive Excavation (non CAIS)	Mod D			✔	✔	✔	✔		✔				✔
Intrusive Excavation (CAIS)	B		✔				✔	✔	✔				✔
Field Monitoring	Mod D			✔	✔	✔	✔		✔				
Filter Removal/Replacement (Clean)	Mod D			✔		✔	✔						
Filter Removal/Replacement (Contaminated)	B		✔				✔	✔	✔				
Segregation of CWAs	A	✔					✔	✔	✔				
Operation of Shaker Table in CAIS Area	B		✔				✔	✔	✔				
Monitoring of Investigative Derived Waste	B		✔		✔		✔		✔				
Dispostion of Non-Contaminated Waste	D				✔	✔	✔	✔		✔			
Decontamination of Contaminated Waste	B		✔				✔	✔	✔	✔			
Monitoring of Soil and Debris	Mod D			✔	✔	✔	✔	✔	✔	✔			
Disposition of Non Contaminated Soil and Debris	Mod D			✔	✔	✔	✔	✔	✔	✔			
Decontamination of Contaminated Soil and Debris	B		✔				✔	✔	✔	✔	✔		
Monitoring of Scrap Metal	Mod D			✔	✔	✔	✔	✔	✔	✔	✔		
Decontamination of Scrap Metal	B		✔				✔	✔	✔	✔			✔
PDS	Note 1												
Compliance Sampling	Mod D			✔	✔	✔	✔		✔				
Backfill	Mod D				✔	✔	✔	✔	✔	✔			✔
Close-out/Demobilization	D					✔	✔	✔	✔	✔			✔
Emergency Rescue	A	✔					✔		✔				

(* See Table 6-4 for specific site requirements.)
NOTE 1: Personnel assigned to the Personnel Decontamination Station (PDS) shall wear one level down from the personnel being decontaminated but shall not downgrade below PPE Level D.
NOTE: 2: Latex gloves shall be worn under butyl rubber gloves at all levels of PPE.
NOTE 3: Office personnel are exempt from PPE requirements when performing routine non-field administrative duties in the office.

Table 6-4 SSHP
Specific PPE Requirements

Area of Concern Specific PPE Requirements		
Site	**PPE**	**Justification**
24-B	Modified Level D	Mod D will be worn by all personnel who enter the containment structure from the onset of intrusive activities until all work within the structure has been completed and determined free of hazardous material. Each person who enters the containment structure MUST have an operationally ready escape mask at their side to provide respiratory protection in the event air monitoring or other warning devices indicate a toxic release. Should this occur, all personnel will immediately don their escape mask and evacuate the structure and proceed through the Personnel Decontamination Station. All personnel involved in the operation will be familiar with various audio and visual warning indicators from each monitoring instrument. Modified D does NOT provide protection from absorption of vapors through the skin. Any indication of a release must be evaluated and, if necessary, PPE will be upgraded.
24-A	Level B and Modified Level D	The backhoe operator shall be in Mod D unless a positive indication is obtained from an air monitor. The initial entry party in the pit will be in Level B PPE. If field-monitoring equipment reveals the area to be free of CWM and other hazardous/toxic waste, the SUXOS may downgrade the PPE to Mod D.
1	Level B	Due to the possibility of encountering raw CWM from CAISs, all personnel within the containment structure will be in Level B PPE. Moreover, due to the high probability of encountering small objects at Site 1, soil will be screened to facilitate segregation of soil from foreign debris. This tactile operation greatly enhances the probability of direct exposure and demands strict adherence to the proper care and utilization of PPE.

TAB

SSHP 7. Medical Surveillance

7.0 Medical Surveillance

7.1.0 General

7 1.0.1 All on-site personnel will participate in medical surveillance, in accordance with 29 CFR 1910.120, and DA-PAM 40-173. The program will consist of a baseline examination and an annual re-examination.

7.1.0 2 Medical examinations will be conducted under the supervision of a licensed physician who is board eligible in Occupational Medicine by the American Board of Preventive Medicine and certified by the American Board of Independent Medical Examiners. An occupational physician will review the exam/test results UXB headquarters personnel will have their examinations performed at:

Corporate Health Center

46440 Benedict Drive, Suite 108

Sterling, VA 20164

(703)444-5656

7.1.0 3 UXB and the physician shall determine the minimum content and frequency of the medical examinations/tests, based upon probable site conditions, potential occupational exposures, and required protective equipment. At a minimum, examinations will consist of a medical and occupational history review, blood tests, and urine tests for contaminants of interest, electrocardiogram, pulmonary function tests, chest x-ray, and general physical examination (including hearing and vision).

7.1.0.4 The written opinion of the attending physician will be maintained on-site and made available to the Contracting Officer for review. Examination results of employees who terminate employment or who have worked on a hazardous waste project are also maintained at UXB's Corporate Office.

TAB

SSHP 8. Environmental and Personal Monitoring

8.0 Environmental and Personal Monitoring

8.1.0 General

8 1.0.1The purpose of monitoring the work area is to identify and quantify contaminants in order to determine the level of worker protection needed. The two principal approaches for identifying and quantifying contaminants are (1) on-site use of direct reading instruments and (2) laboratory analysis of air samples obtained by a sampling pump and collection media (e.g., filters, sorbent tubes, etc.). Direct-reading instruments provide immediate information for rapid decision-making, but they are not compound specific and have limited detection levels. Data obtained from real-time monitoring are used to assure proper selection of personal protection equipment, engineering controls, and work practices. Laboratory analysis provides better detection limits, more quantitative results, and can specifically identify constituents; however, the results are not immediately available. Laboratory analysis will be conducted at the discretion of the site safety officer/CIH. Only American Industrial Hygiene Association accredited laboratories will be used to analyze samples.

8.1.0.2 All direct-reading instrumentation and sampling media will be assembled and calibrated (pre- and post-shift) per the National Institute of Occupational Safety and Health Manual of Analytical Methods and/or the manufacturer's specifications. Personnel will be trained and qualified to operate specific air monitoring instruments and sampling equipment. Continuous air monitoring in the breathing zone of the workers will be conducted initially; periodic monitoring may be conducted after the initial assessment as directed by the site safety officer/CIH. Calibration data and air monitoring results will be documented.

8.1.0 3 The "action level" is typically 50% of the published occupational exposure limit for specific chemical constituents or as stated below for non-specific instrumentation. If the action level is exceeded, work will cease, the area will be evacuated, and the site supervisor and CIH will be notified to direct corrective actions.

8.1.0.4 Specific air monitoring for worker protection includes the following:

Flammable/Explosive Atmospheres: A combustible gas indicator will be used to monitor flammable/explosive atmospheres. The action levels for the combustible gas indicator will be set at 10% of the lower explosive limit (LEL) and at oxygen (O_2) levels of less than 19.5% or greater than 23.5%. Any sustained LEL readings above 5% will be investigated by the site safety officer/CIH. Oxygen and LEL readings will be read concurrently to ensure an accurate LEL measurement.

Toxic Gases: Toxic gases such as carbon monoxide and hydrogen sulfide will be monitored with direct-reading electrochemical sensors The action level for carbon monoxide is 12 5 parts per million (ppm) and the action level for hydrogen sulfide is 2.5 ppm. Colorimetric indicator tubes for oxides of nitrogen and sulfur dioxide will be used to supplement air monitoring as directed by the site safety officer/CIH.

Organic Vapors: Air monitoring for organic vapors will be conducted using a photoionization detector (PID). The PID action level is a sustained reading (i.e., 20 seconds within a worker's breathing zone) at or above 5 ppm.

Particulates: If operations have the potential to produce airborne particulate, monitoring will be conducted by a direct-reading instrument or sample collection and laboratory analysis. The action level for inhalable particulate is 5 milligrams per cubic meter (mg/m^3). The need for additional particulate monitoring, such as respirable particulate or silica, will be assessed by the site safety officer/CIH.

8.2.0 Excavation Areas CWM Concerns

8.2.1 Air Monitoring

8.2.1.1 Air Filtration

8.2 1.1.1 The containment structure (Sprung™ building) has a negative air pressure filtration system that will replace all air inside the containment six times an hour. Due to this high rate of air exchange the probability of even approaching any airborne exposure limits is an unlikely scenario.

8.2.1.1.2 In the event readings at or above the action level are encountered, work will cease and workers shall immediately exit the work area. An increase in PPE shall be instituted until corrective action is completed or readings return to safe levels. Readings at or above the action levels will be relayed to the SSHO and the CIH. UXB's certified industrial hygienist (CIH) may be reached at (703) 724-9600.

8.2.1.2 CWM Air Monitoring/Sampling Types and Frequency

8.2.1.2.1 Edgewood Chemical and Biological Command (ECBC) is responsible for performing all CWM monitoring. The following paragraphs provide a generalized summary of CWM monitoring. A detailed description of CWM monitoring requirements, procedures, and equipment is provided in the ECBC Monitoring Plan.

8.2.1.2.2 During remediation activities, ECBC personnel will continuously monitor all work areas for the presence of CWM vapors in real time using the Miniature Chemical Agent Monitoring System (MINICAMS) and Real Time Analytical Platform (RTAP). Real time monitoring for mustard and lewisite vapors will also be performed at the inlet to the filter system providing negative pressure to the filtered containment structure and the personal decontamination station (PDS). Lewisite monitoring will only be conducted at the CAIS burial site. ECBC will also monitor filtered containment air at the mid-bank of the Filter Unit. This is the area between the first and second charcoal filter bed. Monitoring locations and procedures are described in the ECBC Monitoring Plan located in Book 3 of the Safety Submission. If the mid bank testing indicates CWM break-through, all work inside the containment will be stopped ECBC will perform confirmation sampling as indicated in the ECBC Monitoring Plan.

8.2.1.2.3 Mobile area monitoring will also be performed for CWM using Depot Area Air Monitoring System (DAAMS) tubes. The DAAMS samples will not be used to immediately warn of hazardous conditions. They will be used to confirm the results of the real time monitors and document conditions over time. The DAAMS samples will be collected as described in the ECBC Monitoring Plan in Book 3 of the Safety Submission.

8.2.2 Area 24B CWM Concerns

8.2.2.1 According to documentation provided, Area 24B was used to dispose of bulk sulfur mustard (H) agent. The mustard agent was decontaminated in a slurry of chlorate of lime. The potential decomposition products are carbon dioxide (CO_2), chloride, and sulfate.

8.2.3 Area 24A Concerns

8.2.3.1 According to documentation provided, Area 24A was used to dispose of bomb fragments potentially contaminated with mustard agent (H). The potential decomposition products are carbon dioxide (CO_2), chloride, and sulfate.

8.2.4 Area 1 CWM Concerns

8.2.4.1 According to documentation provided, Area 1 was used to dispose of Chemical Agent Identification Sets (CAIS). Each kit contained a minute quantity of active chemical agent (mustard, lewisite, chloropicrin, and phosgene). The most common decomposition products of these products are CO_2, Chloride, HCL, and Phosphate. Colorimetric Tubes shall be utilized to detect the presence of HCL (Hydrogen Chloride) which is a decomposition product of phosgene and Lewisite. Samples shall be collected hourly during intrusive excavations

8.3.0 Non-CWM Monitoring Concerns

8.3.1 General

8.3.1 1 UXB is responsible for performing all non-CWM site monitoring. The following paragraphs provide a detailed description of non-CWM monitoring requirements, procedures, and equipment. The following pieces of equipment are required for conducting non-CWM health hazard assessments and monitoring at the site:

MX 251 Combination Combustible Gas Indicator. Lower Explosive Limit- LEL (Methane) and O_2 Concentration;

T8551 Carbon Dioxide/Carbon Monoxide/Temp./Humidity Continuous Monitor;

Noise Dosimeter/Sound Level Meter;

PDM-3 Miniram Aerosol/Dust Monitor;

Colorimetric tubes for hydrogen chloride (HCL).

8.3.1.2 During excavation activities inside the containment structure there is the concern of high carbon monoxide (CO) levels from heavy equipment emissions. This is a concern any time excavation activities occur in the containment structure.

8.3.1.3 Due to potential pockets of methane gas (a volatile organic compound-VOC.) in excavated areas, continuous monitoring for flammable gas (LEL, Lower Explosion Limit: Methane) and oxygen content shall be conducted.

8.3.1.4 Noise level hazards shall be monitored periodically through the work shift (i.e. during heavy equipment operation) utilizing a Noise Dosimeter/Sound Level Meter.

8.3.1.5 Airborne dust is a concern at any excavation site. Due to the use of a containment structure with regulated minimum air changes, this may not be a concern for this project. Until this can be verified, dust monitoring will be conducted during excavation activities.

8.3.2 Non-CWM Monitoring Equipment

8.3.2.1 The following sections briefly describe the conditions under which the equipment must be used.

8.3.2.1 Combination Combustible Gas Indicators (CGI)/Oxygen Monitor/Carbon Monoxide

8.3.2.1.1 Combustible gas indicators are used to identify when flammable materials are in the flammable range. The CGI will report units in percent of the lower explosive limit (LEL) and are valuable in determining when methane is present The CGI shall be used during intrusive activities, as necessary, to rule out methane pockets in the ground It is recommended that the CGI be placed as close as possible to the work site and operated continually with the alarm set at the action level for stopping work (i e., 10 percent of the LEL) The UXB SSHO or his designee will record CGI readings at 30-minute intervals. The O_2 and CO detectors will monitor to assure that the earth moving machinery is not generating a hazardous atmosphere.

8.3.2.1.2 Oxygen deficiencies are not expected to occur. The oxygen readings should be evaluated periodically (every 30 minutes) to ensure that another gas is not displacing oxygen or that the meter is functioning properly.

8.3.2.2 Sound Level Meters (SLM)/Noise Dosimeter

8.3.2.2.1 Noise measurements must be characterized in order to prescribe the correct amount and type of hearing protection, and to designate zones where hearing protection is required. Noise levels may be monitored using a SLM or a dosimeter. The UXB SSHO will coordinate the noise-monitoring program. Any noise monitoring equipment that will be used must meet OSHA requirements (ANSI S1.4-1971, R1976- "Specifications for Sound Level Meters, Type 2"). All measurements will be taken on the 'A' scale in the slow response mode. This monitor will be factory calibrated.

8.3.2.3 Dust Monitors

8.3.2.3.1 Chemicals that may present an inhalation hazard via dust include metals and other non-volatile compounds. Real-time air monitoring for dust is required during invasive activities. Monitoring will be performed continuously using miniature real-time aerosol monitor (MINIRAM) with an alarm set to 2.5 mg/m^3. The MINIRAM will be calibrated daily in accordance with the manufacturer's instructions

8.3.2.2 Colorimetric Tubes

8.3.2.4.1 Colorimetric tubes will be used to detect hydrogen chloride (HCL) a decompositon product of phosgene and lewisite. Readings will be collected hourly during invasive work. It should be noted that there is a reported +/- 25% accuracy associated with the Colorimetric tubes.

8.4.0 Non-CWM Action Levels

8.4.1 Organic Vapors

8 4 1.1 Site-specific organic vapor action levels are set for the site as follows:

1. < 5 ppm — Continue work;
2. > 5 ppm for 5 minutes — Evacuate area and consult with the UXB CIH.

8.4.2 Combustible of Flammable Atmospheres

8.4.2.1 The following limits will be used for potentially combustible or flammable atmospheres:

1. <10 percent LEL — Continue work, consider organic vapor readings and toxicity;
2. >10 percent LEL — Cease activities and evacuate the site for evaluation with UXB CIH.

8.4.3 Oxygen Concentration

8.4.3 1 The following limits will be used:

1. < 19.5 % Evacuate site and evaluate. Must use supplied air respirator for re-entry.
2. 19 5 % to 23.5 % Continue work.
3. > 23.5 % Evaluate the monitoring equipment. If correct, potential explosion hazard.

8.4.4 Noise

8 4 4.1 The following limits will be used:

1 < 85 dBA Continue work.

2. >85 dBA Use hearing protection device rated at no less than the amount that would bring the exposure to under 85 dBA.

dBA Reading	Allowable Time Without Hearing Protection
85	8 hours
90	4 hours
95	2 hours
100	1 hour
105	0.5 hour
110	0.25 hour

8 4.4.2 Additionally, disposable hearing protection devices shall be available to site personnel upon request.

8.4.5 Nuisance Dust

8.4.5.1 The following limits will be used:

1. 2.5 mg/m^3 Implement dust suppression techniques. Optional use of Level C with half or full-face APR with HEPA filters or combination organic vapor/HEPA filter if organic vapor action level also is reached.

2. 5 mg/m^3 Mandatory use of Level C with half or full-face APR with HEPA filters or combination organic vapor/HEPA filter if organic vapor action level also is reached.

8.4.6 Carbon Monoxide

8.4.6.1 The following limits will be used:

1. <25 ppm Continue work.

2 >25 ppm Evacuate area and consult with UXB CIH

8.5.0 Meteorological Monitoring

8.5.0.1 Meteorological monitoring for this CWM will consist of the SSHO tuning to a local radio station and/or calling the weather station for weather reports and forecasts. Refer to Section 10, Table SSHP 10-1 for telephone numbers.

8.6.0 Noise Monitoring

8.6 0 1 Personnel operating, or in the vicinity of heavy equipment, and personnel conducting site preparation with chain saws and weed whackers, are required to wear hearing protection.

8.7.0 Radiation Monitoring

8.7.0.1 Not applicable to this delivery order. Based upon a review of available documentation and the Scope of Work, radiation is not a hazard at this site.

8.8.0 Monitoring/Sampling Protocol

8.8.0.1 Sampling and monitoring protocols are the responsibility of ECBC (Book 3, Safety Submission).

8.9.0 Corrective Action

8.9.0.1 The SSHO will administer corrective actions, when necessary, as directed by the CIH.

8.10.0 Heat Stress Monitoring

8.10.1 Heat Stress Monitoring and Work Cycle Management

8.10.1.1 Both heat stress and heat strain must be assessed in evaluating worker safety and health, using the decision tree diagram shown at Figure SSHP 8-1.

8.10.1.2 Heat stress is the net load on the body with contributions from both metabolic heat production and external environmental factors including temperature, relative humidity, radiant heat transfer, and air movement, as they are affected by clothing.

8.10.1.3 Heat strain is the net physiological load resulting from heat stress.

8.10 1.4 TLVs specified in Table SSHP 8-1 refer to heat stress conditions under which it is believed that nearly all heat acclimatized, adequately hydrated, unmedicated, healthy workers wearing light-weight summer clothing may be repeatedly exposed without adverse health effects. The work areas are assumed to have at least some air movement. When the WBGT values in Table SSHP 8-1 must be exceeded, the guidelines in Table SSHP 8-2 must then be followed.

8.10.2 Physical Barriers to Heat Loss

8.10 2.1 Evaporation of sweat from a person's skin can be an important means of dissipating heat from the body. Also, the free movement of cool, dry air over the skin's surface optimizes heat loss. Water vapor impermeable or thermally insulating clothing, encapsulating suits, and similar convective and evaporative barriers can severely restrict heat loss and produce life-threatening heat strain, even when the ambient air temperature, radiant heat, and humidity are low. Whenever workers wear such restrictive clothing, it is essential that extra caution be exercised.

8.10.3 Wet-Bulb Globe Temperature (WBGT)

8.10.3.1 Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required to correlate with deep body temperature and other physiological responses to heat. The Wet Bulb Globe Temperature (WBGT) Index is the simplest and most suitable technique to measure the environmental factors.

8.10.3.2 Measurement of WBGT offers a useful, first-order index of heat stress by assessing the net effects of dry air temperature, radiant heat transfer, and ambient humidity. It may not, however, sufficiently reflect the effects of air movement on convective heat transfer or evaporative heat loss (typically major avenues of heat loss) and it does not by itself account for heat produced by physical work, often a major source of heat strain.

8.10.3.3 WBGT values are calculated using the following equation:

WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

WBGT = wet bulb globe temperature index

NWB = natural wet-bulb temperature

GT = globe temperature

DB = dry-bulb temperature

8.10.3 4 The WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer.

1. The wick of the natural wet-bulb thermometer should be kept wet with distilled water for at least ½ hour before the temperature reading is made. The wick should extend over the bulb of the thermometer, covering the stem about one additional bulb length.
2. The dry-bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb.
3. The globe thermometer should be exposed at least 25 minutes before it is read.
4. A stand should be used to suspend the three thermometers so that they do not restrict free airflow around the bulbs, and the wet-bulb and globe thermometers are not shaded.

8.10.3.5 As Table SSHP 8-2 indicates, acceptable WBGT exposures depend on the rate of metabolic heat production and the balance of work and rest periods.

8.11.0 Work Rate

8.11.1 Introduction

8.11.1.1 As shown in Table SSHP 8-3, physical activity can impose high rates of heat production. It is commonly the major source of heat strain, even when there is little or no environmental heat stress. The metabolic heat resulting from such activity can be an especially serious threat for someone wearing water-vapor-barrier or heat-insulating clothing, or an encapsulated suit. Even in cool and dry ambient conditions, high work rates or wearing such clothing require that the guidelines in Table SSHP 8-2 be followed.

8.11.2 Heat Acclimatization

8.11.2.1 Periodic physical activity performed under heat stress conditions normally induces physiological changes, including those in Table SSHP 8-4, that allow a worker to withstand heat stresses with reduced heat strain. Heat acclimatization is acquired gradually over weeks of continued physical activity under heat stress conditions. Its loss begins when the activity under heat stress conditions is discontinued.

8.11.3 Heat Strain

8.11.3.1 Heat Strain manifests itself in four disorders – Heat Stroke, Heat Exhaustion, Heat Cramps, and Sunburn. The symptoms, treatments, warnings, and prevention of each of these disorders and a work/rest schedule are noted in Table SSHP 8-5.

8.11.4 Optimizing Safety and Health

8.11.4.1 People who are least endangered while working in heat stress conditions are young and appropriately clothed, in good general health and physical condition, not obese, and adequately hydrated with electrolyte concentrations in normal ranges. To help assure that safe and healthy conditions are maintained, the guidelines in Table SSHP 8-6 should be followed.

8.12. Cold Stress Monitoring

8.12.0.1 Cold Stress disorders includes Hypothermia, Frostbite, and Chilblain. The symptoms, treatment, and prevention of these disorders, plus work/rest cycles are detailed in Table SSHP 8-7.

8.12.0.2 The ACGIH cold stress standard shall be the minimum protocols for cold stress, Table SSHP 8-8. The cooling power of wind on exposed flesh is depicted in Table SSHP 8-9.

Figure 8-1 SSHP Evaluating Heat Stress and Strain

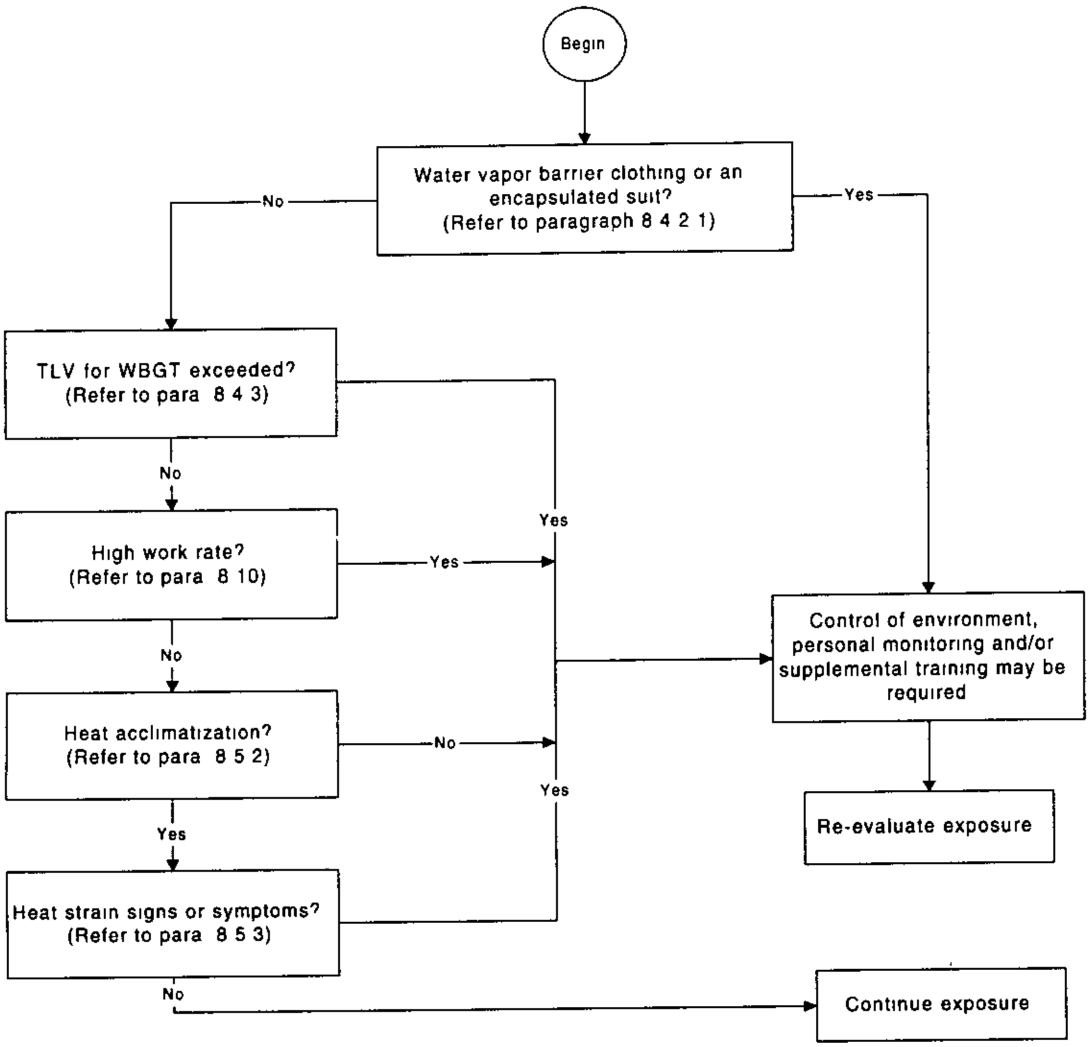

Table 8-1 SSHP TLVs for Heat Exposure

Hourly Activity	Work Rates		
	Light	Moderate	Heavy
100% Work	30.0°C/86.0°F	26.7°C/80.0°F	25.0°C/77.0°F
75% Work - 25% Rest	30.6°C/87.0°F	28.0°C/82.5°F	25.9°C/78.0°F
50% Work - 50% Rest	31.4°C/89.0°F	29.4°C/85.0°F	27.9°C/82.5°F
25% Work - 75% Rest	32.2°C/89.5°F	31.1°C/88.0°F	30.0°C/86.0°F

Temperature values in WBGT
Refer to Table SSHP-8-3 for work rates.
Work and rest environments are assumed to be the same. If different, hourly time-weighted average WBGTs must be calculated.

Table 8-2 SSHP Guidelines for Heat Exposure Limits

Always monitor signs and symptoms of heat-stressed workers (refer to Table SSHP 8-5). When WBGT-TLV criteria (Table SSHP-8-1) are exceeded or water vapor impermeable clothing is worn, discontinue any environmentally induced or activity-induced heat stress for a person when any one of the following indicators is exhibited.
Sustained heart rate is greater than 160 beats per minute for those under 35 years of age Sustained heart rate is greater than 140 beats per minute for those 35 years of age or older Complaints of sudden and severe fatigue, nausea, dizziness, lightheadedness, or fainting Periods of inexplicable irritability, malaise, or flu-like symptoms Sweating stops and the skin becomes hot and dry
Good physical fitness and adequate hydration are the first lines of defense against heat stress

Table 8-3 SSHP Examples of Metabolic Heat Production

Work Rates	Activity	Watts
Resting	Sitting quietly	130
	Sitting with moderate arm movements	150
Light	Sitting with moderate arm and leg movements	175
	Using table saw	215
	Standing with light work at machine or bench and some walking about	220
	Standing with light work at machine or bench while using mostly arms	250
	Replacing tires	255
	Standing with moderate work at machine or bench and some walking about	260
Moderate	Walking about with moderate lifting or pushing	360
	Carpenter sawing by hand	475
	Shoveling dry sand	480
	Heavy assembly work on a noncontinuous basis	500
Heavy	Intermittent heavy lifting with pushing or pulling (pick and shovel work)	520
	Shoveling wet sand	535

Table 8-4 SSHP Heat Acclimatization Benefits

Someone with heat acclimatization exposed to environmentally or activity-induced heat stress has:
Improved productivity and safety More stable and better regulated blood pressure which promotes lower pulse rates, less fatigue, improved alertness, and focus of attention More finely tuned sweating reflexes with increased sweat production rate at lower electrolyte concentrations, when needed Fewer and less severe signs and symptoms of heat strain for the same level of heat stress

Table 8-5 SSHP Heat Strain Monitoring

HEAT STRAIN
(In descending order of severity)

HEAT STROKE (Sun Stroke) results from the disruption of the body's heat regulating system, producing excessively high body temperature. Can be caused by continuous exposure to high temperatures for as little as three hours. **RAPID COOLING IS URGENT TO PREVENT DEATH.**

SYMPTOMS:
- Extremely high body temperature, often 106° Fahrenheit (F) or above
- Skin is red, hot, and dry, sweating is absent
- Pulse is rapid and strong
- Convulsion or collapse is possible
- Delirium, disorientation, or unconsciousness is possible

EMERGENCY TREATMENT:
- Immediately call for emergency help
- Place person in an air-conditioned room, vehicle, or in a shaded area (at a minimum)
- **COOL THE PERSON RAPIDLY** – remove the person's clothing, bathe the body in cool water, and massage continuously (submerge in cool water, or at least administer a sponge bath). Fans or air currents (such as hand fanning) also assist in the cooling process.
- When the back of the hand held against the victim's cheek indicates normal skin temperature, or when internal body temperature reaches 102°F or less, discontinue the cooling process and wrap the person in a blanket to prevent shock.
- Victim may sip liquids

WARNINGS:
- **Do not administer alcoholic beverages or stimulants (coffee, tea)**
- **If the body temperature begins to rise again, repeat the cooling process**

PREVENTION:
- Protect the body from radiant heat
- Break the workday into short work/rest periods
- Drink enough fluids to replace those lost by sweating

HEAT EXHAUSTION (Heat Prostration or Heat Collapse) results when the circulatory system fails to sufficiently compensate for increased blood flow demands imposed by the need to cool the body and dehydration caused by profuse sweating. Failure to provide quick treatment can lead to heat stroke.

SYMPTOMS:
- Body temperature is normal or slightly elevated
- Skin is clammy and pale, and there is a moist, profuse sweating
- Pulse may be weak with low blood pressure
- Victim is tired and weak
- Victim may complain of dizziness or giddiness, and fainting is possible
- Possible muscle cramps
- Possible nausea or vomiting
- Mental state is generally rational

EMERGENCY TREATMENT:
- Place person in an air conditioned room, vehicle, or in a shaded area (at a minimum)
- Have person lie down; elevate feet 8 - 12 inches
- Loosen tight fitting clothing
- If conscious, have victim sip a glass of electrolyte replacement solution (Gatorade, ERG, or Squincher). Repeat ever 15 minutes to 1 hour, stop fluids if vomiting occurs.
- If symptoms persist or return, immediately summon medical assistance

PREVENTION:
- Schedule frequent rest periods
- Drink electrolyte liquids every 15 minutes to 1 hour to replace body fluids

HEAT CRAMPS are muscle pains and spasms caused by loss of electrolytes (due to sweating over an extended period of time). Not life threatening, but heat cramps may hinder work or cause a potential hazardous situation.

SYMPTOMS:
- Painful muscle cramps and spasms
- Heavy sweating, vomiting, and/or convulsions
- Normal, or near normal, pulse and blood pressure
- Irrational behavior

EMERGENCY/MEDICAL TREATMENT:
- Quiet rest in a cool, shaded area
- Gently massage affected area
- If person is not vomiting, give electrolyte fluids every 15 minutes to 1 hour
- If symptoms persist, victim should be transported to the nearest medical facility.

PREVENTION:
- Salt food more heavily than normal
- Drink electrolyte solutions

HEAT STRAIN (In descending order of severity)
• Eat salty foods during heavy sweat-producing activities
WARNING: If on a low sodium diet or taking diuretics, consult your physician regarding the replacement of salts prior to field activities Be sure to explain any problems to the LCPM
SUNBURN is the most common of the heat disorders. It is usually a first-degree burn of the epidermis (first layer of skin), and the effects may not be noticed or felt until several hours after exposure.
SYMPTOMS: • Skin redness • Pain • Swelling • Blisters, nausea, vomiting, chills (in severe cases)
EMERGENCY/MEDICAL TREATMENT: • Put cold water on the burned area as quickly as possible • Submerge severe burns in cold water or soak with wet cloths • Elevate burned limbs • Do not break a blister (this increases the chance of infection)
PREVENTION: • Cover exposed parts of the body • Gradually expose the skin to the sun for 20 minute intervals per day, extending the time as the skin builds its own natural protection in the form of a tan • Use sun lotion, sun block, and sun shields (reapply every hour, even on cloudy days)
HEAT STRESS MONITORING AND WORK/REST CYCLE
The following will be implemented during field activities when the temperature exceeds 70°F The LCPM will determine the appropriate work/rest schedule and ensure all personnel take the appropriate breaks, additional breaks will be approved, as necessary. Measure Heart Rate: To be conducted for 30 seconds as early as possible during the rest cycle The rate should not exceed 110 beats per minute for most people. If the heart rate is higher during the next rest period, the following cycle should be shortened by 33 percent The reduction of the work cycle will continue until the pulse rate reaches 110 beats per minutes. Measure Body Temperature orally with a clinical thermometer as early as possible in the resting period. If oral temperature (OT) at the beginning of the rest period exceeds 99.40°F, the worker will be prohibited from continuing work until the OT is maintained below 99 4°F (37.4°C) The next work cycle will be reduced by 33% if the oral temperature exceeds 99 68 °F (37.6°C) Establish Work/Rest Schedule The SSHO will monitor personnel every two hours at temperatures above 70°F, and every hour at temperatures above 90°F. Cool drinks will be available for consumption during rest periods.

Table 8-6 SSHP Guidelines for Optimizing Safety and Health

For people working in hot conditions:
Encourage drinking small volumes (approximately 1 cup) of cool or tepid water about every 20 minutes Provide work settings with good ventilation and shielding from radiant heat sources Assure co-worker observation to detect signs and symptoms of heat strain Pay extra attention to those who take medications that compromise normal cardiovascular, blood pressure, body temperature regulation, renal, or sweat gland functions
Never ignore anyone's signs or symptoms of heat strain

Table 8-7 Cold Stress Monitoring

COLD STRESS (In descending order of severity)
HYPOTHERMIA is characterized by a significant loss of body heat. Moderate cases may exhibit the first 7

COLD STRESS (In descending order of severity)
symptoms below. Severe cases are indicated with extremely cold skin; loss of consciousness; faint pulse; and shallow, infrequent, or apparently absent respiration – death may result.
SYMPTOMS 1 Severe shivering 6 Repeated falling 2 Abnormal behavior 7 Inability to walk 3 Slowing of movements 8 Collapse 4 Stumbling 9. Stupor 5. Weakness 10 Unconsciousness
EMERGENCY/MEDICAL TREATMENT. • A severely shivering worker shall immediately terminate work and exposure to cold • Seek qualified medical help immediately • Remove the victim from the hypothermia-producing environment • Keep handling to a minimum, DO NOT rub or massage the victim • Cover the victim lightly with blankets, plastic may be used for further insulation DO NOT cover face. • If victim is conscious, administer hot drinks, encourage activity (walking while wrapped in a blanket), and DO NOT administer any form of sedative, tranquilizer, or analgesic (pain reliever), as they may facilitate further heat loss.
PREVENTION: Wear insulated garments in a layered fashion
FROSTBITE includes localized injury resulting from exposure to cold temperatures, and includes several degrees of severity.
SYMPTOMS: • <u>frostnip or incipient frostbite</u> is a sudden blanching or whitening of the skin • <u>superficial frostbite</u> has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient • <u>deep frostbite</u> is an extremely serious condition in which tissues are cold, pale, and solid.
EMERGENCY/MEDICAL TREATMENT. DO NOT rub effected part with snow Slow rewarming in water at 103° - 105°F Give warm nutritious drinks (no alcohol). Victim should not smoke.
PREVENTION: Wear insulated garments in a layered fashion
CHILBLAIN is an inflammation caused by exposure to cold moisture.
SYMPTOMS: • Localized itching • Severe spasms • Swelling • Pain • Inflammation of fingers, toes, or ears
EMERGENCY/MEDICAL TREATMENT: Warm gradually by placing parts in lukewarm water or with warm hands. Do not rub. Place victim in warm but not hot room. Give warm nutritious drinks (no alcohol).
PREVENTION. Wear insulated garments in a layered fashion.
COLD STRESS PREVENTION AND WORK/REST CYCLE
• A work/rest regime and a heated shelter shall be provided, as needed. A change of clothing for each worker shall be on hand Warm, non-alcoholic drinks (avoid caffeine) and soup will be available, if required. • Use the heated shelter at regular intervals when temperatures below 20°F or equivalent wind chill are present. Frequency of breaks is dependent on environmental conditions and each worker's needs. • When entering shelter, remove outer layer of clothing and loosen remaining clothing to permit sweat evaporation. Do not return to work with wet work clothing. • Heavy shivering, frostnip, excessive fatigue, drowsiness, irritability, or euphoria indicate an immediate return to the heated shelter. • If conditions are below 10°F or an equivalent wind chill, the following shall apply: Work under constant supervision and the buddy system Reduce work rate to avoid heavy sweating Instruct workers in warming procedures, first aid, clothing, eating/drinking, and recognition of signs and symptoms of impending frostbite, hypothermia, or excessive cooling without shivering.

Table 8-8 SSHP Cold TLVs

Air Temp Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
C (approx.)	F (approx.)	Max Work Period	No of Breaks	Max. Work Period	No. of Breaks	Max Work Period	No of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No of Breaks
-26 to -28	-15 to -19	Norm.	1	Norm	1	75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Norm.	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
-43 & belo	-45 & belo	Non-emergency work should cease									

Notes for Table

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

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:

3. 5 mph: light flag moves

4. 10 mph: light flag fully extended

5. 15 mph: raises newspaper sheet

6. 20 mph: blowing and drifting snow

7. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m2: 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m2. In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges because windy conditions rarely prevail at extremely low temperatures.

8. TLVs apply only for workers in dry clothing.

Table 8-9 SSHP

Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature

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

TAB

SSHP 9. Site Control

9.0 Site Control

9.0 1 Site control is an important part of a field health and safety program. The purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism of the site operations. Site control requires the establishment of site work zones, a communications network, an evacuation protocol, and site security. Personnel on site will use the buddy system and will maintain communication or visual contact between team members at all times. The possibility of exposure or transaction of substances will be reduced or eliminated by.

- Establishing physical barriers (e g. fencing, containment structure, etc.) to exclude unnecessary personnel from the general area.
- Setting up manometers at three locations, and performing pre-operational tests on the containment structures filter units using HEPA filter and carbon filter integrity testing methods.
- Establishing work zones around each site work area.
- Establishing control points to regulate access to work zones.
- Minimizing the number of personnel on site consistent with effective operations.
- Implementing appropriate decontamination procedures.

9.1.0 Site Work Zones

9.1.0.1 After confirming the appropriate level of PPE for site entry and determining the general wind direction (for evacuation purposes only), site work zones including an Exclusion Zone (EZ), a Contamination Reduction Zone (CRZ; includes a personnel/equipment decontamination), and a Support Zone (SZ) shall be established The SSHO is responsible for defining, marking, and enforcing the zones. The work zones for Burial Site 1 are depicted in Figure 9-1.

9.1.1 Exclusion Zone

9.1.1.1 The exclusion, or "hot," zone is the zone where contamination or potential contamination exists. Consequently, all personnel entering the EZ must wear prescribed PPE, and adhere to the training and medical surveillance requirements presented in Sections 6.3 and 7.0, respectively As described in the work plan, a filtered air containment structure with a negative air filtration system will be constructed over the site to protect site workers, support personnel, and the public (Fig. WP 3-1) The interior of the filtered containment structure is considered the EZ. The filtered containment structure will be of sufficient size to include all equipment necessary to perform site remediation tasks. Field personnel will enter and exit the filtered containment structure through a door controlled by the SSHO. Gross decontamination will take place near the "hotline," before proceeding to the CRZ.

9.1.2 Contamination Reduction Zone

9.1.2.1 A CRZ will be established between the EZ and the SZ. The CRZ is the area where personnel and equipment will undergo decontamination. The CRZ serves as a buffer to further reduce the probability of the clean zone becoming contaminated or being affected by other existing hazards. It will provide additional assurance that the physical transfer of contaminants via personnel or equipment is limited through a combination of decontamination procedures and a minimum required distance between exclusion and support zones Initially, the CRZ will be considered to be a non-contaminated area. As operations proceed, the area around the decontamination station may become contaminated, but to a much lesser degree than the EZ.

9.1.3 Support Zone

9.1.3.1 The support zone, the outermost part of the site, will be considered a non-contaminated or clean area. Support equipment (command post, safety vehicle, etc) is located in this area. Since normal work clothing is appropriate within this zone, potentially contaminated clothing, equipment, and samples are not permitted. The location of the command post and other support facilities in the support zone depends on a number of factors, including:

- Accessibility – topography; open space available; locations of roads, or other limitations.
- Visibility – line of sight to all activities in the exclusion zone is preferable.
- Wind direction – preferably the support facilities should be located upwind of the exclusion zone. Shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources – water; mobile telephone; or other communication equipment.

9.1.3 2 Access to the CRZ from the SZ will be through a controlled access point. The SSHO will maintain a Site Visitor's Logbook that is located in this zone. Personnel entering the CRZ to assist in decontamination will wear the prescribed PPR. Re-entrance into the SZ will require removal of any PPE worn in the CRZ.

9.2.0 Emergency Protocol

9.2.0 1 UXB shall take the following actions to minimize chemical/physical hazards and operational mishaps:

- Evacuation routes shall be established and communicated to all personnel during daily safety meeting prior to work start-up in any area.
- Warning devices shall be placed at each work area in the exclusion zone, personnel decontamination station, and support zone.
- Communication devices will be available for general and emergency use, and will be compatible with all agencies on site. The communication devices will include radios, cellular phones, land-line phones, and voice.

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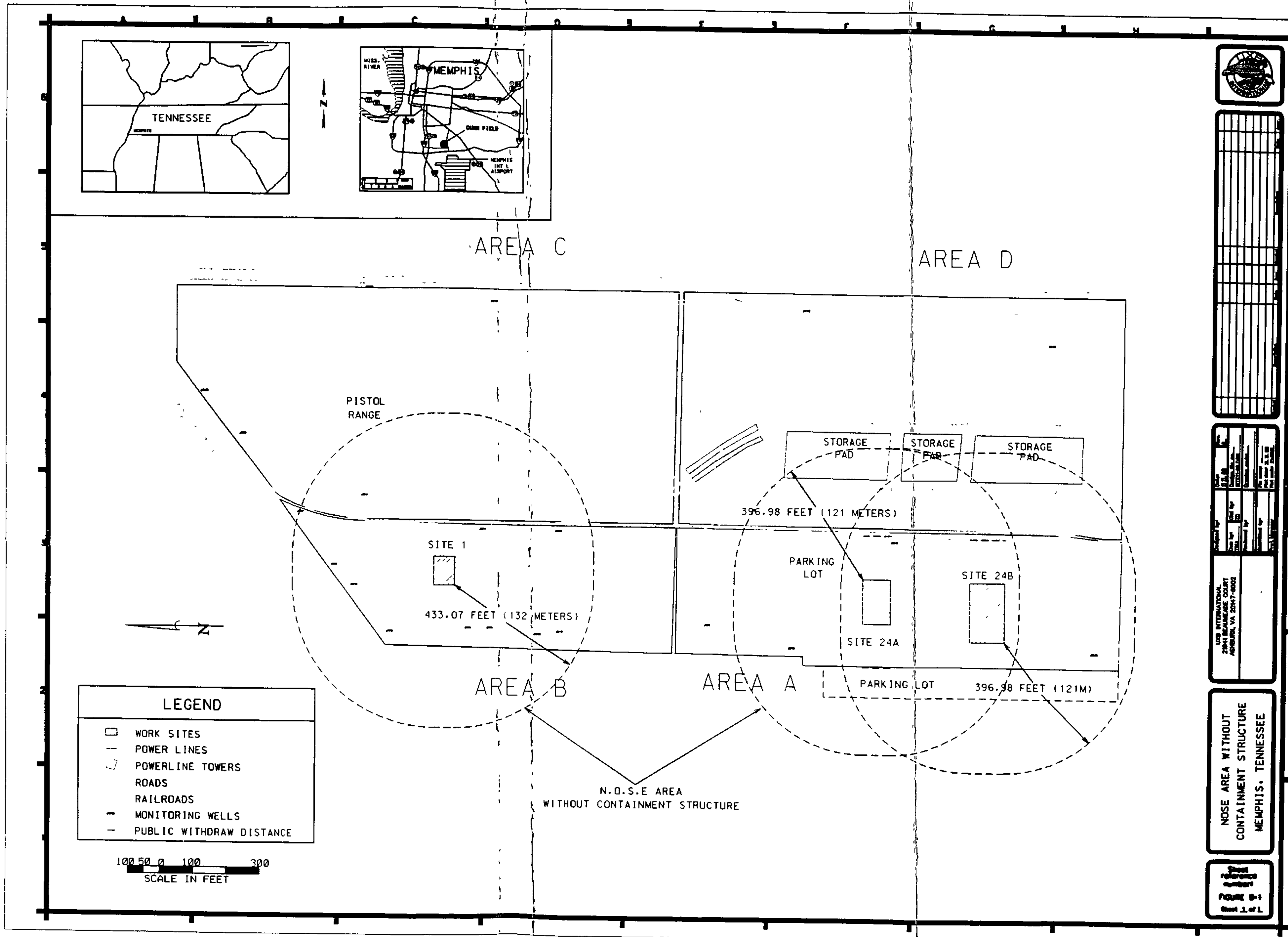

TENNESSEE
MEMPHIS
MISS. RIVER
AREA C
AREA D
PISTOL RANGE
STORAGE PAD
STORAGE PAD
STORAGE PAD
396.98 FEET (121 METERS)
SITE 1
433.07 FEET (132 METERS)
PARKING LOT
SITE 24A
SITE 24B
PARKING LOT
396.98 FEET (121M)
AREA B
AREA A
N.O.S.E AREA
WITHOUT CONTAINMENT STRUCTURE
LEGEND
WORK SITES
POWER LINES
POWERLINE TOWERS
ROADS
RAILROADS
MONITORING WELLS
PUBLIC WITHDRAW DISTANCE
100 50 0 100 300
SCALE IN FEET
N
NOSE AREA WITHOUT CONTAINMENT STRUCTURE
MEMPHIS, TENNESSEE
UXB INTERNATIONAL
21641 BEAUMEADE COURT
ASHBURN, VA 20147-6002
FIGURE 9-1

TAB

SSHP 10. Emergency Response and Contingency procedures

10.0 Emergency Resp ns and Contingency Procedures

10.0.1 Personnel must be prepared to immediately respond to emergency situations, and all required equipment must be readily available, in proper working order, and ready for use. To ensure rapid, effective response to an emergency, these emergency response and contingency procedures (developed in accordance with 29 CFR 1910.120) shall be implemented prior to and during operations.

10.1.0 Pre-Emergency Planning and Procedures

10.1.0.1 The following will ensure appropriate pre-emergency planning and procedures are in place. Upon mobilization, weekly, and during the morning safety meetings, personnel will be briefed on:

1. location of the nearest means of off-site communications;
2. evacuation routes (these will change as the project progresses);
3. assembly points (these will change as the project progresses);
4. location of maps depicting the route to the hospital – posted in the office and break areas, and maintained in the designated emergency vehicle and all personnel vehicles;
5. emergency telephone numbers (posted in the project office and all break areas); and
6. first Aid and PPE equipment shall be readily available.

10.2.0 Personnel Roles, Lines of Authority, Communications

10.2.0.1 Immediate control will reduce jeopardizing on-site personnel and the surrounding community. The LCPM will assume the responsibilities of the On-Scene Incident Commander (OSIC). If the LCPM is unavailable or incapacitated, the UXO Supervisor will assume the role. The OSIC will direct all on-site and off-site response personnel and the level of response being dictated by the severity of the situation.

10.2.0.2 Communications consist of a combination of hand-held radios, commercial telephones, and cellular telephones.

10.3.0 Emergency Contacts

10.3.0.1 Table SSHP 10-1 is a list of Emergency Telephone Numbers that will be posted in the project office, in all break areas, and available to all personnel in case of an emergency.

10.4.0 Emergency Recognition and Prevention

10 4.0.1 At the morning safety meetings, employees will be briefed on new developments, tasks, hazards, hazard recognition, and appropriate prevention procedures. These meetings will include:

1. tasks to be performed;
2. specific hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals;

3 transportation routes along which hazardous substances move;

4 additional hazards as a direct result of site activities, and prevention and control techniques, and

5. emergency procedures.

10.5.0 Site Evacuation

10.5.1 Criteria

10.5.1.1 The SSHO will determine the need to evacuate the Exclusion Zone based on the following criteria·

1. discovery of suspected CWM;
2. change in site conditions that would require an upgrade of PPE, and
3. fire and/or explosion.

10.5.2 Emergency Alerting Procedures

10.5.2.1 Emergency notification will normally be conducted via hand-held radios The following air horn system will supplement the radio notification system.

1. **One long blast on the air horn (30 seconds)** – immediately evacuate the site and proceed to the designated place of refuge.
2. **Two short blasts (5 seconds at 1 second intervals)** -- "all clear" signal indicating that personnel can once again re-enter the site.

10.6.0 Emergency PPE and Equipment

10.6.0 1 Each UXB vehicle, UXB's on-site office, and each operational site will be supplied with at least one 2A:10B:C fire extinguisher (5 pounds).

10.6.0.2 First aid kits, complying with 29 CFR 1910.151 and ANSI Z308.1, will be located at each operational site and at UXB's on-site project office. Kits will be inspected on a weekly basis and missing components immediately replaced.

10.7.0 Safe Distance

10.7.0.1 Safe distances are established after considering the amount and type of substance(s) at the site, as well as the potential impact on workers and the public. Actual safe distances can only be established at the time of an emergency, based on a combination of site-specific and incident-specific factors. Some factors that need to be considered are.

1. the toxicological/radiological properties of the substance;
2. the physical state of the substance;
3. the quantity and rate of release;
4. the method of release;
5. the atmospheric conditions; and

6 local topography

10.8.0 Place of Refuge

10.8.0.1 In the unlikely event that an evacuation is required, personnel will immediately proceed to UXB's on-site office At this mustering point, an accounting of personnel will be conducted, as well as personnel interviews to assure no one has sustained injuries as a result of the accident or incident. Once all personnel are accounted for, the OSIC will assess the situation and outline the actions to be taken.

10.8.0.2 UXB's on-site office will serve as the primary refuge. The LCPM will identify and announce other locations, as site conditions warrant.

10.8.0.3 The refuge will have the following equipment for localized emergencies not requiring site evacuation:

1. communications network;
2. emergency personal protection equipment;
3. first-aid supplies, and
4. fire extinguisher.

10.9.0 Evacuation Route

10.9.0.1 Evacuation routes will vary depending upon the location of the affected teams and the scope and severity of the emergency. Daily, the team supervisor will brief all personnel on-site concerning the applicable evacuation route for that day.

10.10.0 Site Security and Control

10.10.0.1 The UXO team will report unauthorized personnel within the work area to the LCPM. In turn, the LCPM will request assistance from the Depot's Security Force and/or local law enforcement to remove the unauthorized personnel from the work area. In order to access a work area, authorized visitors must participate in a site-specific safety briefing and sign the visitor log prior to entering the work area. UXO-related operations must cease prior to visitor entry to the work area.

10.11.0 Decontamination and Medical Treatment of Injured Personnel

10.11.0.1 In the unlikely event that treatment of injured personnel is required, the procedures listed in Table 10-2 will be followed; some can be conducted simultaneously. The OSIC must assess the situation and outline the appropriate response prior to emergency response/rescue.

10.12.0 Community Alert Program

10.12.0.1 The Protective Action Plan (PAP), contained in Book 3, outlines detailed procedures to be followed in the event of a chemical release outside of engineering controls. UXB and all other supporting entities will provide assistance, as requested by the Corps of Engineers.

10.13.0 Documentation

10.13.0.1 Documentation related to the emergency shall be recorded in an accurate, authentic, and complete fashion. Documentation shall be recorded as soon as possible after the emergency to ensure it is recorded while the events are vivid in the minds of the personnel involved The information will include

1. a chronological record of events;
2. a listing of the personnel involved, including personnel on-site, site personnel who responded, personnel in charge, and off-site groups or agencies that responded;
3. a listing of the actions taken to minimize the effects of or mitigate the emergency,
4. the results of air monitoring conducted during the emergency, and if applicable, results of environmental samples;
5. an assessment of the potential exposures received by site personnel and the surrounding public, and
6. a record of the injuries or illnesses which occurred as a result of the emergency.

10.14.0 Commencement of Normal Operations

10.14.0.1 Site operations can commence when the site and personnel are prepared and equipped to respond to another emergency. Federal, state and local authorities will only be notified of a chemical emergency in the event of a chemical agent release outside of engineering controls. The following activities must be conducted prior to commencing operations:

1. The UXB Sector Director, Chemical Warfare Materiel shall notify the following agencies, as appropriate of the emergency:

a. OSHA - any fatalities or five or more personnel are hospitalized,

b. Bureau of Alcohol, Tobacco, and Firearms (BATF) - if emergency involved illegal use of explosives;

c. the SSHO will restock and clean all equipment and supplies utilized or damaged in the emergency;

d. the President of UXB will request an accident investigation to determine the cause of the emergency and what preventative measures can be implemented to ensure a similar emergency does not occur again;

e. UXB safety and health personnel, in conjunction with the SSHO and CEHNC, shall conduct an emergency response critique to assess the effectiveness of the emergency response procedures, and identify areas requiring improvement;

f. the SSHO shall complete the USACE Accident Investigation Report (ENG Form 3394) and UXB's Employee Injury/Property Damage Report Form (UXB Form 1.0034); and

g. the SSHO, in conjunction with the CIH, shall review and revise, as needed, the site operational and emergency response procedures, and if necessary, update the SSHP to reflect the new procedures.

10.15.0 Route Maps to the Nearest Pre-Notified Medical Facility

10.15.0.1 Written directions to the Regional Medical Center are located in Table SSHP 10-3; maps highlighting the route from Dunn Field to the hospital are located in Figure SSHP 10-1.

Figure 10-1 SSHP Map to Hospital

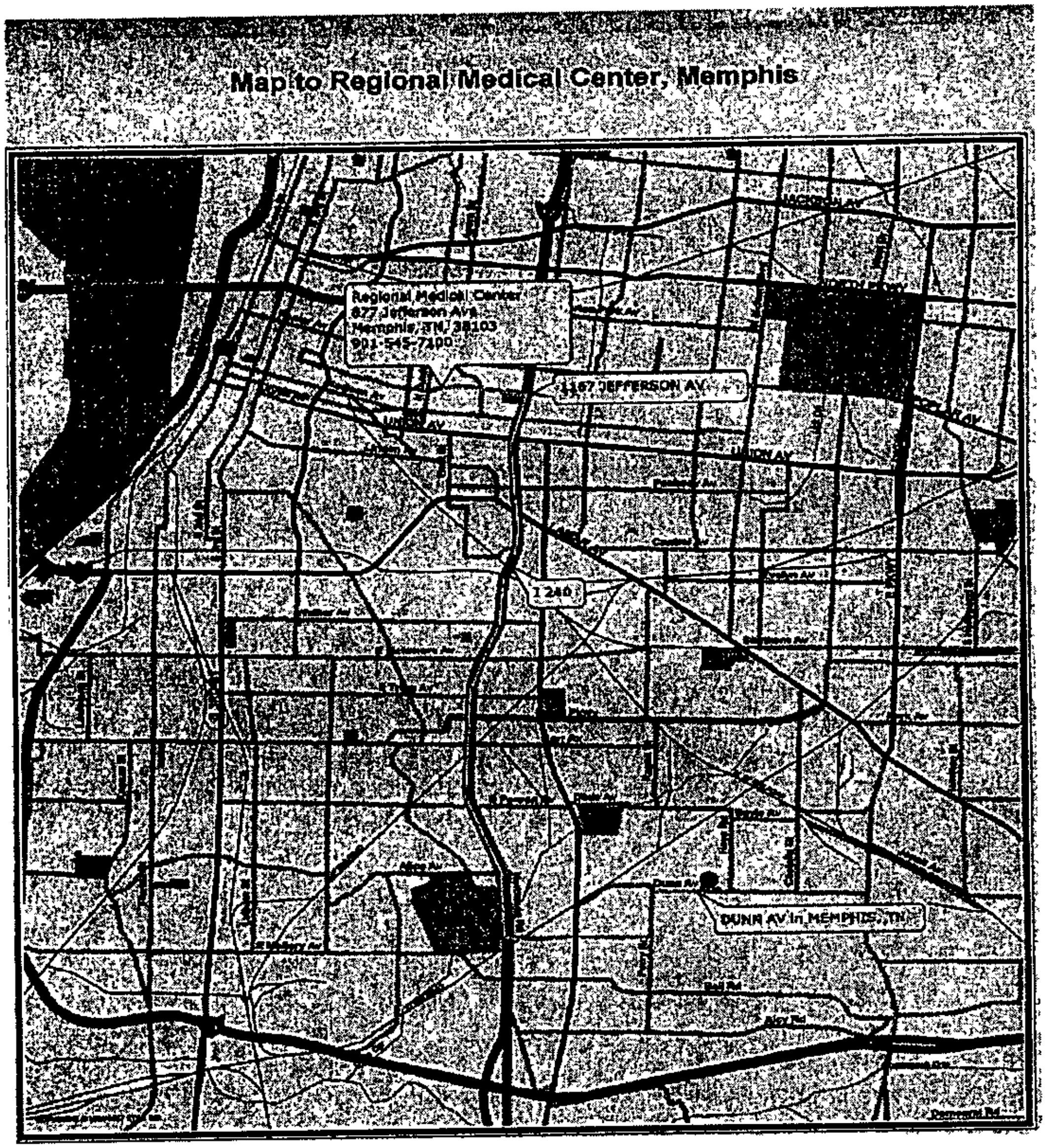


Table 10-1 SSHP Emergency Telephone Numbers

AGENCY	NAME	TELEPHONE NUMBER
	Emergency	
Fire Department Non-Emergency	No Contact Name	911 901-393-7441
Police Department Non-Emergency	No Contact Name Maj. Pruitt	911 901-774-4600
Depot Security	No Contact Name	901-775-6677
	Environmental	
Environmental Agencies Federal	U.S. Environmental Protection Agency	1-800-535-0202
US EPA	Turpin Ballard	404-562-8553
Depot Environmental Department	Shawn Phillips	901-544-0611
Tennessee Dept. of Conservation and Environment	Jordan English	901-432-6600
	Medical	
Ambulance Service	No Contact Name	911
Medical Facility	Regional Medical Center Memphis	(901) 545-7100
	Memphis Depot	
Memphis Depot Site MANAGER/Base Transition Coordinator	John DeBack	(901) 544-0622
BRAC Environmental Coordinator	Shawn Phillips	(901) 544-0611
Environmental Protection Specialist	Mike Lee Jack Kallal Denise Cooper (Assist)	(901) 544-0612 (901) 544-0614 (901) 544-0610
Facilities Engineer	Harold Roach	(901) 544-0614
	U.S. Army Corps of Engineers	
COE Depot Project Manager	Mr. Steve Dunn	256-895-1144
U. S. Army Corp. of Engineers Mandatory Center of Expertise for Ordnance and Explosive Waste	(Contact via CEHNC Safety Specialist)	**REGULAR HOURS** (256) 895-1582, 1507, 1510 **OFF DUTY HOURS** 1(800) 627-3532 PIN# 777-2534 At beep, enter your number (including area code) and Huntsville will return your call.
	UXB International, Inc.	
UXB Deputy Director, Federal Programs	Mr. Bob Hilliard	(703) 724-9604
CIH	Lori Arent	1- (919) 789-9152

AGENCY	NAME	TELEPHONE NUMBER
UXB Headquarters		724-9600 1-800-803-3338 – **EMERGENCY**
Technical Escort		
Technical Escort Unit	No Contact Name	1-410-671-2773
Shelby County Emergency Management		
Memphis Shelby County Emergency Management	No Contact Name	901-528-2780
Memphis Weather		
National Weather Service Memphis	No Contact Name	901-544-0399
Explosive Ordnance Disposal (EOD)		
U.S. Army 717th Fort Campbell, KY	Officer-in-Charge	502-798-2312 931-431-3824 – After hours
Other		
Memphis and Shelby County Health Department	No Contact Name	901-576-7600
Poison Center	No Contact Name	800-962-1253
Oil Spill Federal	National Response Center	1-800-424-8802
Report Suspected burial sites Discovery of actual/ Suspected CWM	PM, Non-Stockpile Chemical Materiel Programs (NSCMP) Army Operations Center Hdqrtrs, Department of Army	1-800-488-6868 (via CEHNC Safety) 697-0218 (via CEHNC Safety) (703) 697-5690 (via CEHNC Safety)

Table 10-2 SSHP General Emergency Response Procedures

Enforce the Buddy System: No one will enter a contaminated/hazardous area without a partner; personnel in the EZ should be in line-of-sight or in communication with the OSIC or assigned appointee. ***Survey Casualties***: Locate all victims and assess their condition; determine resources needed for stabilization and transport. ***Assess Existing and Potential Hazards and Determine:*** Whether and how to respond The need for evacuation of site personnel and off-site population The resources needed for evacuation and response ***Contact the required off/on-site personnel or facilities:*** Ambulance, fire department, police department, COR, etc. ***Allocate Resources:*** On-site personnel/equipment to rescue and initiate incident response operations ***Control:*** Assist in preventing the spread of the emergency, i.e., cover hole with tarp/plastic or wood, control fire, secure site, etc. ***Assign PPE:*** The SSHO will assign the appropriate level of PPE for rescues not involving a chemical release. ***Extricate:*** Remove or assist victims from the area. ***Decontaminate:*** Use established procedures to decontaminate uninjured personnel in the decontamination area

If the emergency makes the area unsafe, establish a new decontamination area at an appropriate distance

Decontaminate victims before or after stabilization, as their medical condition indicates

Decontamination may be delayed if the injuries pose an immediate threat to the victim's life or health

The victim should, instead, be placed on a tarp or sheet of plastic to allow handling without the threat of contaminating support personnel until victim is stabilized

Stabilize:

Administer any medical procedures that are necessary before the victims can be moved

Stabilize or permanently fix the hazardous condition

Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums, tanks)

Transport: No one will be transported without being decontaminated; minimize chemical contamination of the transport vehicle, ambulance, and hospital personnel, except when delay will pose an immediate threat to the victim's life or health.

Casualty Logging: Record the victim's name, time, destination, and condition upon transport

Evacuate: Relocate personnel a safe distance upwind of the incident; monitor incident for significant changes – hazards may diminish (permitting re-entry), or increase (requiring public evacuation)

Casualty Tracking: Record disposition, condition, and location

Table 10-3 SSHP Hospital Directions

Directions to Hospital	Regional Medical Center, Memphis, TN
	877 Jefferson Ave
	(901) 545-7000
	Start out going west on **Dunn Ave**
	Turn south (left) onto **Perry Rd.**
	Turn west (right) onto **Elliston Rd.**
	Enter **North** (right turn) **I-240** and proceed to **Jefferson Ave.**
	Turn West (left) onto **Jefferson Ave.**
	Regional Medical Center is located at 877 Jefferson Ave.

TAB

SSHP 11. Standard Operating Procedures

11.0 Standard Operating Procedures, Engine ring Contr ls, and Work Practices

11 0.1 At a minimum, the following standard operating procedures (SOP), engineering controls, and work practices shall be adhered to.

11.1.0 General Safety Precautions

1. Do not carry fire or spark-producing devices on-site.
2. Do not apply cosmetics, eat, drink, chew gum or tobacco, or smoke in work areas.
3. Do not have fires for heating or cooking, except in authorized areas.
4. Do not conduct operations without approved operating procedures and proper supervision.
5. Do not become careless by reason of familiarity with ammunition.
6. Do not conduct UXO operations during electrical, sand, dust, or snow storms.
7. Avoid contact with suspect chemical hazards.
8. Be aware of monitoring equipment, wind direction, nearest water source, evacuation routes, emergency communication, and notification procedures.
9. Keep a first aid kit and fire extinguisher readily available while in the work area.
10. 29 CFR 1926.100 requires personnel to wear protective helmets in areas where there is the possibility of head injury from impact, falling objects, or flying objects. During field activities on ordnance projects, hard hats need not be worn unless a head injury threat is present.
11. All personnel should be aware of the potential for slips, trips, and falls; always be aware of the placement of your feet. When working off of the ground on large pieces of equipment, maintain at least three points of contact with the equipment.
12. A UXO Specialist (or higher level) must be present when excavation operations are being performed.
13. Alert team personnel of a suspected or potentially dangerous situation. If an alarm sounds, a strong nauseating odor is detected, or you see fire or smoke, all personnel are to evacuate the site and notify the LCPM or SSHO.
14. UXB-generated waste will be controlled and held for disposal.
15. Operational activities will only be conducted during daylight hours.

11.2.0 UXO Safety

1. Only those personnel absolutely necessary to the operation and the CEHNC Safety Specialist (if present) shall be allowed in the Exclusion Zone during CWM/UXO activities.

2. Only personnel who have graduated from the U.S. Naval EOD School, Indian Head, Maryland, the U.S. Army Bomb Disposal School, Aberdeen Proving Grounds, Maryland, the EOD Assistant's Course at Redstone Arsenal, Alabama, or Eglin Air Force Base, Florida, are authorized to handle UXO.

3. Detection and identification of suspect explosive materials will be accomplished in accordance with U.S. Army Engineering and Support Center's *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO) Operations* (February 16, 1996).

11.3.0 Geophysical Safety

1. The Foerster MK26 Magnetometer will be used to locate the buried bomb casings in site 24-A, and as a safety measure to detect anomalies in site 1 after each 6-inch lift of soil is removed. Use of a magnetometer will alert investigators of the presence of metal debris and provide an indication of the buried depth.

2. Instrument probes will not be permitted to make contact with a suspected hazardous item, but probes will be placed as close as possible to the ground, but will not touch the ground.

3. In the event CWM is encountered, the instrument will be decontaminated and tested to ensure all CWM has been removed.

4. Probe must remain free of dirt and debris that can comprise instrument readings.

5. Instruments will be properly calibrated prior to use and field tested on a daily basis.

6. Time Domain Electro Magnetic (TDEM) Instruments must be kept a minimum of 0.42 meters above the ground.

7. Frequency Domain Electro Magnetic (FDEM) Instruments must be kept a minimum of 0.3 meters above the ground.

8. Electronic packages, data loggers and battery packs will not be stored on the ground in work areas.

9. Electronic packages, data loggers and battery packs will be kept a minimum of 1 meter from the ground during operations for Flux Gate Gradiometers, Cesium Vapor Magnetometers, Total Field Magnetometers.

10. GPR will not be used for UXO activities.

11. Manual probing will not be conducted in CWM sites. Most chemical munitions have thin casings and are prone to rapid deterioration. A probe could easily puncture a thin and deteriorated skin of a buried CWM ordnance item causing a release of the agent.

11.4.0 Buddy System

11.4.0.1 The buddy system requires work crews consisting of teams of at least two, and is required during all operations. Team members will maintain visual contact with each other and be alert for signs of a medical emergency, such as:

1. Changes in complexion or skin color,
2. Changes in coordination or demeanor;
3. Excessive salivation and pupillary response;
4. Changes in speech pattern,
5. Mention of headaches, dizziness, blurred vision;
6. Nausea, cramps; and
7. Irritation of eyes, skin, or respiratory tract.

11.5.0 Smoking Restrictions

11.5.0 1 Smoking is prohibited in the work areas Upon mobilization, the LCPM will designate a smoking area.

11.6.0 Material Handling

11.6.0.1 Not applicable. This delivery order does not require the movement of materials on pallets (material handling).

11.7.0 Confined Space Entry

11.7.0.1 Confined space entry IS anticipated at Dunn Field. Confined space entry guidelines are contained in Appendix C to this document.

11.8.0 UXO Evacuation Safety

11.8.0.1 Every effort shall be made to identify the presence of subsurface excavation hazards (i.e., sewer, telephone, water, fuel, electric, and pipe services). The EE/CA does not indicate the presence of underground utilities within the excavation sites, however, Memphis Light, Gas, and Water will be contacted and Dunn Field's utility records will be reviewed prior to commencement of intrusive actions.

11.8.0.2 Keep materials or equipment that might fall or roll into an excavation at least 2 feet from the edge of excavations, unless a retaining device is provided

11.8.0.3 Personnel will not work on the sloped or benched excavations at levels above other personnel.

11.8.0.4 Excavations are expected to exceed a depth of 12 feet. Any excavation that exceeds five feet in depth and requires employees to enter an excavation necessitates a method to prevent cave-in. EM 385-1-1, Section 25 sets forth the standards to be applied and contains specifications for sloping and benching when used as methods of protecting employees from cave-ins. The requirements of this appendix apply when sloping and benching protective systems are to be performed. Tabulated data will include:

1. Identification of the parameters that affect the selection of a sloping or benching system;
2. Identification of the limits of the data (to include the magnitude and configuration of slopes determined to be safe);
3. Explanatory information as may be necessary to aid the user in correctly selecting a protective system from the data; and
4. Identity of the registered professional engineer who approved the data.

A copy of the design will be maintained at the work site during excavation.

11.9.0 UXO Disposition Safety

11.9.0.1 UXO Disposition operations will be conducted in compliance with the U.S. Army Engineering and Support Center's *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO) Operations* (February 16, 1996). UXB personnel will perform disposal of UXO. Items that are determined "safe" to move, shall be moved from the excavation site a suitable distance on Dunn Field that they may be safely destroyed by detonation as described in the work plan. Any UXO that is determined "unsafe" to move whose destruction by a Blow In Place (BIP) operation would cause unacceptable damage to equipment or danger to personnel, or whose size (greater than 20 lbs NEW) prohibits safe disposal on Dunn Field, shall remain in situ (unsafe to move only) or be held under the control of UXB personnel to await RSP/Disposal/Transportation by the local responsible EOD unit. Suspect CWM items shall be turned over to TEU for disposition. No item shall be moved until it has been identified and known to be safe to move and does NOT contain chemical warfare materiel. Only TEU personnel are authorized to perform tactile operations on CWM.

11.10.0 Heat/Cold Stress

11.10.0.1 Heat/Cold Stress SOPs are detailed in Section 8 of this SSHP.

11.11.0 Illumination

11.11.0.1 All operations will be performed during daylight hours; illumination will be required inside the containment structure. All lighting shall comply with OSHA standards.

11.12.0 Sanitation

11.12.0.1 Sanitation will be provided as detailed in the following paragraphs. Some of these services will be provided through a local contractor.

11.12.1 Potable Water

11.12.1 1 UXB will provide workers and visitors with an adequate supply of potable water approved by federal, state, or local authorities.

11.12.1.2 Disposable cups will be provided for all sources of drinking water; no common drinking cups will be used.

11.12.1.3 A waste receptacle for soiled cups will be supplied

11.12 1.4 Potable drinking water containers will be labeled as such and not used for any other purpose. Potable drinking water containers will be cleaned and sanitized daily, contain only ice and water, and be fitted with a tight-fitting lid and tap

11.12.2 Non-Potable Water

11.12 2 1 Non-potable water may be used for washing equipment and general housekeeping/cleaning, provided the water does not contain substances that may pose a threat to the employees' health.

11.12.2 2 There will not be any cross-connection, open or potential, between systems furnishing potable and non-potable water.

11.12 2.3 All outlets for non-potable water will be conspicuously posted "**CAUTION - Water unfit for drinking, washing, or cooking.**"

11.12.3 Toilet Facilities

11.12.3.1 Portable toilet facilities will be placed in the support zones and in UXB's on-site office

11.12.4 Food Handling

11.12.4.1 UXB personnel will not perform food-handling services at this site.

11.12.5 Temporary Sleeping Quarters

11.12.5.1 UXB will provide per diem eligible employees (per Joint Travel Regulations) with temporary sleeping quarters at a local hotel, motel, or other suitable habitable quarters.

11.12.6 Washing Facilities

11.12.6.1 Washing facilities, including hot and cold running water, soap, necessary decontamination products, materials and individual means of drying are located in UXB's on-site project office.

11.12.7 Showers and Change Rooms

11.12.7.1 During this delivery order, there is no need for showers or change rooms for personal hygiene. Showers will be available for decontamination at the PDS.

11.12.8 Housekeeping

11.12 8.1 Every job site must be left clean and orderly at the end of the day.

11.12.8.2 UXB personnel are responsible for providing all general housekeeping of temporary office areas and work areas during the project. The floors of the temporary office area will be swept clean daily and kept as dry as practical (with consideration to weather conditions). Office trash will be removed on a daily basis and disposed in either government or municipal systems.

11.12.9 Personal Hygiene

11 12.9.1 An adequate water and soap supply will be provided to allow personnel to wash hands and face prior to leaving the project site

11.12.9.2 Personnel will be reminded to wash prior to eating or drinking after leaving the work area.

11.13.0 Safety Meetings

11.13.0.1 Daily Safety Meetings are required prior to operations; all personnel are required to attend.

11.13.0.2 Weekly Supervisors Meetings are required; all supervisors must attend.

11.14.0 Equipment Safety

11.14.0 1 Equipment safety will be in accordance with the most current revision of the USACE Safety and Health Requirements Manual (EM 385-1-1).

11.15.0 Motor Vehicles and Trailers

11.15.0.1 Motor vehicle operators will possess a valid driver's license.

11.15.0.2 Vehicles will be inspected prior to use and daily thereafter to assure parts, equipment, and accessories are in safe operating condition and free from apparent damage. Vehicles not meeting the safety standards will be removed from service until the defect is corrected.

11.15.0.3 All towing devices will be properly mounted and adequate for the weight drawn.

11.15.0.4 No vehicle will be driven on a downgrade with gears in neutral or clutch (if appropriate) disengaged.

11.15.0.5 No vehicle will be left unattended until after the motor has been turned off, parking brake set, and the gears engaged in low, reverse, or park.

11.15.0.6 Park vehicle with the front towards the emergency egress route. Turn wheels so that if the vehicle rolls, it will roll towards the area of most resistance, thus stopping the vehicle in the shortest distance.

11.15.0.7 A signal person will be used for backing or maneuvering when the operation site is not in full view, vehicles are backed more than 100 feet, terrain is hazardous, or two or more vehicles are backing in the same direction.

11.15.0.8 No person will be permitted to ride with arms and legs outside the vehicle body or while standing on the vehicle body, running boards, or off of the rear of the vehicle.

11.15.0.9 Each team vehicle will be equipped with a first aid kid, fire extinguisher, and eye wash (if used, the project manager's sedan will not require an eye wash).

11.16.0 Power Equipment

11 16.0..1 Section 16 (Machinery and Mechanized Equipment) of the USACE Safety and Health Requirements Manual (EM 385-1-1) shall be followed when using power tools. These guidelines include but are not limited to:

1. Power tools will be procured from a manufacturer listed by a nationally recognized testing laboratory; the tools will be designed for the specific application for which they are to be used.
2. Power tools will be used, inspected, and maintained in accordance with the manufacturer's specifications.
3. Equipment will be inspected, tested, in good repair, and equipped with all safety devices to assure it is in safe operating condition prior to use.
4. PPE (per Table SSHP-6-3) will be made available and used by the operator while operating power equipment. Loose and frayed clothing, loose long hair, or dangling jewelry will not be worn while operating power tools.
5. Chain saw operators will not raise the chain saw above shoulder height
6. Fuel on the work site will be stored a minimum of 50 feet from established break areas. Fuel cans will be placed on drop cloths and absorbing material (when needed) Two 2-A: 10-B-C fire extinguishers (5 pound) will be readily available.

11.17.0 Hand Tools

11 17.0.1 Section 13 (Hand and Power Tools) of the USACE Safety and Health Requirements Manual (EM 385-1-1) shall be adhered to in selecting and using hand tools:

1. Hand tools will be used, inspected, and maintained in accordance with the manufacturer's specifications.
2. Tools will be inspected, tested, in good repair, and equipped with all safety devices to assure they are in safe operating condition prior to use.
3. Only non-sparking tools will be used in locations where sources of ignition may cause a fire or explosion.
4. Protective clothing recommended for use while using the equipment will be made available and used by the operator.
5. Throwing tools from one person to another is not permitted.

11.18.0 Bloodborne Pathogens

11.18 0.1 Bloodborne Pathogens are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV). Personnel administering care must successfully complete bloodborne pathogens training in accordance with Table SSHP 1-5 and must implement exposure control measures.

11 18.0.2 Personal Protective Equipment is the first line of defense against bloodborne pathogens. The following protective equipment will be available on-site for personnel administering first aid.

1. Surgical Gloves - must be worn when hand contact with blood or other body fluids is possible or the care provider has non-intact skin areas on their hands.

2. Masks/Eye Protection/Face Shields - will be worn when slashes, sprays, or droplets of blood or body fluids are likely to occur and contaminate the eyes, nose, or mouth of the care provider.

3. Coveralls/Jacket - will be donned if the possibility exists for contamination of the body of the caregiver.

11.18.0.3 To insure that equipment is used effectively, employees will adhere to the following practices when using personal protective equipment:

1. Any garments penetrated by blood or other suspect infectious materials are to be removed immediately, or as soon as feasible.

2. All personal protective clothing/equipment shall be removed prior to leaving the site and placed in a suitable container for decontamination and/or disposal.

3. Disposable gloves are to be replaced as soon as practical after contamination or if they are torn, punctured, or otherwise lose their ability to function as an "exposure barrier."

4. Potential exposure to the body of the caregiver will require donning a coat or coveralls to provide protection.

TAB

SSHP 12. Logs, Reports and Record Keeping

12.0 Logs, Reports, and Record Keeping

12.0.1 Table SSHP 12-1 lists the safety-related logs, reports, and records that will be maintained during on-site operations, the criteria, and the personnel responsible for maintaining the information.

12.1.0 Recovered Chemical Warfare Material (RCWM) Site Specifics

12.1.0.1 If chemical warfare materiel (CWM) is discovered Technical Escort Unit (TEU) will remove, package, and transport this material to the Interim Holding Facility (IHF).

Table 12-1 SSHP
Safety-Related Record Keeping Requirements

Reporting Requirement	Criteria	Responsible Personnel
Site-Specific Training	• Specialized Training Form (UXB Form 1.0037) • Work Plan Acknowledgement Form (UXB Form 1.004)	LCPM
Daily Safety Inspections	• Written weekly report to UXB LCPM to identify. • Task/area inspected • Type of inspection • Safety topics at Morning Safety Meetings • Findings • Corrective actions • Follow-up inspection dates and results • Safety Inspection Log	SSHO
Employee/ Visitor	• Site Visitor's Log (UXB Form 1.0012) • Part of final contract file	LCPM
Medical Surveillance	• Certificates and Records	SSHO
Personal Exposure Monitoring	• IAW applicable OSHA standards, 29 CFR 1904, 1910, and 1926	LCPM
QC Reports	• Daily QC Reports (UXB Form 1.0020)	QC Specialist
Accidents	• Accident Investigation Report (ENG Form 3394 and UXB Form 1.0034) • Submit within 2 working days (IAW AR 385-40 and USACE) Supplement 1	SSHO
Morning Safety	• Conducted Daily • Safety Meeting Attendance Log (UXB Form 1.0023)	SSHO
Visitor Safety Briefings	• Safety Meeting Attendance Log (UXB Form 1.0023)	LCPM
Equipment Maintenance	• Heavy Equipment Inspection Log (UXB Form 1.0046) • Daily Calibration and Quality Control Log (UXB Form 1.0002) • Vehicle Condition Inspection Log (UXB Form 1.0038) • Daily Truck Inspection Log (UXB Form 1.0041)	LCPM

Daily Activities	• Official record of operational activities will contain, as a minimum, the following information:
	  • Date and start and stop times
	  • Daily weather conditions
		LCPM

	• Personnel on-site, company, and title or classification • Record of site Safety Meeting • Proposed and actual work activities • Equipment use (type and length of time • Injuries, incidents, or any other health and safety-related issues or situations, including as many facts concerning the accident/incident as possible • Official communications, written and verbal	

TAB

SSHP 13. Personnel and Equipment Decontamination

13.0 Personnel and Equipment Decontamination

13.1.0 Introduction

13.1.0.1 The following procedures shall be implemented whenever site activities involve the potential for contact with CWM, or other hazardous wastes. This plan outlines the different levels and phases of decontamination which will be used during the conduct of the various site activities outlined in this SSHP. It will be the responsibility of the SSHO to ensure that site personnel implement and comply with the elements of this plan and follow the safe work practices, specified in the Emergency Response and Contingency Procedures, Section 10.0 of this SSHP. These and any other site specific control methods, as specified by the SSHO, shall be used to minimize personnel and equipment contamination. The SSHO will also be responsible for ensuring the effectiveness of this plan and will immediately notify the UXB CIH if any deficiencies are noted.

13.1.0.2 Table SSHP 13-1 presents the applicable decontamination application for agents of concern. If an item is identified as CWM by TEU and air monitoring indicates no release, TEU will recover, package, and transport the item to the IHF. Decontamination will be performed as necessary by UXB at the direction of TEU.

13.1.0.3 In the event of a CWM alarm condition or a condition requiring an upgrade of PPE within the structure, the following procedures will be followed Upon elimination of the source of contamination, but prior to resuming operations, the lining of the structure and the filter inlets will be tested for contamination. If any contamination above the action level is found, additional testing will be performed to localize the area of contamination. Decontamination procedures will then be performed in accordance with applications from Table SSHP 13-1. All decontamination waste will be collected and containerized. Subsequent testing will then be performed to ensure that the contaminated surfaces have been decontaminated to the 3X level. If testing indicates a level of contamination above the 3X level, then the decontamination process will be repeated.

13.2.0 Procedures for Handheld Equipment Decontamination

13.2.0.1 All hand equipment and tools used inside the EZ shall be staged in the CRZ and decontaminated prior to leaving the CRZ. Decontamination of hand tools/equipment used on a CWM site will as a minimum receive a three stage wash and rinse prior to leaving the CRZ. The first stage is a wash in accordance with Table SSHP 13-1. The second stage is a wash consisting of hot soapy water. The third step involves rinsing the item in clean water. After this three-stage wash/rinse cycle, hand tools/equipment can be removed from the CRZ, upon inspection and approval by the SSHO.

13.2.0.2 Hand tools/equipment with porous surfaces, such as those with wooden or foam covered handles, may allow for the absorption of contamination. Items of this nature should be kept in the EZ until the project is complete and then bagged and disposed of as potential CWM or hazardous waste.

13.2.0.3 If CWM agents are the only COPC, and if directed by CEHNC, items with potentially absorbed or surface CWM contamination may be tested by DA personnel after the items have been decontaminated in accordance with the procedure in Section 13.2.1. This testing utilizes a sampling method which involves containing the items in "Hot Boxes" and then testing the atmosphere inside the "Hot Box" for traces of CWM. Items in the "Hot Box" which show evidence of off-gassing CWM, or its breakdown products, shall be classified as contaminated and disposed of in accordance with regulations found in DA PAM 385-61. If CWM agents are not the only COPC, the CWM contamination will take precedence. Additional testing for contamination will be performed after CWM decontamination.

13.2.0.4 Whenever possible, equipment that could receive internal contamination or equipment that cannot be washed and rinsed will be encapsulated in plastic prior to being placed in the EZ. For example, air monitoring equipment which is not water sealed can be wrapped in plastic with the exception of the air sampling inlet. After the air monitor is taken from the EZ, the plastic can be removed, the inlet cleaned, and as long as a CWM release did not occur during site activities, the monitor can be taken out of the CRZ. If a CWM release did occur then any handheld equipment with the potential for internal contamination would be considered CWM contaminated and would be double bagged and held, pending guidance from CEHNC. This equipment may be tested using the method described in Section 13.2.3.

13.3.0 Procedures for Heavy Equipment and Vehicle Decontamination

13.3.0.1 Proper decontamination of equipment is extremely important to ensure that contamination is not spread to uncontaminated portions of the site or to site personnel. Heavy equipment or vehicles taken into the EZ shall be routinely inspected and decontaminated in the CRZ prior to leaving the site. All equipment requiring maintenance or repair will also be staged in the CRZ prior to servicing. It will be the responsibility of the SSHO to properly inspect, and approve for general cleanliness, all heavy equipment and vehicles prior to their leaving the CRZ. In order for a vehicle or piece of heavy equipment to pass inspection it must be in a broom-clean condition, free of loose dirt or stabilized material on tailgates, axles, and wheels. All surfaces that contacted potentially contaminated materials, including soil, will be given a wash in accordance with Table SSHP-13-1 and clean water rinse. Approval for vehicle/heavy equipment removal from the CRZ will be based on visual inspection of all exposed surfaces, and if needed the analysis of smear samples.

13.3.0 2 For decontaminating vehicles and heavy equipment, UXB will utilize an equipment decontamination pad located inside the CRZ. Equipment that is contaminated with CWM, as evidenced by an alarm will be decontaminated with bleach solution. If no alarm or CWM contamination is suspected, the equipment will be cleaned with steam. The pad will be utilized to collect run-off solutions created during the bleach solution and/or high-pressure washing used to remove mud and/or dirt. All solutions collected from the equipment decontamination pad will be containerized and sampled by UXB and tested by ECBC for CWM. The sample results will determine if the waste is to be handled as CWM-contaminated waste.

13.3.0.3 Personnel assigned to heavy equipment and vehicle decontamination shall wear the protective equipment, clothing, and respiratory protection consistent with the levels of PPE worn during the site activities during which the heavy equipment/vehicle became contaminated. Unless a full facepiece respirator is worn as part of this requirement, the decontamination personnel will wear a splash shield during the decontamination of heavy equipment/vehicles.

13.3.0.4 To assist in contamination control, seats and flooring in heavy equipment and vehicles used in the Exclusion Zone will be covered to the extent possible with disposable polyethylene. This layer of protection will be changed as needed to prevent the spread of contamination to surfaces inside the operator area.

13.3.0.5 In the event vehicles or heavy equipment become contaminated with CWM, they will be left in the EZ and the CO/COR notified. UXB will then decontaminate the equipment. UXB shall move the equipment to the decontamination pad, steam wash and scrub the equipment to remove all gross debris. The equipment will then be washed with bleach solution and brushes. The equipment is then rinsed with water and retested. If no further contamination is detected, the equipment will be classified "3X". If CWM is detected, the equipment will be re-cleaned.

13.3.0.6 Any equipment which becomes classified as "3X", due to contact and subsequent contamination with CWM agents shall be handled in accordance with DA PAM 385-61. The backhoe, shaker table, and bobcat that will be used at Defense Depot Ogden, Utah site are currently designated "3X" equipment.

13.4.0 Decontamination Procedures for Personnel

13.4.1 General

13 4 1.1. A personnel decontamination station (PDS), which includes an emergency personnel decontamination station (EPDS), shall be established in the CRZ to facilitate decontamination, protective clothing removal and to prevent EZ personnel from transferring contamination to the SZ. The PDS shall be established prior to, and utilized during, any site activities involving the potential for personnel exposure to the materials listed in Section 5.0 of this SSHP. To help eliminate the airborne migration of contaminants, the PDS shall be established up-wind from the EZ and shall be geographically located to minimize exposure of unprotected personnel and equipment to contaminated personnel/equipment. During the set up of the PDS, signs shall be set up at each station to remind personnel of the proper activity to be conducted at the particular station.

13.4.1.2. All personnel exiting the EZ shall pass through the PDS to ensure removal of contamination. As personnel move through the PDS, PPE will be removed in the order of highest to lowest potential contamination. This outside-in removal process will be used to minimize the contamination of inner clothing or the body. The actual decontamination steps to be used for each level of protection, as well as emergency decontamination, are described later in this Section, and depicted in Figures H-1 through H-5 of Appendix H. The EPDS will be utilized for the emergency decontamination of personnel who, due to injury or illness, cannot pass through the PDS.

13.4.1.3. Personnel may be required to shower completely (including the washing of hair) prior to changing into personal clothing, entering the SZ, or leaving the site. Personnel shall under all circumstance wash hands, face, and other exposed skin areas immediately after leaving the CRZ for breaks, lunch or at the end of each work day. The shower facility shall have hot and cold water systems to provide warm water for showers. The shower room shall have adequate shower heads and deck or mats for walkways and a floor drain. Towels, washcloths, liquid soap, and shampoo shall be provided for personnel. Work clothes worn inside the EZ shall be left in the shower/change facility, and with the exception of clothing worn for operations in the support zone, no company provided work clothing, shoes, or boots will be worn off or carried out of the work site. Space shall be provided in the clean room for storage of the employee's street clothes along with benches to facilitate changing of clothing.

13.4.1.4. As stated earlier, the SSHO will be responsible for ensuring that the PDS is set-up each day and ready for operation prior to site personnel entering the EZ. If necessary, the Site Supervisor will designate personnel to assist in setting up the PDS and to assist the work party in the doffing of PPE as they process out of the CRZ. Personnel exiting the EZ shall proceed through the specified wash, rinse and PPE removal steps relevant to the level of protection they are wearing. The equipment and PPE needed for each level of PPE are specified and described in detail in Section 8.0 of this SSHP. The doffing procedures for Level A, Level B, Level C and Modified Level D are outlined below and in Appendix H. These steps correlate to the PDS and EPDS maps found in Figures H-1 through H-5.

13.4.1.5. If site activities call for the use of Level A or Level B based on site monitoring, the PDS will be established as specified in this paragraph, using the PDS maps found in Figures H-1 and H-2 as guides. For both levels of protection, stations 2 through 4 will be placed inside a containment structure lined with 10 mil or greater plastic and filled with small gravel. The containment structure box will be large enough to contain the pans/tubs required for stations 2 through 4, and any spillage, splash or over spray which may occur during the use of these stations. The containment structure will have a drain attached which leads to a collection station. The pans/tubs will be large enough for a man to stand in and will have a least 12" sides. The containment structure will be sprayed with decontamination solution, and the residue collected, if site events dictate (i.e. action levels are reached for CWM agents) the need for increased precautions to prevent the contamination of soil and the spread of CWM and/or industrial chemical contamination Upon completion of the project, the contents of the containment system will be tested and disposed of accordingly

13.4.2 Personnel Decontamination Procedures

13.4.2.1 General

13.4.2.1.1 In order to significantly minimize the potential for contaminant contact and migration, it is imperative that site personnel decontaminate thoroughly, remove PPE very carefully, and follow the decontamination procedures outlined in the following paragraphs. Although these procedures apply to personnel exiting the EZ, their implementation is of paramount importance to all other site personnel, the environment and the general public. Site personnel utilizing these procedures must remember and understand that improper decontamination can lead to not only personal contamination, but also to contamination of other site personnel, company equipment, personal property and the general public. The procedures listed below represent the minimum requirements for personnel and equipment decontamination. If deemed necessary by site activities or conditions, revised or additional procedures may be added to this plan by the SSHO. Additional or revised decontamination procedures must receive approval of the UXB CIH and the CEHNC.

13.4.2.2 Levels A/B (w/Encapsulating Suit) Decontamination Procedures

13.4.2.2.1 Refer to Section H.1 of Appendix H (Personnel Decontamination Station SOPs).

13.4.2.3 Level B Decontamination (Non-encapsulating Suit) Procedures

13.4.2.3.1 Refer to Section H.2 of Appendix H (Personnel Decontamination Station SOPs).

13.4.2.4 Level C Decontamination Procedures

13.4.2.4.1 Refer to Section H.3 of Appendix H (Personnel Decontamination Station SOPs).

13.4.2.5 Modified Level D Decontamination Procedures

13.4.2.5.1 Refer to Section H.4 of Appendix H (Personnel Decontamination Station SOPs).

13.4.2.6 PDS Attendant Duties

13.4.2.6.1 The PDS attendant plays an integral role in ensuring that the PDS is set-up and operated in a manner which prevents the contamination of site personnel and equipment and eliminates the migration of contamination to clean areas of the site. Depending upon site conditions, level of protection and number of personnel working in the EZ, more than one PDS attendant may be needed to ensure smooth conduct of the PDS. In support of the PDS, the PDS attendant will have the following duties.

1. On a daily basis, after the safety brief, prepare, and direct assembly of, the PDS required for the day's operation.
2. Assist EZ personnel as they process through the PDS; assist in tank changes for Levels A and B.
3 Receive and put away all equipment passed from the hot side of the hot line after ensuring items have been cleaned and decontaminated thoroughly.
4. After the final person has passed through the PDS, the attendant will retrieve and store away reusable equipment that has been previously decontaminated, including respirators, gloves, boots and suits.

5. At the end of each day, the attendant will secure the PDS and dispose of all materials, as required, including, securing of disposal containers and transfer of used decontamination solutions to approved containers.

6. Ensure that once the PDS is secured, all respirators are cleaned and stored per the manufacturer's guidelines.

13.4.2.6.2 The PDS attendants shall wear a level of PPE which will provide adequate protection from the hazards associated with assisting site personnel through the PDS. The PDS attendants will wear Level B PPE while processing personnel through the PDS The PDS attendants will also wear Level B PPE during the clean-up of the PDS after processing personnel

13.4.2.6.3. After assisting EZ personnel after the last work period, the PDS attendant, with the assistance of a buddy, will secure the PDS using procedures that allow the attendant to simultaneously decontaminate as the PDS is secured To do this, the PDS attendant will initiate securing the PDS at the outer garment wash and work back conducting personal decontamination and PDS security at the same time. This will be accomplished using the following general procedures:

1. First gather and remove from the PDS all reusable equipment and transfer to the SZ to be stowed.

2. Wearing appropriate PPE (as specified in Section 6 0 of this SSHP), cross the hot line, if applicable, wash and rinse suit and then, moving from dirtiest to cleanest, transfer decontamination solutions to their respective storage containers

3. Proceed down the line, remove tape, if applicable, then secure tape disposal container

4. Move to boot removal, remove boots while stepping across the hot line; reaching back across the hot line, secure the boot disposal container.

5. At outer glove removal, remove outer gloves and secure the outer glove disposal container.

6. At outer garment removal, remove outer garment, if applicable, and secure the outer garment disposal container.

7. At inner glove wash/rinse station, wash inner gloves and transfer inner glove wash solution to appropriate disposal container, then rinse inner gloves and dispose of rinse solution, and secure wash/rinse containers.

8. At facepiece station (Level C PDS and above) transfer both solutions to appropriate disposal containers and secure the containers; if wipes were used, secure disposal container.

9. Move to inner glove removal station, remove gloves and secure container

13.5.0 Contamination Control

13.5.1 General

13.5.1.1 This section outlines the measures that will be taken to control contamination and prevent it from leaving the EZ.

13.5.1.2 The decontamination procedures described in the Personnel Decontamination SOPs (Appendix H) will be the primary sources of contaminant control. Also, as indicated previously, all wastewater generated from decontamination procedures will be collected on site, tested, and disposed of accordingly. In addition to these procedures, measures will be taken to limit the movement of dust and vapors that may be generated within the EZ. Water will not be used in excavations to control dust when CWM may be present.

13.5.1.3 Eating, drinking, smoking, chewing, and application of cosmetics shall be restricted to the clean (support) zone, except drinking of replacement fluids, which shall be permitted in designated areas of the CRZ. Uncontaminated standby personnel assigned to assist personnel working in Level C or Level B PPE shall, at a minimum, remove outer and inner gloves, respirator and coverall top, and wash hands prior to drinking replacement fluids. Personnel who have come in contact with contaminated material (based on air monitoring data) will be processed through the decontamination line before they are allowed to disrobe, eat or drink.

13.5.1 4 Personnel who may be required to wear respiratory protective equipment, either on a routine or emergency basis, must shave beards or other facial hair which interfere with the proper fitting of respirators. Any abrasions in the site personnel's skin (cuts, bruises, etc.), will be covered with a Band-Aid and/or adhesive tape before the operator dons protective clothing.

Table 13-1 SSHP
Decontamination Solutions for Sampling Equipment

CONTAMINANT OF CONCERN	FIRST WASH	SECOND WASH
Mustard (H)	Caustic Soda and Water	Hot Soapy Water
Adamsite (DM)	Hot Soapy Water	Hot Soapy Water
Phosgene (CG)	Hot Soapy Water	Hot Soapy Water
Choropicrin	5% Sodium Bisulfite Solution	Hot Soapy Water
All Others	Hot Soapy Water	Hot Soapy Water

TAB

Appendix A

APPENDIX A
To

Site Safety and Health Plan

CWM FIELD IDENTIFICATION

A.1.0 CWM Field Identification

A.1.1 General

A.1.1 1 Archive records indicate that German mustard bombs and chemical agent identification sets (CAIS) were disposed of on Dunn Field. The CAIS typically contain small quantities of dilute and/or neat CWAs in small glass bottles or vials. The glass bottles are typically packaged within a steel cylinder or drum (called a "pig") with bolted end covers. The pigs are packaged inside wooden shipping containers.

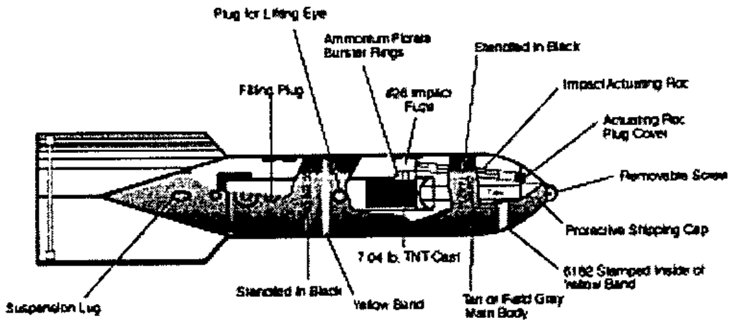
A.1 1.2 All three project areas on Dunn Field (23-A, 23-B, and Site 1) are recorded as having contained CWAs. Mustard was disposed of in area 23-B, in a chlorate of lime slurry pit. Empty German mustard bomb casings were countercharged and the remains buried in area 23-A CAIS were disposed of by burial in Site 1.

A.1.1.3 Any suspect CWM or CAIS components identified will be immediately turned over to TEU.

A.2.0 250 kg German Mustard Bomb

A.2.1 All 250-kilogram German chemical bombs used identical casings. The fill, markings, and fuzes were different. The casing consisted of a section to which a rounded nose section and a pointed tail section of sheet steel were welded. There was only one fuze pocket. A central exploder tube ran the length of the bomb case. Two baffles were welded to the body where the sections were welded together. The wall thickness was 0.16 centimeter (0.063 inch). A standard eyebolt may have been screwed into the side or nose for suspension. The tail was 54.61 centimeters (21 5 inches) long and 60.96 centimeters (24 inches) wide and was made of sheet steel. Four sheet steel vanes were secured directly to the body cone. Bar struts were used.

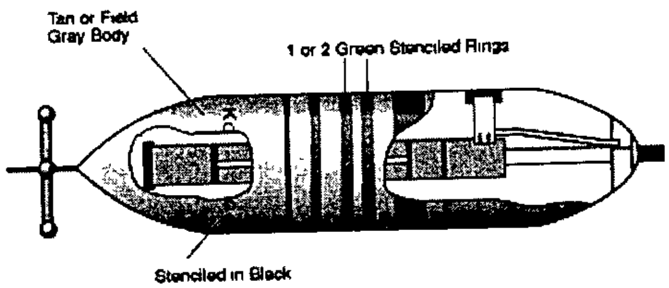
A 2.2 The 250 kg bomb filled with H had a main body color of tan or field gray with one green band on the nose. Other markings were stenciled in black. Weight of filler was 99.79 kg (220 lb), total weight was 165.56 kg (365 lb)



A.3.0 500 kg German Mustard Bomb

A.3.1 The German 500-kilogram chemical bomb was constructed of a drawn steel cylindrical case, a cast steel nose welded to the case, a steel casting with male filling plug welded to the case or a domed cap without filling plug attached by screws. One or two fuze pockets may have been found in this bomb. The wall thickness was 0.16 centimeter (0.063 inch). A standard German eye-bolt may have been screwed into the nose or side of the bomb for suspension. The tail was 76.2 centimeters (30 inches) long and 60.96 centimeters (24 inches) wide made of sheet metal. The tail assembly consisted of four vanes welded to the tail cone with box type struts made of steel bars.

A.3.2 The main body color was tan or field gray overall. The nose markings were one red ring. Other markings were stenciled on the body in black. The exact weights are unknown, but approximate weight of fill is 215.46 kg (475 lb), total weight of 471 74 kg (1040 lb).



A.4.0 Chemical Agent Identification Sets (CAIS) Information

A.4.0.1 More than 100,000 CAIS were produced for use by all branches of the military between the 1930s and the 1960s Three major varieties including 17 different types of CAIS were produced over the years. These sets were used by the military to train soldiers to identify chemical agents in the field. In the past, one of the standard and approved procedures for disposing of CAIS was burial.

A.4.1 K951/K952 War Gas Identification Set, Instructional M1

A.4.1 1 This CAIS is also known as the "Set Gas Identification, Detonation M1" and is the only CAIS known to have been at the depot.

A.4.1 2 The K951/K952 CAIS contained 48 Pyrex, flame sealed ampules, 12 each containing 1.4 ounce solution of mustard (H, 5 percent in chloroform), Lewisite (L, 5 percent in chloroform), chloropicrin (PS, 50 percent in chloroform), and phosgene (CG) for a total of 26 ounces (0.768 liters) of agent, less the chloroform, per set. The amount of agent and solvent in each ampule is:

Pyrex Ampule	Agent	Chloroform
H	2 ml	38 ml
L	2 ml	38 ml
PS	20 ml	20 ml
CG	40 ml	0 ml

A.4.1.3 Each ampule is 1 inch in diameter and 7 1/2 inches long. Each ampule is packed in a cardboard screw cap container (mailing tube-type) with agent type indicated by letters on the cardboard container. Twelve cardboard containers each are packaged into 4 press fit metal cans which are 9 1/4 inches high. The cans are packed into a steel cylinder 6 5/8 inches in diameter, approximately 38 inches long, and 0.145 inch thick. The cylinder is closed by a flanged cover which is secured by eight bolts.

A.4.1.4 The only difference between the K951 and K952 is that the K951 was issued with blasting caps that were packed and shipped in a separate container. The K951 ampules (also called vials) are frequently found in any configuration (loose, in the original shipping container (also called "pigs"), in drums, cans, or other disposal containers). When found loose, the agent type cannot be readily identified without sophisticated spectrographic equipment, and a worst case assumption of phosgene should be made by field personnel.

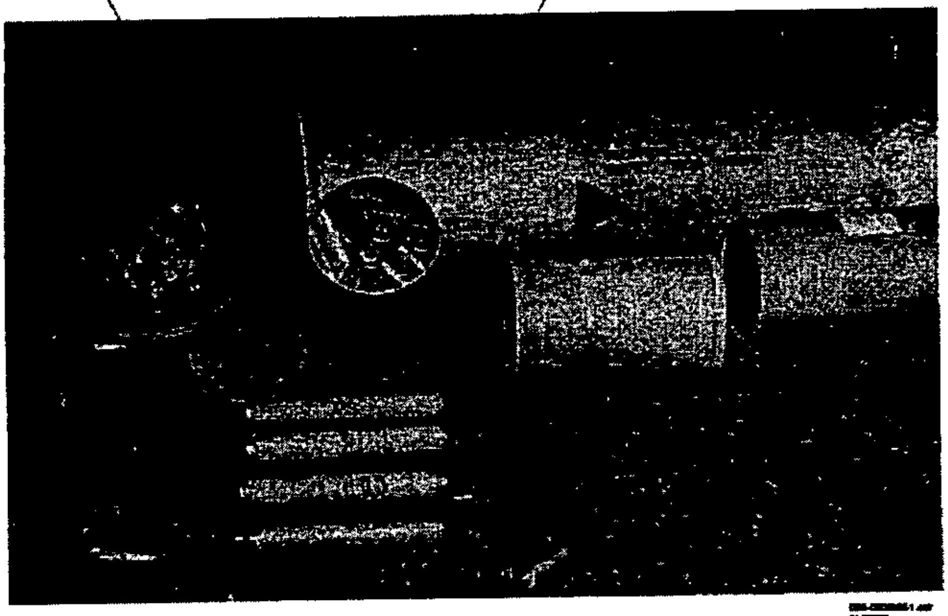


Figure 10. K951 and K952 War Gas Identification Sets

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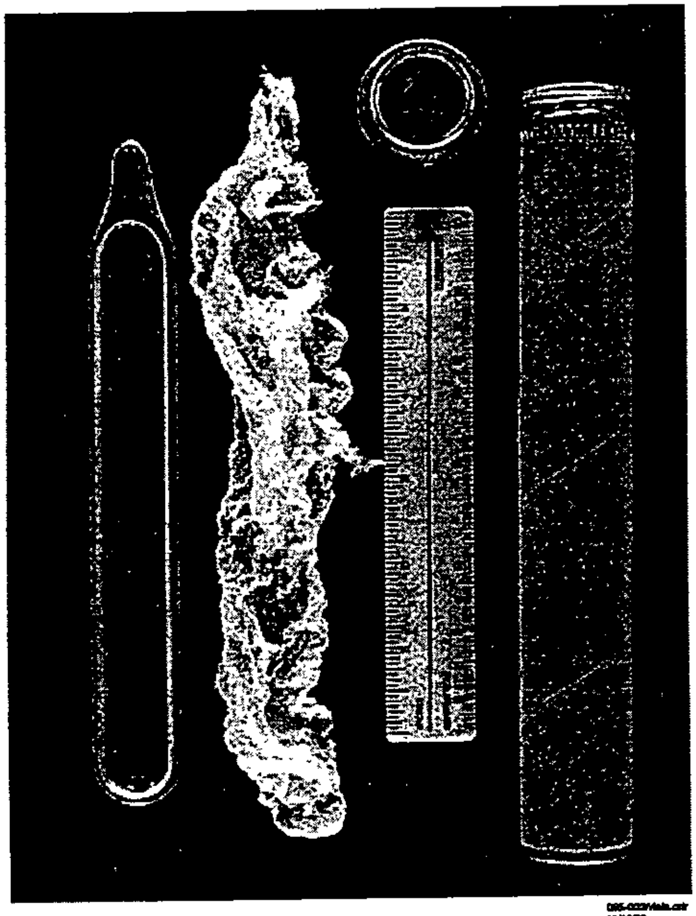

Figure 11. K951/952 Ampule, Packing Material, and Cardboard Container

Figure 12. Multiple-Tube Container, Opened

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TAB

Appendix B

Appendix B

Activity Hazard Analysis Forms

HAZARD ANALYSIS

Hazard analysis analyzes the significance of potential hazards and identifies safety requirements (or alternatives) needed to eliminate or control the hazards to reduce the associated risk to an acceptable level The hazard analysis also evaluates the adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks.

In many cases, there will be no potential hazards associated with an operation. In such a case, include the hazard analysis for in the SOP package, but note on the hazard analysis form that "There are no potential hazards associated with this operation; therefore, a hazard analysis is not required."

Personnel conducting the hazard analysis will be knowledgeable in UXO and explosive safety standards and requirements, have and understanding of the operation, and will be knowledgeable in the method used to conduct the hazard analysis.

The hazards analysis will specifically identify the following:

- Operations and activities that involve hazardous materials or potential exposure to hazardous conditions, and the actions required to minimize the risk during these activities.
- Requirements for personal protective equipment
- Requirements for life support devices and equipment
- Special emergency procedures (e.g. egress, rescue, evacuation) to produce the expected safe result
- Requirements for handling, storing, transportation, and disposal of hazardous materials
- Requirements for safety training and certification

OPERATION. Insert name of operation.

PREPARER. Insert name of person preparing Hazard Analysis.

REVIEWER. Insert name of person reviewing Hazard Analysis

ITEM #. This is a consecutive numbering of the potential hazards associated with this operation.

DESCRIPTION OF HAZARD. Briefly describe the potential hazards associated with this operation.

EFFECT ON OPERATION. Briefly describe how the potential hazards will effect the operation.

HAZARD. This hazards ranking system is based upon the qualitative determination of the severity of the hazards and the probability of the mishap to occur.

Severity. Using Table 2, calculate the hazard severity of each potential hazard and insert the corresponding hazard severity category.

Probability. Using Table 3, calculate the hazard probability level and insert the corresponding hazard probability level.

Table 2: Hazard Severity Categories

Description	Category	Definition
Catastrophic	I	Death, severe environmental damage
Critical	II	Severe injury, severe occupational illness, major environmental damage
Marginal	III	Minor injury, minor occupational illness, minor environmental damage
Negligible	IV	Less than minor injury, less than minor occupational injury, less than minor environmental damage

Table 3: Hazard Probability Levels

Description	Level	Hazard Probability
Frequent	A	Likely to occur frequently (continuously)
Probable	B	Likely to occur several times during the life of the project
Occasional	C	Likely to occur sometime during the life of the project
Remote	D	Unlikely, but possible to occur during the life of the project
Improbable	E	So unlikely, it can be assumed that the event may not be experienced

RAC WITHOUT CONTROL. Table 4, the risk assessment matrix, contains the Risk Assessment Codes (RAC). Considering the hazard severity and hazard probability levels for this operation, calculate the RAC without implementation of institutional controls.

RECOMMENDED CONTROL. All hazards in the RAC 1 and 2 categories require changes in the procedures or operation to reduce the risk category to either the acceptable with controls category or to the acceptable category. Insert the recommended controls.

RAC WITH CONTROL. Calculate the RAC after controls are implemented. Implementation of controls must improve the RAC 3 or 4 levels.

Table 4: Risk Assessment Matrix

Probability	Severity			
	(I) Catastrophic	(II) Critical	(III) Marginal	(IV) Negligible
(A) Frequent	1	1	1	3
(B) Probable	1	1	2	3
(C) Occasional	1	2	2	4
(D) Remote	2	2	3	4
(E) Improbable	3	3	3	4

Risk Assessment Codes (RAC)

RAC 1	Unacceptable	Modify procedures and operations to reduce risk
RAC 2	Undesirable	Modify procedures and operations to reduce risk
RAC 3	Acceptable with controls	Some controls are required to maintain the risk level
RAC 4	Acceptable	

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Erection, Movement and Disassembly of Sprung Structure		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Erect/Assemble Sprung Structure	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Personal Injury	II	D	2	Use level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site	(IIE) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Personal Injury	II	D	D	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
Disassembly and Movement of Structure	Same as above	Personal Injury	II	D	D	Same as above	Same as above

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012			Location: DDMT		
Activity: Filter Assembly Installation and Removal, Filter Replacement		Analysis Performed by: Zeth DeVore, Project Engineer			Reviewed by: M. Donovan, ASP		
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Installation	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Personal Injury	III	D	3	Use modified level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Personal Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
Removal	Same as above	Personal Injury	III	D	3	Same as above	(IVD) 4
Filter Replacement, Clean Filter	Same as above	Personal Injury	III	D	3	Same as above	(IVD) 4
Filter Replacement, Contaminated Filter	Same as above plus injury from exposure to CWM	Personnel Injury	II	C	2	Use level "B" PPE, institute contamination control procedures and decontamination procedures for personnel and equipment. Follow manufacturers instructions, maintain firm footing, beware of obstacles, have medical support, water, and fire extinguisher on site.	(IID) 3

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012			Location: DDMT		
Activity: Shaker Table Operation CAIS Area		Analysis Performed by: Zeth DeVore, Project Engineer			Reviewed by: M. Donovan, ASP		
Description of Operation	Potential Hazard	Effect on Operation	Hazard Severity	Hazard Probability	Initial RAC	Recommended control	Corrected RAC
Place/Move Shaker table	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment	Physical Injury	III	D	3	Use modified level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions Have water, first aid kit and fire extinguishers on site.	(IVD) 4
Operate Shaker Table	Same as above plus injury from exposure to CWM	Physical Injury	II	C	2	Use level "B" PPE, institute contamination control procedures and decontamination procedures for personnel and equipment Follow manufacturers instructions, maintain firm footing, beware of obstacles, have medical support, water, and fire extinguisher on site	(IID) 3
	Injury from unintentional detonation of a UXO	Physical Injury and Damage to Equipment	I	C	1	Use detection instruments and visually check soil during operation. Follow all UXO safety rules. Have medical support, water and fire extinguisher on site	(ID) 3

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Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Site Management		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard: Severity	Hazard: Probability	Initial RAC	Recommended control	Corrected RAC
Overall Management of Site	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment	Physical Injury	III	D	3	Use level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact Avoid contact with poison plants Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site.	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012			Location: DDMT		
Activity: Soil Sampling		Analysis Performed by: Zeth DeVore, Project Engineer			Reviewed by: M. Donovan, ASP		
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Collection of characterization samples (non CAIS area)	Injury from unintentional detonation of a UXO	Physical Injury and Damage to Equipment	I	C	1	Use detection instruments and visually check soil during operation. Follow all UXO safety rules Have medical support, water and fire extinguisher on site.	(ID) 3
	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment or exposure to CWM	Physical Injury	II	D	2	Use modified level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site	(IIE) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site	(IVD) 4
Collection of characterization samples (CAIS area)	Injury from unintentional detonation of a UXO	Physical Injury and Damage to Equipment	I	C	1	Same as above	(ID) 3
	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment or exposure to CWM.	Physical Injury	II	C	2	Same as above except use level "B" PPE.	(IIE) 3

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Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012			Location: DDMT		
Activity: Soil Sampling		Analysis Performed by: Zeth DeVore, Project Engineer			Reviewed by: M. Donovan, ASP		
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Same as above	(IVD) 4
Collection of compliance samples (all areas)	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Physical Injury	III	D	3	Same as above	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Same as above	(IVD) 4

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Activity Hazard Analysis							
Contract #: DAGA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Excavation		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Mechanical Excavation	Injury from unintentional detonation of a UXO	Physical Injury and Damage to Equipment	I	C	1	Use detection instruments and visually check soil during operation. Follow all UXO safety rules. Have medical support, water and fire extinguisher on site.	(ID) 3
	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment or exposure to CWM.	Physical Injury	II	C	2	Use PPE as per SSHP Table 6-3, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site.	(IIE) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact Avoid contact with poison plants. Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Monitoring of Investigative Derived Waste		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Monitoring	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment or exposure to CWM.	Physical Injury	II	A	1	Use level "B" PPE, institute contamination control procedures and decontamination procedures for personnel and equipment. Follow manufacturers instructions, maintain firm footing, beware of obstacles, have medical support, water, and fire extinguisher on site	(IIID) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Pretreatment of Investigative Derived Waste		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Pretreatment	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment, exposure to CWM and decontamination chemicals.	Physical Injury	II	A	1	Use level "A" PPE, institute contamination control procedures and decontamination procedures for personnel and equipment Follow manufacturers instructions, maintain firm footing, beware of obstacles, have medical support, water, and fire extinguisher on site	(IIID) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact Avoid contact with poison plants Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Disposition of Investigative Derived Waste		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Containerization	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Physical Injury	III	D	3	Use modified level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site.	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Personnel Decontamination Station (PDS)		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Setup PDS	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment, splash of decontamination chemicals.	Physical Injury	III	C	3	Use level "D" PPE, use face shield when mixing decontamination chemicals, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions Have water, first aid kit and fire extinguishers on site	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site.	(IVD) 4
Processing personnel through PDS.	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment, exposure to CWM and decontamination chemicals.	Physical Injury	II	C	2	Use PPE as per SSHP Table 6-3, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions Have water, first aid kit and fire extinguishers on site	(IIIC) 3

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Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Personnel Decontamination Station (PDS)		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
Closing PDS	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment, splash of decontamination chemicals	Physical Injury	III	C	3	Use level "D" PPE, use face shield when mixing decontamination chemicals, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site.	(IVD) 4

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Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Excavation Backfill		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M. Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Backfill of excavation	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Physical Injury	II	B	1	Use level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site	(IIIC) 3
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact Avoid contact with poison plants. Be aware of weather conditions and shelter locations. Have water, first aid kit and fire extinguishers on site	(IVD) 4

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Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012				Location: DDMT	
Activity: Disposal of Inert UXO and Related Scrap		Analysis Performed by: Zeth DeVore, Project Engineer				Reviewed by: M Donovan, ASP	
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Loading inert UXO and related scrap for disposal	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Physical Injury	III	D	3	Use level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions Have water, first aid kit and fire extinguishers on site.	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening.	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site	(IVD) 4

Activity Hazard Analysis							
Contract #: DACA87-97-D-0006		Project #: 0012			Location: DDMT		
Activity: Disposal of UXO		Analysis Performed by: Zeth DeVore, Project Engineer			Reviewed by: M. Donovan, ASP		
Description of Operation	Potential Hazard	Effect on Operation	Hazard		Initial RAC	Recommended control	Corrected RAC
			Severity	Probability			
Disposal of UXO by detonation	Injury from unintentional detonation of a UXO	Physical Injury and Damage to Equipment	I	C	1	Use detection instruments and visually check soil during operation Follow all UXO safety rules. Have medical support, water and fire extinguisher on site.	(ID) 3
	Injury from physical exertion, heat/cold stress, slips, trips, falls, mishandling of equipment.	Physical Injury	III	D	3	Use level "D" PPE, institute heat/cold stress monitoring, maintain firm footing, beware of obstacles, use care handling equipment, use guides and spotters, follow manufacturers instructions. Have water, first aid kit and fire extinguishers on site.	(IVD) 4
	Injury from environmental hazards such as wildlife, insects, poison ivy, oak, or sumac, thunderstorms or lightening	Physical Injury	III	D	3	Be aware of natural surroundings, wildlife, insect and rodent habitats and avoid contact. Avoid contact with poison plants. Be aware of weather conditions and shelter locations Have water, first aid kit and fire extinguishers on site	(IVD) 4

TAB

Appendix C

APPENDIX C

UXB

CONFINED SPACE ENTRY PROGRAM

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References:

29 CFR 1910.146
NFPA-70, Article 500

1.0 Objectiv

The hazards associated with a confined space entry increase the threat to the health and safety of on-site personnel. Therefore, it is the objective of this procedure to outline the minimum health and safety requirements for working in or around confined spaces. This procedure outlines the measures specified in 29 CFR 1910.146, the Permit-Required Confined Spaces Standard.

2.0 Scope

This procedure is applicable to all UXB employees and subcontractors who must enter permit-required confined spaces to perform any job function.

3.0 Responsibilities

3.1 Industrial Hygienist (IH)

The Industrial Hygienist (IH) will be responsible for the overall implementation of the Confined Space Entry Program and will perform the following duties:

- Provide general oversight for implementation of the Confined Space Entry Program.
- Assist the Confined Space Coordinator (CSC) in the field implementation.
- Assist the CSC in the proper classification of confined spaces.
- Provide consultation to the CSC and Entry Supervisor (ES) in anticipation, recognition, evaluation, and control of confined space hazards.
- Perform periodic review of the Confined Entry Space Program, using the cancelled permits to identify deficiencies and revise the program, as needed.

3.2 Confined Space Coordinator (CSC)

All confined space entries will be coordinated by the Confined Space Coordinator (CSC). This person is a UXB employee at the supervisory level and will be responsible for:

- Consulting with the **IH** in the classification and identification of confined space and associated hazards.
- Supporting the **ES** with the authorization and implementation of the entry permit.
- Ensuring that all known or potential confined spaces are reviewed to determine the type and level of hazards associated with the space.
- Enforcing the confined space procedures.
- Ensuring all personnel have received proper training in confined space entry procedures and proper use of safety retrieval and emergency equipment.
- Assisting in hazard identification and evaluation of the confined space by conducting or supervising air monitoring or other evaluations, as required by the entry permit.

- May also be designated as the Entry Supervisor.

3.3 Entry Supervisor (ES)

The Entry Supervisor (ES) has general authority for the field implementation of the Confined Space Entry Program, and is responsible for ensuring that the confined space operations are in compliance with relevant **OSHA** regulations. Supervisors are responsible for:

- Knowing the hazards that may be encountered during entry, including information on routes of entry, signs and symptoms, and consequences of exposure.
- Completing and signing the Confined Space Entry Permit (UXB Form 10050, attached) after all provisions of the permit have been met, and ensuring it is authorized by the CSC.
- Ensuring confined space conditions are acceptable during operations.
- Ensuring confined space entry permits are posted and that a confined space attendant is present during all entry activities.
- Ensuring all necessary safety retrieval equipment for confined spaces is on-site, operational, and properly used.
- Ensuring site is properly posted and flagged.
- Conducting an on-site pre-entry briefing with all entrants and attendants prior to the start of the job.
- Ensuring appropriate communications for summoning emergency/rescue personnel are located prior to entry.
- Terminating or canceling the entry permit when entry operations covered on the permit are completed or if a prohibited condition arises in or near the permit-required confined space.
- Removing unauthorized personnel in or near the confined space.
- May also be designated as the CSC.

3.4 Authorized Attendant (AA)

The attendant shall be continually stationed outside the confined space to monitor not more than one confined space entrance and to prohibit unauthorized entrants from entering the area -- those not listed on the confined space entry permit. Attendant shall:

- Know the hazards that may be encountered during entry, including information on routes of entry, signs and symptoms, and consequences of exposure
- Maintain the Confined Space Entry/Exit Log (UXB Form 1.0053).
- Remain in constant two-way communication with entrants by either verbal, visual, or radio contact.

- Provide standby assistance to occupants when ingressing or egressing the confined space.
- Direct occupants to immediately evacuate the confined space when:
  - A prohibited condition is detected
  - Unauthorized personnel enter the space and refuse to leave
  - Behavioral changes are detected in the entrants
  - Air monitoring equipment detects unacceptable oxygen, flammable, or toxic levels
  - Attendant must leave the work area or cannot effectively and safely perform his duties
  - Breakdown in communication with the entrants occurs
  - Condition develops outside the space that could endanger the authorized entrants
- Initiate emergency response procedures in the event that an entrant must be rescued from the confined space, and provides emergency rescue personnel with pertinent information related to the emergency situation
- Monitors for internal and external conditions that could adversely affect operations inside the confined space.
- Control entry into the confined space work and support areas through the use of barrier flags and signs.
- Remain at the entry point, unless relieved by another authorized attendant.
- Review the confined space entry permit with the **ES** prior to entry into the confined space.
- Warn unauthorized personnel to stay away from the confined space, and if they do enter the space, informs them that they must leave immediately. Calls for the evacuation of entrants and informs the **ES**.

At no time shall the AA enter the confined space to perform rescue services. The AA may, however, use rescue equipment and perform rescue/emergency duties outside the confined space.

3.5 Authorized Entrants (AE)

The Authorized Entrants have the following responsibilities:

- Know the hazards that may be encountered during entry, including information on routes of entry, signs and symptoms, and consequences of exposure
- Preview and be knowledgeable of the provisions in the confined space entry permit.
- Maintain effective and continuous contact with the attendant.

- Understand the proper use of personal protective equipment (PPE), safety equipment, retrieval systems, and other hazard control methods.
- Review the entry permit with the attendant and **ES** to resolve any concern or questions.
- Alert the attendant upon recognizing any warning sign or symptom of exposure or detecting a prohibited condition.
- Evacuate the confined space when directed by the attendant or when a prohibited condition is detected or when warning signs or symptoms of exposure are noticed

4.0 Procedures for Identification and Reclassification of Confined Spaces

4.1 Work Area Evaluation

The CSC, in conjunction with the ES, shall evaluate the work area to determine if a confined space exists. A work area shall be classified as a confined space if it meets ALL of the following.

- has limited or restricted means for entry or exit (for example: tanks, vessels, silos, storage bins, vaults, and pits)
- is not designed for continuous employee occupancy
- is large enough and so configured to allow an employee to enter and perform assigned duties

Once a work area has been classified as a confined space, the space shall be posted with signs which include, but are not limited to, the following information:

DANGER

CONFINED SPACE

AUTHORIZATION REQUIRED
FOR ENTRY

If applicable, barricades or flagging should also be used when posting of signs. Warnings of other specific hazards, such as" high noise area" or "respirator required area," should also be posted.

4.2 Classification of Confined Spaces

Once a workspace has been classified as a confined space, the CSC shall consult with the **IH** to determine if the confined space is to be classified as a NON-PERMIT or a PERMIT-REQUIRED confined space.

If entry into the confined space is required to evaluate its hazards, this entry shall be conducted using the requirements of a permit-required confined space.

A permit-required confined space will contain, but not be limited to, one or more of the following:

- Potential oxygen deficient/enriched, toxic, or flammable atmospheres
- Contains, or has a known potential to contain, a hazardous atmosphere or any other recognized serious safety or health hazard
- Contains a material with the potential to engulf an individual, has an internal configuration that could trap or asphyxiate the entrant(s) by inwardly converging walls, or has a floor that slopes downward and tapers to a smaller cross-section
- Physical, mechanical, chemical, or biological hazards
- Possibility of liquids, gases, or solids being admitted during occupancy
- Past and current activities in the confined space which may adversely affect the atmosphere of the confined space
- Possible entry or exit hazards
- Physical characteristics, configuration, and location of the confined space
- The size, depth, and sloping of trenches and excavations

A confined space shall be classified a "non-permit" confined space if it meets the following criteria.

- The space does not contain any hazard capable of causing serious harm or death.
- The space does not contain or have the potential to contain a hazardous atmosphere.

4.3 Classification and Certification of Low Risk Confined Spaces

A permit-required confined space may be reclassified as a low-risk confined space if the following conditions exist:

- The only hazard involved is an actual or potential hazardous atmosphere.
- Forced air ventilation alone will be sufficient to maintain the space as safe for entry.
- Monitoring and inspection data are generated and documented, which supports the conditions stated in subparagraphs.
- Entry is conducted in accordance with the procedures outline in Section 5 0 of this plan.

When a confined space has been classified as a low-risk confined space, the CSC will complete the Low-Risk Confined Space Certification Form (UXB Form 1.0054) and post the form at the space prior to entry.

5.0 Procedures for Entry into Low-Risk Confined Spaces

Any conditions which would make it unsafe to enter the space shall be removed prior to entry.

Temporary barriers shall be erected around the space or entrance of the confined space to prevent accidental falls

Prior to entry, the air within the space will be monitored using calibrated direct-reading instruments. Monitoring shall be conducted using the procedures outlined in Section 8.0 of this plan.

The air monitoring results will be posted on the Low-Risk Confined Space Certification Form.

If required, forced air ventilation will be used to control atmospheric hazards to ensure that employees do not work in a hazardous environment.

If ventilation is required, the procedures outlined in Section 7 0 of this plan will be used.

If a hazardous atmosphere is detected during entry, the following shall be conducted:

- All employees shall leave the space immediately.
- The space shall be evaluated to determine the source of the hazardous atmosphere.
- Control measures shall be implemented to protect the employees prior to any subsequent entries.
- The space shall be upgraded to a permit-required confined space and applicable procedures implemented prior to re-entry if adequate controls cannot be incorporated.

Employees entering the low risk confined space shall wear appropriate PPE, such as hard hats, safety glasses, leather work boots, and work gloves.

6.0 Procedures for Entry into Permit-Required Confined

6.1 Confined Space Permit

The ES, with consultation from the **IH**, will complete a Confined Space Entry Permit prior to employee entry into the space; the following guidelines will be used

6.1.1 General Information

Location/Description of Space - Briefly describe the space -- location, size, shape, depth, etc

Purpose of Entry - Briefly state the scope of the work to be accomplished in the confined space -- geotechnical inspection, environmental sampling, survey, excavation, etc.

Potential Hazards - Describe the expected physical and chemical hazards -- potential IDLH atmosphere, heat/cold stress, noise, etc.

Permit Duration - Give the date and time period (24-hour clock) for which the permit is valid

Authorized Attendants - List the name(s) of the qualified employee(s) who will be stationed outside the space monitoring the entrants and their activities

Authorized Entrants - List the names of all trained employees who will or can enter the confined space during this permit period

6.1.2 Safety Equipment/Requirements

Area Secure and Signs Posted - Mark **YES** when the safe area around the confined space entrance must be secured with flagging, barriers, and proper signs

Pipe Lines Capped or Blanked - Mark **YES** if pipelines between the confined space and the point of isolation may contain hazardous material which would require the capping or blanking of these lines before entry

Pipe Lines Purged or Flushed - Mark **YES** if pipes inside the confined space must be purged with non-flammable gas prior to working on the pipe

Lock Out/Tag Out - Mark **YES** if outside energy sources (electrical, steam, etc.) exist which should be properly locked-out and de-energized before entry into the confined space

Mechanical Ventilation - Mark **YES** if the confined space atmosphere needs to be continuously ventilated by mechanical methods during occupancy, and check the type of ventilation needed

Communication Equipment - Mark **YES** if normal verbal communication will not be possible due to the configuration of the confined space or background noise

Tripod/Retrieval System - Mark **YES** if a tripod or other means of retrieval is needed to assist with ingress, egress, or emergency rescue

Fire Extinguisher - Mark **YES** if the potential for fire exists, and note the appropriate type of extinguisher to be used

Ground Fault Circuit Interrupt - Mark **YES** if electrical tools will be used inside the confined space

Lighting - Mark **YES** if extra illumination sources will be needed inside the confined space.

NOTE - illumination source must be intrinsically safe if the potential for an explosive atmosphere exists

6.1.3 Personal Protective Equipment (PPE)

Self-Contained Breathing Apparatus - The confined space atmospheric conditions are unknown or are potentially IDLH (Immediately Dangerous to Life and Health), mark **YES** if SCBA (Self-Contained Breathing Apparatus) is to be used during occupancy or is needed for on-site rescue purposes.

Airline Supplied Respirator with Escape - When confined space atmospheres dictate the need for supplied air and physical characteristics of space limit the use of SCBA's, mark **YES** for supplied airline respirator.

Air Purifying Respirator (APR) - When confined space atmospheric conditions present a health hazard but are not IDLH, mark **YES** for an air purifying respirator and state type of respirator and cartridge.

Five Minute Escape Air Bottle - Mark **YES** for entrants to carry an escape air pack during occupancy of space. Required when wearing an APR.

Safety Glasses or Goggles - Mark **YES** if entrants are to wear safety glasses or goggles, and circle the appropriate type.

Hard Hat - Mark **YES** if entrants are to wear a hard hat during confined space occupancy.

Ear Plugs/Muffs - Mark **YES** if high noise is present inside the confined space or may be generated by equipment used by the entrants, and circle the appropriate type.

Chemical Clothing - Mark **YES** if the potential for skin contact with hazardous material is possible and state the type of chemical resistant clothing.

Protective Boots/Gloves - Mark **YES** if entrants are to use protective boots or gloves to prevent contact with hazardous material or objects, and circle those that apply.

Chest Harness and Life Line - Mark **YES** if entrants are to wear a chest harness and life line during entry. **NOTE** - if tripod/retrieval system has been marked **YES** then this must also be marked **YES**.

Other - Indicate other protective equipment to be used during the confined space entry. Attach additional page, if needed.

6.1.4 Tests to be Performed

Time/Date - Person performing test must state the time and date that the test was performed.

% Oxygen - Always test for oxygen deficient/enriched atmospheres before testing for other contaminants. Testing for oxygen shall be conducted prior to entry into all permit-required confined spaces. The exposure range for O^2 is between 19.5% (for oxygen deficient) and 23.5% (for oxygen enriched)

% of Lower Explosive Limit (LEL) - LEL monitoring shall always be performed during confined space operations. Monitoring equipment should be adjusted so that it will alarm if concentrations of explosive gas reach 10% of the LEL for that gas. At that point, operations will cease until conditions are evaluated

Carbon monoxide (CO) - The space should be tested for the presence of carbon monoxide prior to entry. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) – Time Weighted Average (TWA) are 25 ppm for CO. The action level at which the site will be evacuated and the CIH consulted is 25 ppm.

Hydrogen sulfide (H_2S) - If there is a potential for H_2S inside the confined space, then the atmosphere must be tested prior to entry. The TLV-TWA for H_2S is 5 ppm. Again, the action level is the PEL, 5 ppm.

Other - List other tests and the corresponding occupational exposure limits which are to be conducted prior to entry.

Tester's Initials - The person conducting the atmospheric testing must initial on the line corresponding to the test performed.

All testing data will be logged on the Confined Space Monitoring Log (UXB Form 1.0056)

6.1.5 Checklist

All Persons Trained - Mark this box when all personnel documentation has been verified

All Persons Medically Approved - Mark this box when medical approval is verified

Welding Is Expected - Mark this box if welding is to be conducted during entry operations

Entrants/Attendants Briefed - Mark this box when all entrants and attendants have been briefed by the supervisor-in-charge

6.1.6 Emergency Contacts

List telephone numbers for ambulance, fire, rescue, or other important contacts.

6.1.7 Special Instructions

List any special precautions or operational instructions.

6.1.8 Signatures

Entry Supervisor - The Entry Supervisor authorizing the work being performed in the confined space prints and then signs his name. This permit is not to be signed until full compliance with the requirements of the permit has been achieved.

Permit Cancelled By - The person responsible for terminating the permit prints his name.

Reason for Cancellation - State the reason the permit was terminated (end of operations, unauthorized condition in the space, etc.).

Date Cancelled - List the date that the permit was terminated

6.2 Authorized Personnel

Entry into a permit-required confined space will be conducted by authorized entrants, attendants, and supervisors who have received proper training in the hazards, procedures, and equipment related to permit-required confined spaces.

6.3 Requirements for Atmospheric Monitoring

Prior to entry, and periodically as specified on the permit, air monitoring shall be conducted to assess potentially hazardous atmospheric conditions in the space. The procedures listed in Section 8.0 of this plan will be followed.

6.4 Requirements for Ventilation

In confined spaces where atmospheric conditions are unacceptable, the procedures in Section 7.0 of this plan shall be utilized.

6.5 Isolation of Physical Hazards

A confined space shall be isolated to prevent entry of materials and hazardous contaminants by:

- Blanking or blinding pipes, lines, or ducts leading into the space
- Removal or misalignment of pipes, lines, or duct sections

- Double block and bleed of pipes, lines, or ducts
- De-energizing and lock out/tag out of hazardous external and internal energy sources

6.6 Electrical Equipment

Electrical equipment used in hazardous locations shall meet the appropriate requirements of Article 500 of the National Electrical Code (NFPA-70).

To eliminate the potential for electrical shock, appropriate electrical equipment or systems shall be used. This would include protection such as ground-fault circuit-interrupters (GFCI), assured grounding systems, double insulated tools, separately derived systems, and low voltage systems

When temporary lighting is used in confined spaces, the following requirements shall be met:

- All lighting shall be "spark proof" approved for use in Class I, Division I, Groups A, B, C, and D atmospheres, if a known or potential flammable atmosphere exists.
- Extension cords used for temporary lighting or other electrical equipment shall be equipped with connectors or switches approved for hazardous locations.
- Temporary lighting shall be equipped with adequate guards to prevent accidental contact with bulbs.
- Electrical cords shall be kept clear of working spaces and walkways or other locations in which they may be exposed to damage or present safety hazards (tripping, etc.).
- Temporary lighting and electrical cords shall be inspected regularly for signs of damage to insulation and wiring.

6.7 Communications

Entrants and attendants will maintain continuous communication during confined space entry operations.

If visual contact is not possible due to the configuration of the space, a radio communications system will be used. Communication equipment to be used in potentially flammable atmospheres will be approved by the manufacturer for use in that type of environment.

Failure of radio communication systems will necessitate immediate evacuation of the entrants from the confined space.

6.8 Retrieval/Rescue Equipment Requirements

To facilitate non-entry rescues, a retrieval system will be set up prior to entry -- unless the retrieval equipment would increase the overall risk of entry or would not contribute to the timely rescue of the entrant.

When used, retrieval equipment shall meet the following requirements:

- Full body or chest harness

- Retrieval line will be attached to the center of the entrant's back near the shoulder level or above the entrant's head
- The other end of the retrieval line shall be attached to a manually-operated lifting device or fixed point outside the space
- A manually-operated mechanical lifting device shall be available to retrieve personnel from a vertical type space of more than five (5) feet in depth

If an entrant is exposed to a hazardous substance, Material Safety Data Sheets (MSDS) or other written material related to the hazardous substance shall be made available to the medical facility providing care to exposed personnel.

6.9 Emergency Rescue

The authorized attendant shall immediately initiate the following steps when a rescue becomes necessary·

- The authorized attendant shall notify the ES, who will initiate the emergency response plan.
- When possible, the authorized attendant shall initiate rescue operations from outside the confined space utilizing the winch and/or the retrieval lines attached to the authorized entrants.
- **At no time** will the attendant enter the confined space to attempt rescue.
- Upon arrival at the emergency site, the emergency rescue team will receive a status report and hazard analysis from the authorized attendant.
- The emergency rescue team will enter the confined space wearing life-support equipment.
- The designated fire department, rescue squad, ambulance service, and other rescue personnel shall be set forth in the confined space entry permit.

6.10 Personal Protective Equipment (PPE)

When entering a confined space, all entrants shall wear the PPE set forth in the confined space entry permit. The PPE level shall be determined by the CSC and will be based on the presence of known or potential hazards.

6.11 Cancellation or Termination of Entry Permits

The ES shall cancel the entry permit and terminate the entry when either:

- The operations specified in the entry permit have been completed.
- A prohibited condition in or near the space arises, increasing the hazard level in the space.

Problems which arise during entry shall be noted on the permit so that appropriate revisions to the permit can be made.

The cancelled permit shall be given to the IH to allow review of the permit-required confined space program

Cancelled permits shall be maintained for a minimum of one (1) year after the termination of entry.

7.0 Procedure for Ventilation of Confined Space

Before employees are permitted to enter a confined space, the space shall be mechanically ventilated if deemed necessary by the ES. Ventilation normally consists of a pre-entry purge of several air changes, followed by the continuous introduction of fresh air during occupancy.

Ventilation shall be maintained during the occupancy if there is a potential for the atmospheric conditions of the confined space to drift out of the acceptable range. When necessary, the confined space shall be mechanically ventilated to prevent accumulation of

- Oxygen deficient or enriched atmospheres
- Flammable gases and vapors in the atmosphere at concentrations above 10% of the LFL
- Toxic contaminants in the atmosphere above the PEL

If the confined space is ventilated with an electrical air blower, it shall be used with a ground-fault circuit-interrupter, and be approved for use within a hazardous atmosphere.

Natural ventilation is preferred if it can achieve the same results as the mechanical ventilation.

Ventilation shall not be used as a means to justify reclassification of a permit-required confined space to a non-permit confined space.

Low-risk confined spaces may be entered without the use of ventilation at the discretion of the CSC.

Fuel powered ventilation system will be positioned to prevent the entering of engine exhaust emissions into the confined space.

Forced air ventilation shall be directed so as to ventilate the immediate area where the employee is or will be working.

Ventilation shall continue until all employees have left the space.

8.0 Procedures for Atmospheric Monitoring

Before entry into a confined space, testing shall be conducted for hazardous atmospheres. The testing sequence should be oxygen, flammability, and toxicity. Testing shall be conducted prior to and after ventilation is initiated. During occupancy, the frequency of testing shall be set forth in the confined space entry permit.

Test equipment and the results for each agent shall be listed on the confined space entry permit each time the space is monitored. When continuous monitoring is conducted, the results will be recorded prior to entry, after breaks of more than one (1) hour, at the end of each work day, and any time an atmospheric hazard exceeds the action level.

When possible, testing of confined spaces shall be conducted throughout the entire portion of the space to be occupied.

It may be required that a probe or extension be added to the sampling equipment or occupants entering the confined space -- especially in spaces which are deep, have odd shapes, or are in remote areas.

For spaces where monitoring of the entire work area is not feasible because the space is too large or part of a continuous system, conditions shall be continuously monitored in the work areas. In such areas, employees will carry emergency escape air packs.

Acceptable Air Sample Limits - The atmosphere of the space shall be within acceptable limits when the following conditions are maintained:

- Oxygen - 19 5% to 23 5%
- Flammability - less than 10% of the Lower Explosive Limit (LEL)
- Toxicity - less than recognized exposure limits. If tests show concentrations above the PEL are encountered during entry, the occupants shall immediately exit the confined space and the hazard shall be re-evaluated

9.0 Reclassification of Permit-Required Confined Spaces

A confined space originally classified as permit-required may be reclassified as a non-permit confined space under the following conditions:

- No actual or potential atmospheric hazards are present
- All other hazards in the space are eliminated.

If entry into the space is required to inspect or eliminate the hazards, this entry shall be conducted in accordance with Section 6 0 of this plan.

The basis for determining that the hazards are eliminated will be documented through the use of the Permit-Required Confined Space Reclassification Form (UXB Form 1 0055), which will be completed by the CSC and posted at the space prior to entry.

If a hazard arises within the space after it has been reclassified as a non-permit space, the employees will evacuate the space and the hazard/classification level will be re-evaluated.

NOTE: Control of atmospheric hazards using forced ventilation does not constitute **elimination** of the hazard and is not a valid method for reclassifying a permit-required confined space as a non-permit confined space.

10.0 Subcontractor Requirements

UXB subcontractors shall be responsible for complying with the requirements of this program, as well as applicable OSHA regulations.

UXB subcontractors performing entry into a permit-required confined space shall be informed by the CSC of the nature and control methods for known or potential hazards present in the confined space.

The CSC shall be responsible for the coordination of subcontractor and UXB personnel working simultaneously in a permit-required confined space

The CSC shall de-brief subcontractor personnel at the conclusion of entry operations regarding hazards encountered or created and the applicability of the entry program requirements.

11.0 Training

During confined space operations, a trained on-site or pre-arranged rescue team shall be provided to respond to requests for rescue services. At least two members of the rescue team will hold current certification in first aid and CPR and be medically qualified, fit tested, and trained to wear SCBAs.

11.1.1 Attendants, Entrants, and Supervisors

During confined space operations, a trained on-site or pre-arranged rescue team shall be provided to respond to requests for rescue services. At least two members of the team shall hold current certification in first aid and CPR.

Training shall be required whenever:

- An employee is first assigned duties related to confined space entry
- An employee's assigned duties are changed.
- A change in the confined space operations or conditions occurs and the employee has not been previously trained for the operation.
- The CSC, ES, or IH believe that there are deviations from the requirements of this program or there are deficiencies in an employee's knowledge or use of the procedures in this program.

UXB shall certify that the provided training establishes employee proficiency in the procedures of this program.

Personnel responsible for supervising, planning, entering, or participating in confined space entry and rescue shall be adequately trained in their functional duties prior to entering any confined space. General training topics shall include:

- An explanation of the general hazards associated with confined spaces
- A discussion of specific confined space hazards associated with the facility, location, or operation
- The reason for, proper use, and limitations of PPE and other safety equipment required for entry into confined spaces
- An explanation of the permit system and other procedural requirements for conducting confined space entry
- Communication procedures and requirements
- Emergency procedures for evacuating or rescuing workers

- Duties and responsibilities as a member of the confined space entry team
- A description of how to recognize signs and symptoms of contaminant air exposure

The ES shall receive the aforementioned general training, as well as additional training on.

- Recognizing the effects of exposure to chemical hazards known to be in the confined space
- Use of air monitoring equipment and interpretation of results
- Use and selection of PPE

Confined space attendants must be trained in the use of Self-Contained Breathing Apparatus (SCBA), the use of special rescue equipment, and the administration of First Aid, as follows:

- SCBA
  - Practical exercises
  - Instruction in the use of SCBA
- Special Rescue Equipment
  - Radio familiarization and operation
  - Lifelines and safety belts/harnesses
  - Procedures for summoning the rescue team
- First Aid
  - Cardiopulmonary resuscitation techniques
  - Recognition of early symptoms of exposure to toxic material and/or oxygen deficiency

11.2 Rescue Team

Members of rescue teams shall receive the following training:

- training identical to the entrants
- proper use of PPE and rescue equipment
- training/drills to perform the assigned rescue function

12.0 Record Keeping and Program Review

Upon cancellation of activities in Permit-Required, Low-Risk, or Non-Permit Confined Spaces, the CSC shall document the reason for cancellation on the appropriate form or certificate.

The CSC will then send all forms, logs, or certificates to the IH for review and storage.

The IH will retain all forms, logs, and certificates for at least one (1) year to facilitate review of the Confined Space Entry Program.

At least annually, the IH will review this program, all cancelled permits, and certificates generated in the previous twelve (12) months to ensure the procedures within the program are providing adequate protection from confined space hazards.

TAB

Appendix D

D. Blank Forms

Appendix D includes the following blank forms:

ENG Form 3394	U.S. Army Corps of Engineers Accident Investigation Report
UXB Form 01-0001	Property Control Card
UXB Form 01-0002	Property Record Card
UXB Form 01-0003	Inventory Adjustment Voucher
UXB Form 01-0004	Lost/Damage Equipment Report Form
UXB Form 01-0005	Physical Inventory Report Form
UXB Form 1.007a	Customer Action Request
UXB Form 1.0012	Site Visitors Log
UXB Form 1.0016	Sketch Sheet
UXB Form 1.0021	Certificate of Inspection
UXB Form 1.0022	Daily Report
UXB Form 1.0023	Safety Meeting Attendance Log
UXB Form 1.0024	Safety Inspection Log
UXB Form 1.0026	Air Monitoring Results Report
UXB Form 1.0032R1	Demolition Material Accountability Form
UXB Form 1.0033	Confidential Personal Data
UXB Form 1.0034	Employee Injury/Property Damage Report Form
UXB Form 1.0036	OEW Excavation Accountability Form
UXB Form 1.0037	Specialized Training
UXB Form 1.0038	Vehicle Condition Inspection Log
UXB Form 1.0039R1	Magazine Data Card
UXB Form 1.0040	Work Plan Acknowledgment Form
UXB Form 1.0041	Daily Truck Inspection Log
UXB Form 1.0043	Consumable Sign Out Log
UXB Form 1.0046	Heavy Equipment Inspection Log
UXB Form 1.0048	Spot Report
UXB Form 1.0050P1	Confined Space Entry Permit
UXB Form 1.0051	Direct Reading Instrument Form
UXB Form 1.0053	Confined Space Entry Log
UXB Form 1.0054	Low Risk Confined Space Certificate Form
UXB Form 1.0055	Permit-Required Confined Space Reclassification Certificate
UXB Form 1.0056	Confined Space Monitoring Log
UXB Form 1.0061	Grid Location Form
UXB Form 1.0062	Subsurface Anomaly Investigations
UXB Form 1.0065	Schonstedt Daily Check Out and Return Procedure
UXB Form 1.0066	Cellular Telephone Daily Check Out and Return Procedure
UXB Form 1.0067	Radio Daily Check Out and Return Procedure
UXB Form 1.0070	Rework Items List
UXB Form 1.0073	Daily QCI Report
UXB Form 1.1201	Geophysical Instrument and Operator Testing Area
UXB Form 3.0004R2	Memorandum

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574 428

(For ...ily)	REPORT NO	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Supp/ to AR 385-40)	REQUIREMENT CONTROL SYMBOL CEEC-S-8(R2)

ACCIDENT CLASSIFICATION

...ONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE		MOTOR VEHICLE INVOLVED	DIVING
...RNMENT ...ILIAN ☐ MILITARY	☐	FIRE ☐ INVOLVED	☐ OTHER	☐	☐
☐ CONTRACTOR	☐	FIRE ☐ INVOLVED	☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER				

PERSONAL DATA

2 a NAME (Last, First, MI) | b AGE | c SEX ☐ MALE ☐ FEMALE | d SOCIAL SECURITY NUMBER ___-__-____ | e GRA...

f JOB SERIES/TITLE

g DUTY STATUS AT TIME OF ACCIDENT: ☐ ON DUTY ☐ TDY ☐ OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT: ☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNT... ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASON... ☐ TEMPORARY ☐ STUDENT ☐ OTHER (Specify)

GENERAL INFORMATION

3 a. DATE OF ACCIDENT (month/day/year) / /

b TIME OF ACCIDENT (Military time))

c EXACT LOCATION OF ACCIDENT

d CONTRACTOR S NAME (1) PRIME: (2) SUBCONTRACTOR

e CONTRACT NUMBER: ☐ CIVIL WORKS ☐ MILITARY ☐ OTHER (Specify)

f TYPE OF CONTRACT: ☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER (Specify)

g HAZARDOUS/TOXIC WASTE: ☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER (Specify)

CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list – see instructions)

4 a CONSTRUCTION ACTIVITY (CODE) #

b TYPE OF CONSTRUCTION EQUIPMENT (CODE) #

INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see instructions)

...EVERITY OF ILLNESS / INJURY (CODE) #

b. ESTIMATED DAYS LOST

c. ESTIMATED DAYS HOSPIT-ALIZED

d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED PRIMARY (CODE) # SECONDARY (CODE) #

f NATURE OF ILLNESS / INJURY (CODE) #

g. TYPE AND SOURCE OF INJURY/ILLNESS: TYPE (CODE) # SOURCE (CODE) #

PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)

6 a ACTIVITY AT TIME OF ACCIDENT (CODE) #

b PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

MOTOR VEHICLE ACCIDENT

7 a. TYPE OF VEHICLE: ☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER (Specify)

b TYPE OF COLLISION: ☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING OTHER (Specify)

c. SEAT BELTS	USED	NOT USED	NOT AVA...
(1) FRONT SEAT			
(2) REAR SEAT			

PROPERTY/MATERIAL INVOLVED

8. a. NAME OF ITEM	b OWNERSHIP	c $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

VESSEL / FLOATING PLANT ACCIDENT (Fill in line and corresponding code number in box from list - see instructions)

9. a. TYPE OF VESSEL/FLOATING PLANT (CODE) #

b TYPE OF COLLISION/MISHAP (CODE) #

ACCIDENT DESCRIPTION (Use additional paper, if necessary)

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11 CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

(Explain YES answers in item 13)

	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a (CONTINUED)

	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task.	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?	☐	☐

b WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?
YES *(If yes, attach a copy)* NO

12 TRAINING

a WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? ☐ YES ☐ NO

b TYPE OF TRAINING ☐ CLASSROOM ☐ ON JOB

c DATE OF MOST RECENT FORMAL TRAINING. / / (Month) (Day) (Year)

13 FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSE: *(See instruction for definition of direct and indirect causes) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b INDIRECT CAUSE(S)

14 ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY

15 DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a BEGINNING *(Month/Day/Year)* / /

b ANTICIPATED COMPLETION *(Month/Day/Year)* / /

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT
CORPS
CONTRACTOR

d DATE *(Mo/Da/Yr)* / /   / /

e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*

f OFFICE SYMBOL

16 MANAGEMENT REVIEW (1st)

a ☐ CONCUR b ☐ NON CONCUR c. COMMENTS

SIGNATURE | TITLE | DATE

17 MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering etc.)*

a. ☐ CONCUR b ☐ NON CONCUR c COMMENTS

SIGNATURE | TITLE | DATE

18 SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS:

SIGNATURE | TITLE | DATE

19 COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE | DATE

☆ U.S.G.P.O.: 1989-6

(Reverse of ENG Form 3394)

GENERAL. Complete a separate report for each person who was *injured, caused,* or *contributed to* the accident (excluding uninjured personnel and witnesses) Use of this form for reporting USACE ...ee first-aid type injuries not submitted to the Office of Workers' ...ensation Programs (OWCP) shall be at the descretion of the FOA ...ander. Please type or print legibly. Appropriate items shall be ...ed with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16 and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable)*

a GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.
- (1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP, mark if accident resulted in military personnel lost-time or fatal injury or illness.
- (2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles)
- (3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
- (4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.
- (1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.
- (2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).
- (3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
- (4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.
- (1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).
- (2) VOID SPACE — Make no entry.
- (3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.
- (4) VOID SPACE—Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: 0-6, E-7, WG-8, WS-12, GS-11, etc.

f JOB SERIES/TITLE — For *government civilian employees* ente... pay plan, full series number, and job title, e.g GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e g., 15A30 or 11G50. For *cont... employees* enter the job title assigned to the injured person, e g... carpenter, laborer, surveyor, etc.,

g DUTY STATUS — Mark the appropriate box.
- (1) ON DUTY — Person was at duty station during duty hours... person was away from duty station during duty hours but c... official business at time of the accident.
- (2) TDY - Person was on official business, away from the duty s... and with travel orders at time of accident. Line-of-Duty investigation required.
- (3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONN... ONLY) Mark the most appropriate box. If "OTHER" is marked, the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of ac...

b. TIME OF ACCIDENT — Enter the local time of accident in mil... time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to l... the accident scene. (installation/project name, building numbe... direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME
- (1) PRIME — Enter the exact name (title of firm) of the prime contractor.
- (2) SUBCONTRACTOR — Enter the name of any subcontra... involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify... contract is civil works, military, or other: if "OTHER" is markec... contract appropriation on line provided. Enter complete contra... number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of con... line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the... identify the HTW activity being performed at the time of the ac... For Superfund, DERP, and Installation Restoration Program (... HTW activities include accidents that occurred during invento... predesign, design, and construction. For the purpose of accid... reporting, DERP Formerly Used DoD Site (FUDS) activities a... activities will be treated separately. For Civil Works O&M HTW... activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCT... ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate*... construction activity being performed at time of accident from... below. Enter the activity name and place the corresponding c... number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION	14. ELECTRICAL
2. SITE PREPARATION	15. SCAFFOLDING/ACCESS
3 EXCAVATION/TRENCHING	16. MECHANICAL
4 GRADING (EARTHWORK)	17. PAINTING
5 PIPING/UTILITIES	18. EQUIPMENT/MAINTENANC...
6. FOUNDATION	19. TUNNELING
7. FORMING	20. WAREHOUSING/STORAGE
8. CONCRETE PLACEMENT	21. PAVING
9. STEEL ERECTION	22. FENCING
10. ROOFING	23. SIGNING
11. FRAMING	24. LANDSCAPING/IRRIGATIO...
12. MASONRY	25. INSULATION
13. CARPENTRY	26. DEMOLITION

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b TYPE OF CONSTRUCTION EQUIPMENT — Select the equipment involved in the accident from the list below Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment

CONSTRUCTION EQUIPMENT

1 LOADER	13 DUMP TRUCK (OFF HIGHWAY)
2 DRAGLINE	14 TRUCK (OTHER)
3 CRANE (ON VESSEL/BARGE)	15 FORKLIFT
4 CRANE (TRACKED)	16 BACKHOE
5 CRANE (RUBBER TIRE)	17 FRONT-END LOADER
6 CRANE (VEHICLE MOUNTED)	18 PILE DRIVER
7 CRANE (TOWER)	19 TRACTOR (UTILITY)
8 SHOVEL	20. MANLIFT
9 SCRAPER	21. DOZER
10 PUMP TRUCK (CONCRETE)	22 DRILL RIG
11. TRUCK (CONCRETE/TRANSIT MIXER)	23 COMPACTOR/VIBRATORY ROLLER
12. DUMP TRUCK (HIGHWAY)	24. OTHER

INSTRUCTIONS FOR SECTION 5 — INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference pare 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	PERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA	RECORDABLE FIRST AID CASE
NRI	NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST — Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED — Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY — Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED — Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate of injury / illness from the list below. This nature of injury / illn correspond to the primary body part selected in 5e, above. E nature of injury / illness name on the line and place the corres CODE letters in the box provided.

ncident or event which occurred during a single work day or shift

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
ATIC INJURY OR LITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION, BRUISE, ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY—OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures nditions of the work environment over a long period of time. For cal purposes, an occupational illness/disease or disability is any ed condition which doses not meet the definition of traumatic injury sability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC—OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCUUAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, FMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER

CATEGORY	CODE	NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCUASSIFIED

g TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below) Examples.

(1) An employee tripped on carpet and struck his head on a desk
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE. This example would NOT be coded 120 (struck against) and 0140 (furni

(2) A Park Ranger contracted dermatitis from contact with poison ivy
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struc another vehicle.
TYPE: 800 (traveling in) SOURCE: 0421 (government-ow vehicle, as dri

NOTE: The Type Code 800, "Traveling In" is different from the other type code that its function is not to identify factors contributing to the injury or fatality, but r to collect data on the type of vehicle the employee was operating or traveling in time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the l below and enter the name on the line and the corresponding code in appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOV
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIF
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

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0200 ENVIRONMENTAL CONDITION
TEMPERATURE EXTREME (INDOOR)
WEATHER (ICE, RAIN, HEAT, ETC)
FIRE, FLAME, SMOKE (NOT TOBACCO)
NOISE
RADIATION
LIGHT
0270 VENTILATION
0271 TOBACCO SMOKE
0280 STRESS (EMOTIONAL)
0290 CONFINED SPACE

0300 MACHINE OR TOOL
0310 HAND TOOL (POWERED. SAW, GRINDER, ETC)
0320 HAND TOOL (NONPOWERED)
0330 MECHANICAL POWER TRANSMISSION APPARATUS
0340 GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350 VIDEO DISPLAY TERMINAL
0360 PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370 HEATING EQUIPMENT
0380 WELDING EQUIPMENT

0400 VEHICLE
0411 AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE,
0412 AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421 DRIVER OF GOVERNMENT VEHICLE
0422 PASSENGER OF GOVERNMENT VEHICLE
0430 COMMON CARRIER (AIRLINE, BUS, ETC)
0440 AIRCRAFT (NOT COMMERCIAL)
0450 BOAT, SHIP, BARGE

0500 MATERIAL HANDLING EQUIPMENT
0510 EARTHMOVER (TRACTOR, BACKHOE, ETC)
0520 CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530 ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540 HOIST, SLING CHAIN, JACK
0550 CRANE
0551 FORKLIFT
0560 HANDTRUCK, DOLLY

DUST, VAPOR, ETC.
DUST (SILICA, COAL, ETC)
FIBERS
ASBESTOS
GASES
0631 CARBON MONOXIDE
0640 MIST, STEAM, VAPOR, FUME
0641 WELDING FUMES
0650 PARTICLES (UNIDENTIFIED)

0700 CHEMICAL, PLASTIC, ETC.
0711 DRY CHEMICAL—CORROSIVE
0712 DRY CHEMICAL—TOXIC
0713 DRY CHEMICAL—EXPLOSIVE
0714 DRY CHEMICAL—FLAMMABLE
0721 LIQUID CHEMICAL—CORROSIVE
0722 LIQUID CHEMICAL—TOXIC
0723 LIQUID CHEMICAL—EXPLOSIVE
0724 LIQUID CHEMICAL—FLAMMABLE
0730 PLASTIC
0740 WATER
0750 MEDICINE

0800 INANIMATE OBJECT
0810 BOX, BARREL, ETC.
0820 PAPER
0830 METAL ITEM, MINERAL
0831 NEEDLE
0850 GLASS
0860 WOOD
0870 FOOD
0880 CLOTHING, APPAREL, SHOES

0900 ANIMATE OBJECT
0911 DOG
0912 OTHER ANIMAL
920 PLANT
930 INSECT
10 HUMAN (VIOLENCE)
50 HUMAN (COMMUNICABLE DISEASE)
BACTERIA, VIRUS (NOT HUMAN CONTACT)

1000 PERSONAL PROTECTIVE EQUIPMENT
1010 PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020 RESPIRATOR, MASK
1021 DIVING EQUIPMENT
1030 SAFETY BELT, HARNESS
1040 PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALI

a. ACTIVITY AT TIME OF ACCIDENT — Select the activity being performed at the time of the accident from the list below. Enter th activity name on the line and the corresponding number in the bo the activity performed is not identified on the list, select from the appropriate primary activity area (water related, non-water relatec other activity), the code number for "Other", and write in the activ being performed at the time of the accident.

WATER RELATED RECREATION

1 Sailing
2 Boating—powered
3 Boating—unpowered
4 Water skiing
5 Fishing from boat
6 Fishing from bank dock or pier
7. Fishing while wading
8 Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin div scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19 Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22.Playground equipment
23. Sports/summer (baseball, foo etc.)
24.Sports/winter (skiing, sledding snowmobiling etc.)
25 Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33 Sleeping
34 Pedestrian struck by vehicle
35 Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED — If fatality was wa related was the victim wearing a person flotation device? Mar appropriate box.

INSTRUCTIONS FOR SECTION 7 — MOTOR VEHI ACCIDENT

a. TYPE OF VEHICLE — Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involve both halves of the appropriate box. USACE vehicle(s) involve be marked in left half of appropriate box.

b. TYPE OF COLLISION — Mark appropriate box.

c. SEAT BELT — Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 — PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM — Describe all property involved in acciden Property/material involved means material which is damage whose use or misuse contributed to the accident. Include th type, model; also include the National Stock Number (NSN) applicable.

b. OWNERSHIP — Enter ownership for each item listed. (Ente the following: *USACE, OTHER GOVERNMENT; CONTRACTOR:PRIVATE)*

c. $ AMOUNT OF DAMAGE — Enter the total estimated dolla of damage (parts and labor), if any.

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PLANT ACCIDENT

'PE OF VESSEUFLOATING PLANT — Select the most appropriate ›sel/floating plant from list below. Enter name and place responding number in box. If item is not listed below, enter item ımber for "OTHER" and write in specific type of vessel/floating plant

VESSEL/FLOATING PLANTS

1. ROW BOAT	7 DREDGE/DIPPER
2 SAIL BOAT	8 DREDGE/CLAMSHELL, BUCKET
3 MOTOR BOAT	9 DREDGE/PIPE LINE
4 BARGE	10 DREDGE/DUST PAN
5 DREDGE/HOPPER	11 TUG BOAT
6. DREDGE/SIDE CASTING	12 OTHER

b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1 COLLISION W/OTHER VESSEL	7. HAULAGE UNIT
2. UPPER GUIDE WALL	8. BREAKING TOW
3 UPPER LOCK GATES	9 TOW BREAKING UP
4 LOCK WALL	10 SWEPT DOWN ON DAM
5 LOWER LOCK GATES	11. BUOY/DOLPHIN/CELL
6 LOWER GUIDE WALL	12 WHARF OR DOCK
13. OTHER	

INSTRUCTIONS FOR SECTION 10 — ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT — Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between sonnel and equipment are clearly specified. Continue on blank sheets ›cessary and attach to this report.

·TRUCTIONS FOR SECTION 11 — CAUSAL .CTORS

a. Review thoroughly. Answer each question by marking the appropriate block If any answer is yes, explain in Item 13 below. Consider, as a minimum, the following:

(1) DESIGN — Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE — Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION — Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES — Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

5) JOB PRACTICES — Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

internal or external to the job)? Did the task tend toward overload the capabilities of the person, i.e , did the job require tracking anc reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere v efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? the person need more training, experience, or practice in doing t task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS — Did any factors such as moist humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temper changes, wind, tides, floods, currents, dust, mud, glare, pressur changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS — Did exposu chemical agents (either single shift exposure or long-term expo. such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke other particulates, liquid or dry chemicals that are corrosive, to› explosive or flammable, by products of combustion or physical agents such as noise ionizing radiation, non-ionizing radiation (radiation created during welding etc.) contribute to the accident/incident?

(9) OFFICE FACTORS — Did the fact that the accident occurred ı office setting or to an office worker have a bearing on its cause example, office workers tend to have less experience and trair performing tasks such as lifting office furniture. Did physical hε within the office environment contribute to the hazard?

(10) SUPPORT FACTORS — Was the person using an improper t the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resc (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was func available, utilized, and adequate to provide proper tools, equip personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT — Did the person f use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail provide adequate protection from the hazard(s)? Did lack of c inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL — Is there any reason to believe the per mental or physical capabilities, judgement, etc., were impaire altered by the use of drugs or alcohol? Consider the effects c prescription medicine and over the counter medications as w illicit drug use. Consider the effect of drug or alcohol inducec "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS — Was a wri Job/Activity Hazard Analysis completed for the task being pe at the time of the accident? Mark the appropriate box. *If one performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12 — TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? the purpose of this section "trained" means the person has b provided the necessary information (either formal and/or on-t (OJT) training) to competently perform the activity/task in a s healthful manner.

b. TYPE OF TRAINING — Mark the appropriate box that best the type of training; (classroom or on-the-job) that the injurec received before the accident happened.

c. DATE OF MOST RECENT TRAINING — Enter the month, year of the last *formal* training completed that covered the a being performed at the time of the accident.

a DIRECT CAUSES — The direct cause is that single factor which most ... lead to the accident. See examples below

... DIRECT CAUSES — Indirect causes are those factors which ... buted to but did not directly initiate the occurrence of the accident.

Examples for section 13.

a Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14 — ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION — Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if ...ssary to fully explain and attach to the completed report form.

...TRUCTIONS FOR SECTION 15 — DATES FOR ...TION

a. BEGIN DATE — Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE — Enter the date when the corrective action(s) identified in Section 14 will be completed.

c TITLE AND SIGNATURE — Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED — Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME — For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16 — MANAGEMENT REVIEW (1st)

1ST REVIEW — Each USACE FOA shall determine who will provide management review. The responsible USACE supervisor in section 1... shall forward the completed report to the USACE office designated a... 1st Reviewer by the FOA Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chie... (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17 — MANAGEMEN... REVIEW (2nd)

2ND REVIEW — The FOA Staff Chief (i.e., FOA Chief of Constructi... Operations, Engineering, Planning, etc.) shall mark the appropriate b... review the completed report, provide substantive comments, sign, d... and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18 — SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW — The FOA Safety and Occupational Health Office s... review the completed report, mark the appropriate box, ensure that inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comme... sign, date and forward to the FOA Commander for review, commen... signature.

INSTRUCTION FOR SECTION 19 — COMMAND APPROVAL

4TH REVIEW — The FOA Commander shall (to include the persor... designated Acting Commander in his absence) review the complet... report, comment if required, sign, date, and forward the report to th... Safety and Occupational Health Office. Signature authority shall nc... delegated.

UXB International, Inc.

UXB Property Control Card
(to be retained in contract file)

Property Number	
Property Name	
Manufacturer Name	
Mfg. Model Number	
Serial Number	
Supplier	
Equipment Type	
Size/Capacity	
Purchase Order Number	
Date Received	
Condition Code	
Physical Location	
Government Contract Number	

Comments:

UXB FORM 01-0001

574 437

UXB International, Inc.

UXB Property Record Card

PAGE NO. ________

Property ID No.	Property Name
Manufact. Name	Model No.
Serial No.	Equip. Type
Supplier	Size/Capacity
P.O. Number	Date Rcv'd
Condition Code	Physical Location
Contract Number	Purch. Employee
Comments	

All employees must sign out this piece of equipment. Lost, damaged or malfunctioning equipment should be tagged and reported in writing to the Equipment Manager. All employees must sign in equipment when returning it. The last individual who signed out the equipment is responsible for it until it is returned. This card will be retained by the equipment and site managers.

RECORD OF USAGE

Date Out	Date In		Project Number		
Released To Name	Employee Number		Condition Code		

Date Out	Date In		Project Number		
Released To Name	Employee Number		Condition Code		

Date Out	Date In		Project Number		
Released To Name	Employee Number		Condition Code		

Date Out	Date In		Project Number		
Released To Name	Employee Number		Condition Code		

UXB FORM 01-0002

574 438

UXB International, Inc.

UXB Inventory Adjustment Voucher

Item No.	Stock or Part No.	Description	Unit of Issue	Unit Cost	Recorded Balance	Inventory Count	Over Qty	Over Value	Short Qty	Short Value
						Total				
						Voucher No.				

Location Name: ____________

Location (Office & site) ____________

Deltek No.: ____________

Was Material Stolen? Y N — If Yes, please attach police report.

Was Material Lost/Damaged In Shipment? Y N

If yes, include the following: Shipper's Name: ____________ Manifest No.: ________ Reference No.: ________ Has claim been filed? Y N

Equipment damaged other than in shipment? Y N

Description of what happened:

This report is filed by: ____________ Name ____________ Title ____________ Phone Number

UXB FORM 01-0003R1

UXB International, Inc.

UXB Lost/Damaged Equipment Report Form

Property ID ____________ Serial No. ____________ Equipment Owner ____________

Description ____

____

Date of Incident ____________ Report date ____________ Modification Date ____________

Time of Incident ____________ Report Time ____________

Location (Office & site) ____________ Location Name ____________

Name of Personnel Involved ____

Equipment Model No. ____________ Equipment Condition Code ____________

Was equipment stolen? [Y/N] ____________ If yes, please attach police report

Was equipment lost/damaged in shipment? [Y/N] ____________

If yes, include the following:

Shipper's Name ____________ Manifest No. ____________ Reference No. ____________

Has claim been filed? [Y/N] ____________

This report is filed by

Name ____________ Title ____________ Phone Number (include area code) ____________

Is damaged equipment cost effective to repair? ____________

Description of what happened ____

____

____

____

____

____

UXB International, Inc.

UXB Physical Inventory Report Form

Property Name	Property Number	Manufacturer Name	Manufacturer Number	Serial Number	Discrepancies with Official Property Records

Comments on discrepancies, if any:	

I, the undersigned, hereby acknowledge that a physical inventory of the above listed property was performed on ______________ and that all UXB property records are found to be in agreement with the exception of the discrepancies listed.

Printed Name:		Contract Name:	
Signature		Contract Number:	
Date:		Deltek No.:	

574 441

UXB International, Inc

Confined Space Entry Permit

GENERAL INFORMATION		
Location / Description of Space.	Purpose of Entry:	
Potential Hazards:	Permit Duration:	Date: To:
		Time: To:
Authorized Attendants:	Authorized Entrants.	

SAFETY EQUIPMENT / REQUIREMENTS	Y	N	N/A	PERSONAL PROTECTIVE EQUIPMENT	Y	N	N/A
Area secured and signs posted				Self-contained breathing apparatus			
Pipe lines capped / blocked				Airline supplied respirator with escape bottle			
Pipe lines purged / flushed				Air purifying respirator: Type ____			
Lock out / Tag out				Five minute escape bottle			
Mechanical Ventilation: Supply ___ Exhaust ___				Safety glasses / goggles (circle selection(s))			
Communication Equipment: Type ____				Hard hat			
Tripod / Retrieval System				Ear plugs / muffs (circle selection(s))			
Fire Extinguisher: Type ____				Chemical clothing: Type ____			
Ground fault circuit interrupter				Protective boots / gloves (circle selection(s))			
Lighting System				Chest harness and life line			
Other.				Other.			

TESTS TO BE PERFORMED							
Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23.5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

CHECKLIST. ☐ All Persons trained ☐ All Persons medically approved ☐ Welding is expected ☐ Entrants / attendants briefed

Emergency Contacts: Ambulance:________ Fire: ________ Rescue ________ Other. ________

Special Instructions: ________

Entry Supervisor: (name printed)	Entry Supervisor: (name printed)	Date:
Permit Cancelled By:	Reason for Cancellation:	Date Canceled:

UXB FORM 95-1 0050p1

574 442

UXB International, Inc.

Customer Action Request

Directions for completing UXB Form 95-1.007a, Rev. 2

1. Within two (2) working days of receipt of complaint/concern, complete Part One and fax to the Sector Director and Director of Quality.
2. Upon receipt of concurrence/non-concurrence section (Part Two), implement the corrective action/preventative action(s) as directed.
3. Five (5) working days after implementation, QC will complete Part Three and forward the result to the Sector Director and Director of Quality.

Part One

Date: ______

Customer: ______

Project Location: ______

LCPM/SUXOS: ______

On site Customer Representative: ______

Nature of complaint/concern: ______

Reference: ______

On site investigation results: ______

Corrective action(s) (specify what has been done to prevent re-occurrence) ______

Part Two

Corporate concurrence/non-concurrence with on site actions ______

Sector Director: ______ Director of Quality: ______

Comments: ______

Part Three

Follow-up Actions ______

Date: ______ QC Specialist: ______

Have corrective action(s) been applied? ______

Have preventive action(s) been applied? ______

Is customer satisfied with the actions? ______

Comments: ______

UXB International, Inc.

Site Visitors Log

Contract No. ____________ Delivery Order No. ____________ Location: ____________

Date	Name	Company	Telephone Number	Safety Briefing Received	Time		Escort Required
					In	Out	

Sketch Sheet

UXB International, Inc.

Job Name: ______ Project Leader: ______ Date: ______

Team Leader: ______

Comments (continue on back if necessary): ______

1 Square =
5' 10'
50' 100'
(Circle One)

Insert Magnetic North Direction
0
270 90
180

SYMBOLS

Bench Mark
Existing
New Well
Road
Brush
Fence
Trench
UXO Expended
X UXO Live
Test Pit
Soil Boring

Certificate of Inspection

UXB International, Inc.

Delivery Order Number: ______________________ Site: ______________________

Contract Number: ______________________ Contract Name. ______________________

I ____________________, certify that the property listed hereon has been inspected by me and, to the best of my knowledge and belief, contains no items of a dangerous nature.

______________________________ ______________

Signature of UXB Sr. UXO Supervisor Date

Item Description	Quantity	Date

UXB International, Inc.

Daily Report

Date: ____________ Contract Number: ____________

Delivery Order Number: ____________ Location: ____________

Weather Conditions: ____________

I. Work Summary: ____________

a. Work Planned: ____________

b. Work Accomplished: ____________

c. Explanation of Discrepancy: ____________

d. Inspection Results: ____________

II. Instructions Received from Government Representative (s) ____________

III. Safety Comments: ____________

IV. UXO Summary ____________

a. UXO Destroyed: ____________

Type	Quantity	U/I	Disposition

b. Demolition Supplies Used:

Type	Quantity	U/I	Disposition

c. Scrap Generation/Disposition:

V. Personnel/Equipment Utilization:

a. Personnel On-site

Description	Number	Man-Hours
Environmental Engineer		
First Aid Specialist		
Heavy Equipment Operator		
Helper		
Magnetometer Operator		
Project Manager		
Quality Control Specialist		
Senior UXO Supervisor		
Site Safety Officer		
Surveyor		
UXO Assistant		
UXO Specialist		
UXO Supervisor		
Unskilled Labor		
Other Personnel (List)		
Sub Contractor Personnel (List by Category)		

b. Equipment Utilization

Description	Number	Hours
Backhoe, Wheeled		

Backhoe, Tracked		
Car (Sedan)		
Pickup (1/2 ton)		
Pickup (3/4 ton)		
Radio, Handheld		
Sport Utility Vehicle		
EM-61		
Schonstedt		
Forrester		
Other Equipment (List)		

VI. Comments/Concerns: ______________________

VII. Signature(s)/Date

Project Manager Senior UXO Supervisor

UXB FORM 1.0022 R-1

UXB International, Inc.

Safety Meeting Attendance Log

Date:		Time:		Contract Number	
Delivery Order Number:		Location:			
Weather Conditions:					
I. Safety Meeting Topic (Briefly describe):					
II. Attendees:					

Name (Print)	Signature	Company

UXB FORM 1.0023

Name (Print)	Signature	Company

III. Verification:

I certify that the personnel listed on this roster received the briefing described above. Site personnel not attending this meeting will be briefed before beginning their assigned duties.

Site Safety Officer

Date

Safety Inspection Log

UXB International, Inc.

Date: ______ Time: ______ Contract Number: ______

Delivery Order Number: ______ Location: ______

Weather Conditions: ______

Type of Inspections. Daily ______ Weekly ______ Special ______ Reinspection ______

Location inspected: (List by grid number, coordinates, or description) ______

Activity inspected: ______

II. Inspection Requirement	Satisfactory	Unsatisfactory	N/A
Surface Sweep			
Subsurface Sweep			
Evacuation Technique			
Personal Protection Equipment			
Work Practices			
Site Control			
First Aid Equipment			
Fire Fighting Equipment			
Explosives Transportation			
Explosives Storage			
Disposal Operations			

Overall Inspection Results: Satisfactory ______ Unsatisfactory ______

III. Comments: ______

- Work stopped due to safety violation: Yes ______ No ______
- Safety violations noted: ______
- Personnel involved: ______
- Corrective Measures ______
- Reinspection required Yes ______ No ______

IV. Signatures: I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary).

______ Site Safety Officer

______ Sr. UXO Supervisor/Project Manager

UXB International, Inc.

Air Monitoring Results Report

Date: ______________ Duration of Monitoring: ______________

Work Location and Task: ______________

Instrument: ______ Reading (Time)	Instrument: ______ Reading (Time)	Instrument: ______ Reading (Time)

(Note: If instruments have recorders, attach tape to report. Note any action levels taken)

Instrument Calibration: ______________

Perimeter Samples Collected: ______________

Personal Samples Collected: ______________

Perimeter & Personal Samples Results from Previous Day (Provide data when received.): ______________

Comments: ______________

Name: ______________ Title: ______________

Signature: ______________

UXB International, Inc.

Demolition Material Accountability Form

Storage Location: ____________ Manufacturer: ____________ Marks of Identification: ____________

Project Location & Number: ____________ Description: ____________

Date Received	Quantity	Unit of Issue	Quantity	Quantity Used	Quantity on Hand	Date Expended

UXB FORM 1.0032R1

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UXB International, Inc.

Confidential Personal Data

Name: ____________________ DOB: ____________

Address: ____________________

SS#: ____________ Phone: ____________ Blood Type: ________

Place of Birth: ____________________

Height: ______ Weight: ______ Eye Color: ______ Hair Color: ______

Allergies: ____________ Medication: ____________

Married: Yes No If yes, spouse's name: ____________

Glasses: Yes No Mask Size: S M L

In case of emergency contact (Name, Address, Phone, Relation):

____

____

____

Alternate emergency contact (Name, Address, Phone, Relation):

____

____

____

Any Physical Limitations: No Yes If Yes, Please explain: ____________

____

____

Authorization for Treatment

I authorize examination and treatment of myself through the Emergency Department of ____________________. I authorize a copy of my medical record to be sent to the referral physician.

Signature: ____________________

UXB International, Inc.

Employee Injury/Property Damage Report Form

This is an official document to be initiated by UXB Supervisors. Be thorough and accurate and answer all questions.

Today's Date ______ Date of Accident ______ Time of Accident ______

Day of Accident: S M T W TH F S Weather Conditions: Sun Clear Overcast Rain Snow

Temperature: To 32 32-50 50-70 7-85 85 Up Wind. Still Moderate High No

Location of Accident: ______

Time Injury was Reported: ______ Reported to Whom: ______

Injured's Name: ______ Sex: ______

Birthdate: ______ S.S. No.: ______ Phone Number: ______

Address: ______

Project/Department: ______ Contractor/Subcontractor Involved: ______

Injured Employee's Job Title or Occupation: ______

Nature of Injury: ______ ______ ______ ______ ______

(Near Miss First Aid Doctor Case Ambulance Hospitalized)

Did Employee Leave Work Site: ______ Time Employee left Site: ______

Name of Service, Physician, Location: ______ Phone: ______

Address: ______

Fatality?: ______ Agency/Family Member Notified: ______

Description of Accident: ______

What was person doing at time of accident: ______

Property Damage: ______ Extent of Damage: ______

Name of Property Owner: ______ Phone: ______

Address: ______

Accident Witness Name: ______ Phone: ______

Address: ______

Employer: ______

Did you witness the incident? Yes No Statements Attached: Yes No

Were and photographs taken of the incident site after the accident? Yes No

UXB FORM 1.0034

Photographs taken by. ______ Photographs stored ______

Why did accident occur? ______

Was lack of use of safety equipment a factor in this incident? ______

If so, explain: ______

Safety regulations violated. ______ Explain: ______

Regulatory Agencies notified: ______ Explain: ______

Action taken by Regulatory Agency. ______

What corrective action has been taken: ______

Your recommendations: ______

UXB Sr. UXO Supervisor ______

What unsafe condition(s) or act(s) caused the accident? ______

Your recommendations: ______

Signature: ______ Date: ______

UXB Project Manager ______

Concur with action taken? Yes No Remarks: ______

______ Signature ______ Date

Report prepared by: ______ Title: ______

UXB International, Inc.

Excavation Accountability Form

Directions: Complete one (1) UXO/Excavation Accountability form for each item noted in the sweep log.

Item Number: ______	Area: ______		
Suspected Depth of Item: ______	Surface: ______	Subsurface. ______	
Depth at which item was located:			
Members of Excavation Team:			
Identification or Features of Item:			
Notes:			
Final Disposition Action:	Removal: ______	Detonation: ______	Other: ______
Disposal Certified by:	______ Signature of UXO Supervisor		
Date and Time of Removal/Detonation:			
Area Backfilled:	______ UXO Specialist		
Verification of Removal/ Detonation/Excavation	______ Signature of QA Specialist	Date: ______	

UXB International, Inc.

Specialized Training

Training Course: ______________________________
(General, UXO, Labor, Visitor, Special)

Presented by: ______________________________

Dates: ______________________________

Topics Discussed

Work Plan/SHERP/APP: ______________________________

____

UXO/OEW Hazards: ______________________________

____

Chemical Hazards: ______________________________

____

Physical Hazards: ______________________________

____

Emergency Procedures: ______________________________

____

Blood Borne Pathogen: ______________________________

____

Other: ______________________________

____

Attendees

Printed Name	Signature

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UXB International, Inc.

Specialized Training

Attendees

Printed Name	Signature

Trainer: ______________________ Date: ______________

574 461

UXB International, Inc.

Vehicle Condition Inspection

Name: ______
Contract No.: ______
Item/Vehicle Number: ______
License Plate Number: ______
State Inspection Date: ______

Date Out: ______
Mileage Out: ______
Refrig Hours Out: ______
Date In: ______
Mileage In: ______
Refrig Hours In: ______

CAB

	OUT	IN
Clean Outside		
Windshield		
Side Glass		
Mirrors		
Lights		
Clean Inside		
Fire Exting		
Reflector		
Permit Book		
Radio		
Fuel		
Oil Level		
Coolant Level		
Belts		
Gauges/Warning Indicators		
Windshield Wipers/Washers		
Horn(s)		
Heater/Defroster		
Steering		
Clutch		
Service Brakes		
Emerg Brakes		
Spare Fuses		
Seat Belts		
Tires/Battery		

VAN/REAR RIGHT	PICK-UP WITH TOP	BOX TRUCK/REAR LEFT

Comments: ______

As a user of this vehicle, I understand the correct operation and function of the controls and confirm that I have received adequate instructions to enable myself and my crew to use the vehicle in a safe and proper manner without risk or injury.

I hereby certify that the physical condition of the vehicle as described above is correct.

UXB International, Inc. ______ Name: ______

By: ______ By: ______

BODY

	OUT	IN
Clean Inside		
Slats		
Plywood		
Lift Gate		
Dump		
Ramp		
Stakes Side		
Stakes Rear		
Permit Book		
Boom		
Tie Rings		
Refrigerator		
Mud Flaps		
1/4 Fenders		
Suspension		
Battery		
Exhaust		
Brakes		
Air Lines		

RETURN INSPECTION

VAN/FRONT LEFT	PICK-UP WITH TOP	BOX TRUCK/FRONT RIGHT
VAN/REAR RIGHT	PICK-UP WITH TOP	BOX TRUCK/REAR LEFT

Comments: ______

I hereby certify that the physical condition of the vehicle as described above is correct.

UXB International, Inc. ______ Name: ______

By: ______ By: ______

ACCESSORIES

	OUT	IN
Clean Inside		
Slats		
Plywood		

OUT INSPECTION

VAN/FRONT LEFT	PICK-UP WITH TOP	BOX TRUCK/FRONT RIGHT

Magazine Data Card

UXB International, Inc.

1. Storage Location:	2. Manufacturer:	3. Marks of Identification:
4. Project Location and Number:	5. Description:	

6. Date	7. Document Number	8. Action/Purpose	9. Qty Gain	10. Qty Loss	11. Balance	12. Printed Name

Instructions:

1. Storage Location – Proper name of the storage magazine. For example, Igloo J180; Building #18; COE Bunker
2. Manufacturer – manufacturer of item and country of origin. For example: Atlas Powder, USA; US Government
3. Marks of identification – Identification as specified by the manufacturer; Lot number for US military explosives
4. Project Location and Number - Project location and DELTEK number. For example: Former Morgan Depot, 5000-027
5. Description - Item name
6. Date – Date that the transaction occurs
7. Document Number – Unique number that can easily identify the transaction such as a shipping document number for a commercial procurement or a receipt number for a government issue of explosives
8. Action/Purpose – Purpose for the transaction. For example: inventory, initial receipt, return to stockage, issue
9. Qty Gain - Quantity gained by the transaction, left blank for a loss
10. Qty Loss – Quantity lost by the transaction, left blank for a gain
11. Balance - Running balance of quantity on hand after the transaction
12. Printed Name – Printed name of the individual performing the transaction

UXB International, Inc.

Work Plan Acknowledgment Form

Site: ______________________________ Page: ________ of ________

By placing my signature below, I certify that I have read this site Work Plan, fully understand its requirements, and will follow all safety directives set forth by the plan or dictated by the Senior UXO Supervisor, as long as I am present at this site.

Name	Date	Company

Daily Truck Inspectio

onth ______________ Work Site ______________

rial No. ______________ Project No. ______________

Signature of Driver	Odometer Begin	Odometer End	Date	Lights/Signals/Reflectors	Brakes	Tires	Seat Belts	Fire Extinguisher	First Aid Kit	Oil Level	Water Level	Horn	Back-up Alarm	Exhaust System	Windshield Wipers/Defrosters	Mirrors	Glass/Windshield, Side	Fuel Tank/Piping	Steering	Power Point	Coupling Device	Mileage
			1																			
			2																			
			3																			
			4																			
			5																			
			6																			
			7																			
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UXB International, Inc.

Consumable Sign Out Log

Job Site: ______________________ Project Manager: ______________________

Item	Quantity	Date	Location	Use	Signature

UXB International, Inc.

Heavy Equipment Inspection Log

Date	Model #	Hour Meter Out	Hour Meter In
Operator Name	Fuel	Gallons	Cost
Item Inspected	Pass	Fail	N/A
Brakes			
Track Condition			
Fire Extinguisher			
First Aid Kit			
Oil Level			
Water Level			
Hydraulic Level			
Horn			
Back-up Alarm			
Exhaust System			
Windshield Wipers			
Mirrors			
Glass/Cab			
Fuel Tank/Piping			

Signature: ______________________________

UXB International, Inc.

Spot Report

Fax to President, UXB (703) 724-3528
Operations, UXB
Compliance Office (205) 882-9719

Date and time of accident:	
Project Location:	
Incident:	
Individual submitting report:	

Instructions:

A Spot Report will be submitted IMMEDIATELY, when:

- an incident occurs which reflects poorly upon UXB
- an incident occurs when UXB employees are injured, exposed to unknown fumes, toxics, etc.
- an incident occurs when the customer has verbally expressed dissatisfaction with UXB performance
- an incident occurs when an UXB operated vehicle is involved in an accident
- an incident occurs when UXB/GFE property is stolen

Any UXB employee can submit a Spot Report.

The Spot Report may be handwritten.

UXB International, Inc.

Direct Reading Instrument Recording Form

Site: ______________________

Instrument	Date	Time	Location	Recordings

UXB International, Inc

Confined Space Entry / Exit Log

DATE	ENTRANTS NAME	TIME IN	ATTENDANTS INITIALS	TIME OUT	ATTENDANTS INITIALS

UXB International, Inc

Low-Risk Confined Space C rtificat Form

This certificate can only be used for confined spaces where the only hazard posted by the space is an actual or potential hazardous atmosphere which can be eliminated through the use of forced air ventilation If any other type of chemical or physical hazards exist, then the space must be upgraded to a permit-required confined space

GENERAL INFORMATION		
Location / Description of Space:	Purpose of Entry:	
	Certification Duration:	Date: To:
Known or Potential Atmospheric Hazards:		Time: To:
	Entry Supervisor:	

TESTS TO BE PERFORMED

Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23.5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

PRE-ENTRY CONDITIONS CHECKLIST

	YES	NO	N/A
Have conditions which would make it unsafe to enter the space been removed?			
Is the only hazard posed by the confined space an actual or potential hazardous atmosphere?			
Are temporary barriers erected around the confined space entrance?			
Has the internal atmosphere been tested for oxygen content, flammability and toxicity?			
Are the results from the atmospheric testing acceptable and recorded on this certificate?			
Is forced air ventilation (if required) able to eliminate atmospheric hazards?			
Are entry personnel using proper personal protective equipment?			

Special Instructions ____________________

____

This certificate can only be signed by the Confined Space Coordinator if all of the above mentioned checklist items are checked YES.

Confined Space Coordinator (name printed)	Confined Space Soordinator (name signed)	Date:
Permit Cancelled By:	Reason for Cancellation:	Date Canceled:

UXB International, Inc.

Permit-Required Confined Spac Reclassification Certificate

This certificate can only be used for reclassification of a permit-required confined space Signature of the Confined Space Coordinator (CSC) below certifies that this space is free of actual or potential atmospheric hazards and that all other serious safety and health hazards have been eliminated. This certificate is to be posted at the entrance to the confined space prior to entry.

Location / Description of Space.	Purpose of Entry		
	Certification Duration:	Date:	To:
Entry Supervisor:		Time.	To:

Confined Space Coordinator (name printed)	Confined Space Soordinator (name signed)	Date:
Permit Cancelled By:	Reason for Cancellation:	Date Canceled:

NOTE:

Forced air ventilation may not be used as a means to eliminate actual or potential hazardous atmospheric conditions If an atmospheric or other serious safety or health hazard arises during entry, all personnel will immediately exit the space and this certificate will be cancelled

UXB International, Inc

Confined Space Monitoring Log

Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23 5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23.5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23.5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

Containment Monitored	Acceptable Conditions	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___	Result T ___ D___
% Oxygen	19.9 - 23.5						
%LEL/LFL	≤ 10%						
H_2S	<10ppm						
CO	<35ppm						
Other:							
Other:							
Testers Initials							

UXB Grid Location Form

AREA:	GRID #:	DIGS:
SUPERVISOR:	CONTACTS:	DATE:

NORTH

Y: 200, 190, 180, 170, 160, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

SW COR

X: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200

	DESCRIPTION	LOCATION X(ft) Y(ft) Z(in)		DESCRIPTION	LOCATION X(ft) Y(ft) Z(in)
1.			6.		
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3.			8.		
4.			9.		
5.			10.		

ANOMALY LOCATION SHEET

PROJECT:____________________ AREA:__________________

GRID #:____________ SUPERVISOR:____________________

INSTRUCTIONS:

1. Record the numbers from all four corner stakes for each grid.
2. Start a separate sheet for each grid.
3. Measure from two grid corners directly to the anomaly.
4. Record the measurement from each grid corner to the anomaly, to the nearest foot, in the appropriate column.
5. Measure and record depth for each anomaly.
6. Enter description or ID if known.
7. Enter estimated weight.

ANOMALY ID or #	NE Stake #	NW Stake #	SE Stake #	SW Stake #	Depth	Description	Weight (lbs)

Schonstedt Daily Check Out and Return Procedure

UXB INTERNATIONAL

Month ______________ Work Site ______________

Serial No. ______________ Project No. ______________

Signature of Operator	Comments	Date	CHECK OUT PROCEDURE	Check case for damage; open case	Check instrument for damage	Open battery compartment	Install batteries	Audio switch in "A" position	Power up; adjust sensitivity control	Set volume control	Verify digital display	Report to test grid	Test grid result; Pass/Fail	RETURN PROCEDURE	Clean instrument	Open battery compartment	Remove and store batteries	Close battery compartment	Return instrument to storage case	Return case to storage area	
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UXB INTERNATIONAL

Cellular Telephone Daily Check Out and Return Procedure

Month ______________ Work Site ______________

Serial No. ______________ Project No. ______________

Signature of Operator	Comments	Date		CHECK OUT PROCEDURE	Remove from charger	Inspect for damage	Power up	Perform battery check	Verify transmits and receives	Turn off until required for use		RETURN PROCEDURE	Power down	Clean item	Return to charger	
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Radio Daily Check Out and Return Procedure

UXB INTERNATIONAL

Month ______________ Work Site ______________

Serial No. ______________ Project No. ______________

Signature of Operator	Comments	Date	CHECK OUT PROCEDURE	Remove from charger	Inspect for damage	Power up	Perform battery check	Verify transmits and receives	Turn off until required for use	RETURN PROCEDURE	Power down	Clean item	Return to charger	
		1												
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UXB International, Inc.

Rework Items List

Contract No. and Title: ______________________

Contractor: ______________________

Number	Date Identified	Description	Contract Requirement (Spec Section and Para. No., Drawing No., Detail., etc.)	Corrective Action Taken by Project Management	Resolution	Date Completed

UXB FORM 1.0070

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Daily QCI Report

DAILY QUALITY CONTROL INSPECTION REPORT
PROJECT:
CONTRACT:
DATE:
QC SPECIALIST:

PART ONE - UXB QC

TASK INSPECTED[1]	RESULTS[2]	COMMENTS[3]

PART TWO - USAESCH QA

TASK INSPECTED[1]	RESULTS[2]	COMMENTS[3]

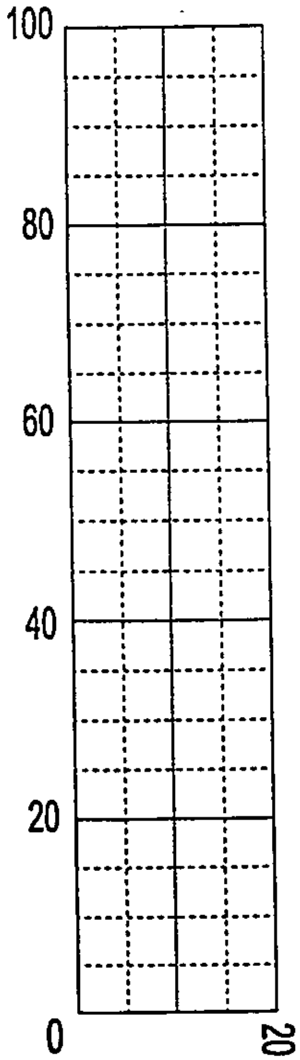
[1] From QCI Schedule
[2] C - Conforms, N - Nonconformance, MI - Minor, MA - Major, CR - Critical, i.e., N-Minor

[3] Briefly describe Nonconformance(s);

UXB International, Inc.

Geophysical Instrument and Operator Testing Area

TEST GRID AREA:		PROJECT:	
QC SUPERVISOR.		DATE:	
OPERATOR:		INSTRUMENT:	



DESCRIPTION	LOCATION X(ft)	Y(ft)	Z(*)
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*** Suitable Units (mv, inches, etc.)**

UXB International, Inc.

Memorandum

Date: ____________________

From: ____________________

To: ____________________

Subject: ____________________

1.

2.

3.

TAB

Appendix E

APPENDIX E

MATERIAL SAFETY DATA SHEETS (MSDSs)

CHLOROFORM

E I DUPONT & -- CHLOROFORM - CHLOROFORM,ACS
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 002646609
Manufacturer's CAGE: 18873
Part No. Indicator: A
Part Number/Trade Name: CHLOROFORM

General Information

Item Name: CHLOROFORM,ACS
Company's Name: E.I. DUPONT DE NEMOURS & COMPANY, INC
Company's Street: 1007 MARKET STREET
Company's P. O. Box: 1635
Company's City: WILMINGTON
Company's State: DE
Company's Country: US
Company's Zip Code: 19899
Company's Emerg Ph #: 800-441-3637 OR 800-345-9999
Company's Info Ph #: 302-999-2161 OR 800-441-7575
Distributor/Vendor # 1: MMM SUPPLY INC
Distributor/Vendor # 1 Cage: 7X274
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 010
Status: SE
Date MSDS Prepared: 01JAN87
Safety Data Review Date: 16MAR91
Supply Item Manager: CX
MSDS Serial Number: BDQSH
Specification Number: O-C-265
Hazard Characteristic Code: T3
Unit Of Issue: PT
Unit Of Issue Container Qty: 16 FL OUNCES
Type Of Container: BOTTLE
Net Unit Weight: 1.6 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: CHLOROFORM (SARA III)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: FS9100000
CAS Number: 67-66-3
OSHA PEL: (C) 50 PPM
ACGIH TLV: 10 PPM; A2; 9293

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID WITH PLEASANT, SWEET ODOR.
Boiling Point: 142F,61C
Melting Point: UNKNOWN
Vapor Pressure (MM Hg/70 F): 160
Vapor Density (Air=1): 4.13
Specific Gravity: 1.5
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: < 1 (ETHER = 1)
Solubility In Water: SLIGHT
Viscosity: UNKNOWN
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A

IMO UN Number: 1888
IMO UN Class: 6.1
IMO Subsidiary Risk Label: -
IATA PSN Code: GJO
IATA UN ID Number: 1888
IATA Proper Shipping Name: CHLOROFORM
IATA UN Class: 6.1
IATA Label: TOXIC *
AFI PSN Code: GJO
AFI Prop. Shipping Name: CHLOROFORM
AFI Class: 6.1
AFI ID Number: UN1888
AFI Pack Group: II
AFI Label: POISON
AFI Special Prov: N36
AFI Basic Pac Ref: 10-9

===

Disposal Data

===

Disposal Data Review Date: 88085
Rec # For This Disp Entry: 02
Tot Disp Entries Per NSN: 005
Landfill Ban Item: YES
Disposal Supplemental Data: STORAGE CODE T4 RATHER THAN T1 BECAUSE ITEM IS NOT A KNOWN CARCINAGEN,BUT IS SUSPECTED(ACGIH-1983-84). IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, cONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.
1st EPA Haz Wst Code New: U044
1st EPA Haz Wst Name New: CHLOROFORM; TRICHLOROMETHANE
1st EPA Haz Wst Char New: TOXIC (T)
1st EPA Acute Hazard New: NO

===

Label Data

===

Label Required: YES
Label Status: F
Special Hazard Precautions: POISONOUS; MAY BE FATAL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN. CONTACT MAY CAUSE BURNS TO SKIN AND EYES. RUNOFF FROM FIRE CONTROL OR DILUTION WATER MAY GIVE OFF POISONOUS GASES AND CAUSE WATER POLLUTION. FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES.
Label Name: DU PONT E I DE NEMOURS AND CO INC
Label Street: 1007 MARKET STREET
Label P.O. Box: 1635
Label City: WILMINGTON
Label State: DE
Label Zip Code: 19899
Label Country: US
Label Emergency Number: 800-441-7515

===

URL for this msds http://hazard.com. If you wish to change, add to, or delete information in this archive please sent updates to dan@hazard.com.

MATERIAL SAFETY DATA SHEET

EM SCIENCE

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer............:

EM SCIENCE
A Division of EM Industries
P.O. Box 70
480 Democrat Rd.
Gibbstown, N.J. 08027

Preparation Date.: 07/12/93
Date MSDS Printed.: Dec 09, 1998

Information Phone Number.: 609-354-9200
Hours: Mon. to Fri. 8:30-5
Chemtrec Emergency Number: 800-424-9300
Hours: 24 hrs a day

Catalog Number(s):
SX0610

Trade Name.......:
Liquid bleach
Chemical Name....:
Sodium Hypochlorite (Solution)
Chemical Family..: Inorganic Salt
Formula..........:
NaOCl in aqueous solution (5-7% avail Cl)

Molecular Weight.: 74.45

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS #	Appr %
Sodium Hypochlorite	7681-52-9	12.7%
Water	7732-18-5	87.3%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
VAPOR IRRITATING.
HARMFUL IF INHALED.
IRRITATING TO SKIN, EYES AND MUCOUS MEMBRANES.
MAY CAUSE EYE INJURY.

 (continued on next page)

Wear self-contained breathing apparatus and protective clothing.

Fire & Explosion Hazards.:
Closed containers will explode in a fire situation.
Thermal decomposition produces highly toxic fumes.

6. ACCIDENTAL RELEASE MEASURES

Spill Response:
Evacuate the area of all unnecessary personnel.
Wear suitable protective equipment listed under Exposure / Personal Protection.
Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards.
Contain the release and eliminate its source, if this can be done without risk.
Take up and containerize for proper disposal as described under Disposal.
Comply with Federal, State, and local regulations on reporting releases. Refer to Regulatory Information for reportable quantity and other regulatory data.

7. HANDLING AND STORAGE

Handling & Storage:
Store in a cool, dry well ventilated area away from oxidizable materials and acids.
Do not breath vapor or mist.
Do not get in eyes, on skin, or on clothing.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT:

Ventilation, Respiratory Protection, Protective Clothing, Eye Protection
Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

 (continued on next page)

Vapor Density (Air = 1)....: N/A
Evaporation Rate (BuAc = 1): N/A
Solubility in Water (%)....: Soluble
Appearance.................:
Yellow/green liquid; pungent odor of

10. STABILITY AND REACTIVITY

Stability...............: Yes
Hazardous Polymerization:
Does not occur
Hazardous Decomposition.:
Chlorine gas, NaOH, Na_2O
Conditions To Avoid.....:

Heat; contact with acid liberates highly toxic chlorine.

Materials To Avoid......:
( )Water
(X)Acids
( )Bases
( )Corrosives
( )Oxidizers
(X)Other :

Combustible material, reducing agents

11. TOXICOLOGICAL INFORMATION

Toxicity Data:
None established

Toxicological Findings:
Tests on laboratory animals indicate material may produce adverse mutagenic effects.
Cited in Registry of Toxic Effects of Substances (RTECS)

12. DISPOSAL CONSIDERATIONS

EPA Waste Numbers:
Treatment:
Material does not have an EPA Waste number and is not a listed waste, however consultation with a permitted waste disposal site (TSD) should be accomplished.

ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE

 (continued on next page)

Health : 2
Flammability : 0
Reactivity : 0
Special Hazards:

Revision History:
07/01/82 04/15/86 10/27/87 03/07/90 03/01/91

N/A = Not Available
N/E = None Established

The statements contained herein are offered for informational purposes only and are based upon technical data that EM SCIENCE believes to be accurate. It is intended for use only by persons having the necessary technical skill and at their own descretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE.

Phosgene (CG)

TRADE NAME AND SYNONYMS:

Phosgene
CG

BIOLOGICAL TYPE COMPOUND: Lethal Agent

FORMULA/CHEMICAL STRUCTURE:

```
                         Cl
                          \
      CCl2O                C = O
                          /
                         Cl
```

SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
CG	CCl_2O	99+	0.8 mg/m^3 (8 hr-TWA)

SECTION III - PHYSICAL DATA

BOILING POINT DEG F (DEG C): 45.7 DEG F (7.6 DEG C)

VAPOR PRESSURE (mm Hg): 1180 mm Hg @ 20 DEG C (1400 mm Hg @ 25 DEG C)

VAPOR DENSITY (AIR=1): 3.4

SOLUBILITY IN WATER: (g/100 g solvent @ 25 DEG C)

a. Water (distilled): very slight, with decomposition
b. Other: very soluble with almost all organic solvents, i.e., benzene, toluene. Unstable in some.
c. Best solvent: organic solvents

FREEZING POINT: 128 DEG C

LIQUID DENSITY (g/cc): 1.370 @ 20 DEG C

PERCENTAGE VOLATILE BY VOLUME: 4.3×10^6 mg/m^3 @ 7.6 DEG C
2.2×10^6 mg/m^3 @ -10 DEG C
5.28×10^5 mg/m^3 @ -40 DEG C

APPEARANCE AND ODOR: Colorless gas at room temperature. Odor of new-mown hay, grass, or green corn.

SECTION IV - FIRE AND EXPLOSION DATA

FLASHPOINT (METHOD USED): Does not flash

EXTINGUISHING MEDIA: Use water spray or fog nozzle to keep cylinder cool. Move cylinder away from fire if there is not risk.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Protective clothing and a self-contained breathing apparatus should be worn to prevent contact with skin and eyes.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS: Contents under pressure. Container explosion may occur under fire conditions. Toxic fumes are emitted under fire conditions.

DANGER: POISONOUS AND CORROSIVE NONFLAMMABLE LIQUID AND GAS UNDER PRESSURE.

SECTION V - HEALTH HAZARD DATA

AIRBORNE EXPOSURE LIMIT (AEL): The AEL for CG is 0.8 mg/m^3.

EFFECTS OF OVEREXPOSURE: CG is a burning agent that is extremely destructive to the tissue of the mucous membranes and upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Median doses of CG in man are:

ICt_{50} = 1600 mg-min/m^3 at 70 - 80 DEG F (humid environment)
LCt_{50} = 3200 mg-min/m^3 (Ct does not significantly change with time since the effects are cumulative)

Locally, CG causes mild irritation to the eyes

SYSTEMIC ACTIONS occur primarily through inhalation. Phosgene is a lung irritant. The characteristic feature of phosgene poisoning is massive pulmonary edema. The edema results from the passage of fluid into the alveoli from capillaries whose permeability has been affected by the corrosive action of the compound. Hemoconcentration results from loss of plasma into the alveoli. The edema interferes with the interchange of oxygen and carbon dioxide and the capillary blood. As the edema progresses, discomfort, apprehension, and dyspnea increase, and frothy, often blood-tinged sputum is raised. Rales and rhonchi are audible in the chest. Death results from anoxemia and may occur in less than 5 hours.

During and immediately after exposure, symptoms include coughing, choking, a feeling of tightness in the chest, nausea, and occasionally headache and lacrimation. Some patients with severe cough fail to develop serious lung injury, while others with no signs of early respiratory tract irritation incur fatal pulmonary edema. Following the above discomfort, there may be a delay in which the patient has few symptoms, not even abnormal chest signs.

CHRONIC EXPOSURE: Five industrial workers who had been chronically exposed to low concentrations of CG exhibited disturbances in lung function. All of the patients developed the following signs and symptoms over a period of several months with varying degrees of severity: cough, shortness of breath on exertion, and pain or tightness in the chest. Two of the patients also expectorated small amounts of glairy, mucoid sputum. Residual pulmonary deficit may be expected from chronic exposure to CG.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION. The protective mask should be put on immediately upon detection of the odor of phosgene (like green corn or grass), irritation of the eyes, or change in the taste of a cigarette (smoking may become tasteless or offensive in taste). The individual should hold his breath while masking.

If some phosgene has been inhaled, normal combat duties should be continued unless there is difficulty in breathing, nausea, and vomiting, or more than the usual shortness of breath on exertion.

If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

EYE CONTACT. Immediately flush eyes with copious amounts of water for at least 15 minutes while removing contamintaed clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with fingers.

SKIN CONTACT. Immediately flush skin with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing and shoes.

INGESTION. Wash out mouth with water, provided the person is conscious. Call a physician immediately.

SECTION VI - REACTIVITY DATA

STABILITY: Stable in steel containers if CG is dry. Decomposition temperature is 800 DEG C. No action on metals when CG is dry; acidic and corrosive when moist.

INCOMPATIBILITY: Rapid hydrolysis to hydrochloric acid and carbon dioxide under acidic conditions. Under basic conditions, hydrolysis products are sodium chloride and sodium carbonate. Rain destroys effectiveness. Heavy vegetation, jungle, and forests cause considerable loss by hydrolysis on leafy surfaces. Incompatible materials include water, amines, ammonia, alcohols, sodium, and potassium.

HAZARDOUS DECOMPOSITION: Toxic fumes of carbon monoxide, carbon dioxide, and hydrogen chloride gas.

SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate the area and keep personnel upwind. Wear full protective equipment such as a butyl rubber chemical-proof air suit, with breathing air supplied. If no risk exists, then shut off leak. Ventilate area and wash spill site after material pickup is complete.

RECOMMENDED FIELD PROCEDURES: Caution: no-return cylinder. Do not reuse. Empty cylinders will contain hazardous residue. Follow proper disposal techniques, and observe all federal, state, and local laws.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION: Use only in a chemical fume hood. NIOSH/MSHA-Approved respirator in nonventilated areas and/or for exposure above the ACGIH TLV.

PROTECTIVE GLOVES: MANDATORY. Rubber gloves

EYE PROTECTION: Chemical safety goggles

MONITORING: Can be detected using M18A2 and M19 Kits, and M8 Alarm

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
Phosgene is a compressed gas; cylinder temperature should not exceed 125 DEF F (52 DEG C). It should be used with equipment rated for cylinder pressure of compatible construction material. Be sure that the cylinder is properly secured when in use or stored.

SECTION X - TRANSPORTATION DATA

FORBIDDEN FOR TRANSPORT OTHER THAN VIA MILITARY (TECHNICAL ESCORT UNIT)

TRANSPORT AS PER 49 CFR 172

DOT HAZARD CLASS: Poison A

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency.

1,4-DITHIANE

DOD Hazardous Material Information
DOD 6050.5-L
As of April 1997

D21770-1,4-DITHIANE,97%

FSC: 6810

NIIN: 00F049328

NSN: 681000F0493286

MANUFACTURERS CAGE: 60928

PART NO INDICATOR: A

PART NUMBER TRADE NAME: D21770-1,4-DITHIANE,97%

Nuclear Water Data

NUCLEAR WATER FSC:

NUCLEAR WATER NIIN:

NUCLEAR WATER COG:

NUCLEAR WATER NOMENCLATURE:

NUCLEAR WATER REMARKS: ALDRICH CH

Standard PMS Identification Data

SPIN FSC: EMIC

SPIN NIIN: AL CO SUB

SPIN: OF S

General Informatitioi

ITEM NAME: IGMA-ALDRICH 1001 W ST PAUL AVE

MANUFACTURERS NAME: 355 MILWAUKEE WI

MANUFACTURERS STREET: US53233-5000414-273-383850

MANUFACTURERS P O BOX:

MANUFACTURERS CITY: 414-273-3850

MANUFACTURERS STATE:

MANUFACTURERS COUNTRY:

MANUFACTURERS ZIP CODE:

MANUFACTURERS EMERG PH:

MANUFACTURERS INFO PH:

DISTRIBUTOR VENDOR 1:

DISTRIBUTOR VENDOR 1 CAGE:

DISTRIBUTOR VENDOR 2:

DISTRIBUTOR VENDOR 2 CAGE:

DISTRIBUTOR VENDOR 3: F 001001SE 13MAR9601AUOG96

DISTRIBUTOR VENDOR 3 CAGE:

DISTRIBUTOR VENDOR 4: ALDRICH CHEMICAL CO S SUB OF SI

DISTRIBUTOR VENDOR 4 CAGE: GMA-A

SAFETY DATA ACTION CODE: L

SAFETY FOCAL POINT: DR

RECORD NO FOR SAFETY ENTRY: ICH

TOT SAFETY ENTRIES THIS STK: 100

STATUS: 1 W

DATE MSDS PREPARED: ST PAU

SAFETY DATA REVIEW DATE: L AVE

SUPPLY ITEM MANAGER:

MSDS PREPARERS NAME: MILWAUKE

PREPARERS COMPANY: E WI53233-

PREPARERS ST OR P O BOX: 5000

PREPARERS CITY: BZVRC

PREPARERS STATE:

PREPARERS ZIP CODE:

OTHER MSDS NUMBER:

MSDS SERIAL NUMBER:

SPECIFICATION NUMBER:

SPEC TYPE GRADE CLASS: WHITE TO OFF

HAZARD CHARACTERISTIC CODE: WHIT

UNIT OF ISSUE: E

UNIT OF ISSUE CONTAINER QTY: CRYSTALS W/UN I

TYPE OF CONTAINER: PLEASANT ODOR

NET UNIT WEIGHT:

NRC STATE LICENSE NUMBER:

NET EXPLOSIVE WEIGHT:

NET PROPELLANT WEIGHT AMMO: 392F

COAST GUARD AMMUNITION CODE:

Physical & Chemical Characteristics

APPEARANCE AND ODOR: 230-233.6F N/K N/K N/K N/KK N/K

BOILING POINT: N/K

MELTING POINT:

VAPOR PRESSURE MM HG 70 F: N/K

VAPOR DENSITY AIR 1:

SPECIFIC GRAVITY: N/K

DECOMPOSITION TEMPERATURE:

EVAPORATION RATE AND REF: N/K N/K

SOLUBILITY IN WATER: N/K N/

PERCENT VOLATILES BY VOLUME: K

VISCOSITY: N/K

PH: WAT

RADIOACTIVITY: ER SPRAY, CO

FORM RADIOACTIVE MATL: 2, DRY C

MAGNETISM MILLIGAUSS: HEMIC

CORROSION RATE IPY: AL POWDE

AUTOIGNITION TEMPERATURE: R/APPR

Fire and Explosion Hazarrd Data

FLASH POINT: OPRIATE FOAM.

FLASH POINT METHOD:

LOWER EXPLOSIVE LIMIT:

UPPER EXPLOSIVE LIMIT:

EXTINGUISHING MEDIA: WEAR SCBA & PROTECTIVVE CLOTHING.

SPECIAL FIRE FIGHTING PROC: EMITS TOXIC FUMHES UNDER FIRE CONDITIONS

UNUSUAL FIRE AND EXPL HAZRDS: YESN/K

Reactivity Data

STABILITY:

COND TO AVOID STABILITY: STRONG OXIDIZING AGGENTS

MATERIALS TO AVOID: COMBUSTION: CO, CO2, SULLFUR OXIDES.

HAZARDOUS DECOMP PRODUCTS: NO N/K

HAZARDOUS POLY OCCUR:

CONDITIONS TO AVOID POLY: ORAL LD50(RAT): 27658 MG/KG P-DITHIANE YESYESYESMAY BE HARMFUL BY INHALATION, INGEESTION

Health Hazard Data 1

LD50 LC50 MIXTURE: /SKIN ABSORPTION. EYES/SKIN:1: IRRITATION.

ROUTE OF ENTRY INHALATION: IN

ROUTE OF ENTRY SKIN: HAL

ROUTE OF ENTRY INGESTION: ATI

HEALTH HAZ ACUTE AND CHRONIC: ON. MATERIAAL IS IRRITATING TO MUCOUS MEMBRANES & UPPER RESPIRATORY TRACT. NO NGO NO NONE

CARCINOGENICITY NTP:

CARCINOGENICITY IARC:

CARCINOGENICITY OSHA:

EXPLANATION CARCINOGENICITY: IRRITATION, NNAUSEA, HEADACHE, VOMITING.

SIGNS SYMPTOMS OF OVEREXP: N/K

MED COND AGGRAVATED BY EXP: EYES: FLUSH W/W/COPIOUS AMOUNTS OF WATER FOR 15 MINS SKIN: WASH W/SOAP & COPIOUS AMOUUNTS

EMERGENCY FIRST AID PROC: OF WATER. INHALAATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. INGESTION: WASH OUT MOOUTH W/WATER IF CONSCIOUS. OBTAIN MEDICAL ATTENTION IN ALL CASES. EVACUUATE AREA. WEAR SCBA, RUBBER BOOTS & HEAVY RUBBER GLOVES. SWEEP UP, PLACEE IN A BAG &

Precautions for Safe Handlinpg and Use

STEPS IF MATL RELEASED SPILL: HOLD FOR WASTEE DISPOSAL. AVOID RAISING DUST. VENTILATE AREA & WASH SITE AFTER MATERIAL PICCKUP IS COMPLETE. N/K DISSOLVE

NEUTRALIZING AGENT: /MIX THE MATERIAL W/A CCOMBUSTIBLE SOLVENT & BURN IN A CHEMICAL INCINERATOR EQUIP

WASTE DISPOSAL METHOD: PED W/AN AFTERBURNNER & SCRUBBER, IAW/ FEDERAL, STATE & LOCAL REGULATIONS. STORE IN A COOL DRRY PLACE. KEEP TIGHTLY CLOSED.

PRECAUTIONS HANDLING STORING: AVOID PROLONNGED/REPEATED EXPOSURE AVOID CONTACT W/ EYES, SKIN/CLOTHING. DON'T BRREATHE D

OTHER PRECAUTIONS: UST. WEAR APPROPRIATE NIOOSH/MSHA APPROVED RESPIRATOR.

Control Measures

RESPIRATORY PROTECTION: CHEMICAL FUME HOODD

VENTILATION: CHEMICAL RESISTANT SAFETY GOGGGLES PROTECTI

PROTECTIVE GLOVES: VE CLOTHING, SAFETY SHOWWER & EYE BATH.

EYE PROTECTION:

OTHER PROTECTIVE EQUIPMENT: REMOVE/LAUNNDER CONTAMINATED CLOTHING BEFORE REUSE. WASH THOROUGHLY AFTER HANDDLING.

WORK HYGIENIC PRACTICES: N/K

SUPPL SAFETY HEALTH DATA:

Transportation Data

TRANSPORTATION ACTION CODE:

TRANSPORTATION FOCAL POINT:

TRANS DATA REVIEW DATE:

DOT PSN CODE:

DOT SYMBOL:

DOT PROPER SHIPPING NAME:

DOT CLASS:

DOT ID NUMBER:

DOT PACK GROUP:

DOT LABEL:

DOT DOD EXEMPTION NUMBER:

IMO PSN CODE:

IMO PROPER SHIPPING NAME:

IMO REG PAGE NUMBER:

IMO UN NUMBER:

IMO UN CLASS:

IMO SUBSID RISK LABEL:

IATA PSN CODE:

IATA UN ID NUMBER:

IATA PROPER SHIP NAME:

IATA UN CLASS:

IATA SUBSID RISK CLASS:

IATA LABEL:

AFI PSN CODE:

AFI SYMBOLS:

AFI PROP SHIPPING NAME:

AFI CLASS:

AFI ID NUMBER:

AFI PACK GROUP:

AFI LABEL:

AFI SPECIAL PROV:

AFI BASIC PAC REF:

MMAC CODE:

N O S SHIPPING NAME:

ADDITIONAL TRANS DATA:

Disposal Data

DISPOSAL DATA ACTION CODE:

DISPOSAL DATA FOCAL POINT:

DISPOSAL DATA REVIEW DATE:

RECNUM FOR THIS DISP ENTR:

TOT DISP ENTRIES PER NSN:

LANDFILL BAN ITEM:

DISPOSAL SUPPLEMENTAL DAT:

EPAHAZWST 1ST CODE NEW:

EPAHAZWST 1ST NAME NEW:

EPAHAZWST 1ST CHAR NEW:

EPAACUTEHAZARD 1ST NEW:

EPAHAZWST 2ND CODE NEW:

EPAHAZWST 2ND NAME NEW:

EPAHAZWST 2ND CHAR NEW:

EPAACUTEHAZARD 2ND NEW:

EPAHAZWST 3RD CODE NEW:

EPAHAZWST 3RD NAME NEW: YES G D21770-1,4-DDITHIANE,97%

EPAHAZWST 3RD CHAR NEW:

EPAACUTE 3RD HAZARD NEW:

Label Data

LABEL REQUIRED:

TECHNICAL REVIEW DATE:

LABEL DATE:

MFR NUMBER:

LABEL STATUS: M

COMMON NAME: AY BE HARMFUL BY INHALATIONN, INGESTION/SKIN ABSORPTION. EYES

CHRONIC HAZARD: /SK

SIGNAL WORD: IN: IRRI

ACUTE HEALTH HAZARD NONE: T

ACUTE HEALTH HAZARD SLIGHT: A

ACUTE HEALTH HAZARD MODERATE: T

ACUTE HEALTH HAZARD SEVERE: I

CONTACT HAZARD NONE: O

CONTACT HAZARD SLIGHT: N

CONTACT HAZARD MODERATE: .

CONTACT HAZARD SEVERE:

FIRE HAZARD NONE: I

FIRE HAZARD SLIGHT: N

FIRE HAZARD MODERATE: H

FIRE HAZARD SEVERE: A

REACTIVITY HAZARD NONE: L

REACTIVITY HAZARD SLIGHT: A

REACTIVITY HAZARD MODERATE: T

REACTIVITY HAZARD SEVERE: I

SPECIAL HAZARD PRECAUTIONS: ON: MATERIAL I IS IRRITATING TO MUCOUS MEMBRANES & UPPER RESPIRATORY TRACT. IRRITATATION, NAUSEA, HEADACHE, VOMITING. ALDRICH CHEMICAL CO SUB OF SIGMA-1-ALDRICH 1001 W ST PAUL AVE

PROTECT EYE:

PROTECT SKIN:

PROTECT RESPIRATORY:

LABEL NAME: 355 MILWAUKEE WI

LABEL STREET: 53233-5000US414-273-3850

LABEL P O BOX:

LABEL CITY:

LABEL STATE:

LABEL ZIP CODE:

LABEL COUNTRY:

LABEL EMERGENCY NUMBER:

YEAR PROCURED:

FIRE HAZARD SEVERE: A

REACTIVITY HAZARD NONE: L

REACTIVITY HAZARD SLIGHT: A

REACTIVITY HAZARD MODERATE: T

REACTIVITY HAZARD SEVERE: I

SPECIAL HAZARD PRECAUTIONS: ON: MATERIAL IS S IRRITATING TO MUCOUS MEMBRANES & UPPER RESPIRATORY TRACT. IRRITAATION, NAUSEA, HEADACHE, VOMITING. ALDRICH CHEMICAL CO SUB OF SIGMA-ARLDRICH 1001 W ST PAUL AVE

PROTECT EYE:

PROTECT SKIN:

PROTECT RESPIRATORY:

LABEL NAME: 355 MILWAUKEE WI

LABEL STREET: 53233-5000US414-273-3850

LABEL P O BOX:

LABEL CITY:

LABEL STATE:

LABEL ZIP CODE:

LABEL COUNTRY:

LABEL EMERGENCY NUMBER:

YEAR PROCURED:

Page Created 10/25/97 11:00:06 AM

Chloropicrin (PS)

REVISED: 12 December 90

POISON

OCCUPATIONAL
HEALTH SERVICES, INC.

Emergency Telephone #s:
818-366-2000

CHLOROPICRIN

MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME:
OCCUPATIONAL HEALTH SERVICES, INC.

MANUFACTURER'S ADDRESS:
OCCUPATIONAL HEALTH SERVICES, INC.
11 WEST 42ND STREET, 12TH FLOOR
NEW YORK, NY 10036
800-445-MSDS OR 212-789-3535

CAS REGISTRY NUMBER: 76-06-2

CHEMICAL NAME AND SYNONYMS:

Trichloronitromethane
Nitrochloroform
Chloropicrin
Nitrotrichloromethane

TRADE NAME AND SYNONYMS:

Chloropicrin
PS

CHEMICAL FAMILY: Nitro (Aliphatic halogen compound)

SECTION IV - FIRE AND EXPLOSION DATA

FLASHPOINT (METHOD USED): Negligible fire hazard when exposed to heat or flame.

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, water spray or regular foam. For larger fires, use water spray, fog or regular foam.

SPECIAL FIRE FIGHTING PROCEDURES: Wear chemical protective suit with self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. Move container from fire area if you can do so without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

WARNING: Extinguish with agents suitable for type of surrounding fire. Use flooding amounts of water and fog, avoid breathing poisonout vapors; keep upwind. Consider evacuation of downwind area if material is leaking.

SECTION V - HEALTH HAZARD DATA

AIRBORNE EXPOSURE LIMIT (AEL): 0.7 mg/m^3

EFFECTS OF OVEREXPOSURE:

Short-term exposure: Chloropicrin causes eye irritation and tearing. It also causes cough, nausea, and vomiting, and severe irritation of the skin. Breathing chloropicrin vapors may also cause delayed severe breathing difficulties and which may cause death. Additional effects may include bluish color of skin, lips and fingernails.

Long-term exposure: Overexposure to chloropicrin may cause increased susceptibility to future overexposure. In addition to effects from short term exposure, redness and swelling of the skin and eyes and heart and lung damage may occur.

SECTION VI - REACTIVITY DATA

STABILITY: Unstable liquid that decomposes under the influence of light. High temperatures or severe shock (particularly in containers larget than 30 gallons) also contribute to instability.

INCOMPATIBILITY: Contact with strong oxidizers may cause fires or explosions.

Aniline: violent reaction
Bromo-2-propyne: explosive, shock and heat sensitive
Sodium Hydroxide: reacts violently
Sodium Methoxide: below 50 DEG C, nitro compound will accumulate and cause a violent and dangerous exothermic reaction
Strong Oxidizers: possible violent reaction

HAZARDOUS DECOMPOSITION: Toxic gases and vapors (oxides of nitrogen, phosgene, nitrosyl chloride, chlorine, and carbon monoxide) may be released when chloropicrin decomposes. Decomposition occurs at temperatures above 400 DEG C.

HAZARDOUS POLYMERIZATION: Has not been reported to occur under normal temperatures and pressures.

SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Do not touch spilled material. Stop leak if you can do so without risk. Use water spray to reduce vapors. For small spills, take up with sand or other absorbent material and place into containers for later disposa. For small dry spills, place material into clean dry containers with clean shovel and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry. Ventilate closed spaces before entering.

WASTE DISPOSAL METHOD: Chloropicrin may be disposed of by absorbing in vermiculite, dry sand, earth, or a similar material and disposing in sealed containers in a secured sanitary landfill.

OTHER PROTECTIVE EQUIPMENT: Impervious clothing should be worn, as well as any other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid chloropicrin.

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

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
Observe all federal, state and local regulations when storing or disposing of this substance. For assistance, contact the district director of the environmental protection agency.

Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a well-ventilated area. Where there is any possibility that employees' eyes may be exposed to liquid chloropicrin, an eye-wash fountain should be provided within the immediate work area for emergency use. Where there is any possibility of exposure of an employee's body to liquid PS, facilities for quick drenching of the body should be provided within the immediate work area for emergency use. Eating and smoking should not be permitted in areas where liquid chloropicrin is handled, processed, or stored. Employees who handle liquid chloropicrin should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

SECTION X - TRANSPORTATION DATA

FORBIDDEN FOR TRANSPORT OTHER THAN VIA MILITARY (TECHNICAL ESCORT UNIT)

TRANSPORT AS PER 49 CFR 172

PROPER SHIPPING NAME: Chloropicrin UN 1580

DOT HAZARD CLASS: 6.1-Poisonous Materials Packing Group I

DOT LABEL: Poison

THIODIGLYCOL

Safety data for thiodiglycol

Synonyms: Bis (2-hydroxyethyl)sulfide. Beta-thiodiglycol, 2,2'-thiobis-ethanol, 2,2'-thiodiethan
2-Hydroxyethyl sulfide. omega,omega'-Dihydroxyethyl sulfide
Molecular formula: C4 H10 O2 S
CAS No: 111-48-8
EC No:

Physical data

Appearance: colourless liquid with characteristic odour.
Melting point: -10 C
Boiling point: 165 C at 14 mm, 282 C at 760 mm
Vapour density:
Vapour pressure:
Specific gravity: 1.18
Flash point: 160 C
Explosion limits:
Autoignition temperature:

Stability

Stable. Incompatible with strong oxidizing agents. Reacts with a wide variety fo compounds. Flammable.

Toxicology

Eye and skin irritant. Toxicological properties not fully investigated. ORL-RAT LD50 6610 mg/kg

Personal protection

Safety glasses and adequate ventilation.

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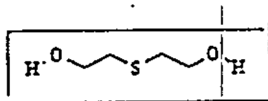
574 515

HELP CATALOGS SEARCH ORDER LIST PREVIOUS NEXT CONTENTS

Acros Organics: 2,2'-Thiodiethanol

2,2'-Thiodiethanol



CAS #	*[111-48-8]*
Synonym	2-Hydroxyethyl sulfide Thiodiglycol Bis(2-hydroxyethyl)sulfide omega,omega'-Dihydroxyethyl sulfide
Linear formula	$HOCH_2CH_2SCH_2CH_2OH$
FW	122.19
Molecular formula	$C_4H_{10}O_2S$
bp	165 (14mm)°
d	1.1800
Beil.	**1**, 470
Merck Index	**11**, 9259
Hazard symbol	Xi
Risk/safety phrases	*R* 36
RTECS#	KM2975000
EINECS	203-874-3
TSCA	

Abbreviations Explained

Literature reference Selective reducing agent for peroxides. Chemist-Analyst, 55, 11 (1966).

Ordering Information

Click on part number to order.

Acros Organics Cat. No.	Size	Price
42086-0250	25g	18.60

MSDS 42086-0250

HELP CATALOGS SEARCH ORDER LIST CONTENTS

MATERIAL SAFETY DATA SHEET

2,2'-Thiodiethanol, 99% (gc)
22735

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 2,2'-Thiodiethanol, 99% (gc)

Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
111-48-8	Ethanol, 2,2'-thiobis-		203-874-3

Hazard Symbols: XI
Risk Phrases: 36

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Not available.
Target Organs: None.

Potential Health Effects
The toxicological properties of this material have not been investigated. Use appropriate procedures to prevent opportunities for direct contact with the skin or eyes and to prevent inhalation.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.
Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Remove contaminated clothing and shoes.
Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.
Inhalation:
Get medical aid immediately. Remove from exposure to fresh air

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:
Use agent most appropriate to extinguish fire.

Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: health-2; flammability-1; reactivity-0
Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

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

Spills/Leaks:
Clean up spills immediately, observing precautions in the Protective Equipment section.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation.

Storage:
Store in a cool, dry place. Keep container closed when not in use.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethanol, 2,2'-thiobis-	none listed	none listed	none listed

OSHA Vacated PELs:
Ethanol, 2,2'-thiobis-:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:
Wear chemical goggles.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to minimize contact with skin.

Respirators:
A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Not available.
Appearance:	Not available.
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	165 deg C @ 14.00mm Hg
Freezing/Melting Point:	0 deg C
Decomposition Temperature:	Not available.
Solubility:	Not available.
Specific Gravity/Density:	1.1800g/cm3
Molecular Formula:	C4H10O2S
Molecular Weight:	122.19

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, strong oxidants.
Incompatibilities with Other Materials:
Not available.
Hazardous Decomposition Products:
Irritating and toxic fumes and gases.
Hazardous Polymerization: Not available.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 111-48-8: KM2975000
LD50/LC50:
CAS# 111-48-8: Oral, rat: LD50 = 6610 mg/kg.
Carcinogenicity:
Ethanol, 2,2'-thiobis- -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

No information available
IMO
Not regulated as a hazardous material.
IATA
Not regulated as a hazardous material.
RID/ADR
Not regulated as a hazardous material.
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 111-48-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Ethanol, 2,2'-thiobis- can be found on the following state right to know lists: Florida, Pennsylvania, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XI
Risk Phrases:
R 36 Irritating to eyes.
Safety Phrases:
WGK (Water Danger/Protection)
CAS# 111-48-8: 1
Canada
CAS# 111-48-8 is listed on Canada's DSL/NDSL List.
WHMIS: Not available.
CAS# 111-48-8 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

574 520

MSDS Creation Date: 2/28/1995 Revision #2 Date: 4/05/1997

Back to product information.

1,4-OXATHIANE

ACROS ORGANICS

Acros Organics: 1,4-Thioxane, 98%

1,4-Thioxane, 98%

CAS #	*[15980-15-1]*
Synonym	1,4-Oxathiane
FW	104.17
Molecular formula	C_4H_8OS
bp	147-147 (755mm)°
d	1.1140
Refractive index (sodium D line at 20°C)	1.5095
Fp	+42°
Beil.	19, 3
Risk/safety phrases	*R* 10 *S* 16 *UN* 1993 DOT/T 3
RTECS#	RP4200000
EINECS	240-117-6
TSCA	

Abbreviations Explained

Ordering Information

Click on part number to order.

Acros Organics Cat. No.	Size	Price
15784-1000	100g	147.20

MSDS 15784-1000

Keywords: 1 4-Thioxane 98%

ACROS ORGANICS

MATERIAL SAFETY DATA SHEET

1,4-Thioxane, 98%
16887

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANNY IDENTIFICATION ****

MSDS Name: 1,4-Thioxane, 98%

Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROOS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATICON ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
15980-15-1	1,4-oxathiane	98	240-117-6

Risk Phrases: 10

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Not available.
Appearance: clear colorless to faint yellow. Flassh Point: 42 deg C.
Not available.
Target Organs: None.

Potential Health Effects
The toxicological properties of this materiall have not been investigated. Use appropriate procecures to prevent opportunities for direct contact with the skin or eyes and to prevent inhalation.

**** SECTION 4 - FIRST AID MEEASURES ****

Eyes:
Flush eyes with plenty of water for at lleast 15 minutes, occasionally lifting the upper and loweer lids. Get medical aid immediately.

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

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Inhalation:

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

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Flammable Liquid.

Extinguishing Media:

Use agent most appropriate to extinguish fire.

Autoignition Temperature: Not available.

Flash Point: 42 deg C (107.60 deg F)

NFPA Rating: health-2; flammability-2; reactivity-0

Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

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

Spills/Leaks:

Absorb spill with inert material, (e.g., , dry sand or earth), then place into a chemical waste container. Clean up spills immediately, observing precautions in the Protective Equipment section.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid contact with heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. . Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,4-oxathiane	none listed	none listed	none listed

OSHA Vacated PELs:

1,4-oxathiane:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear chemical goggles.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to minimize contact with skin.

Respirators:

A respiratory protection pprogram that meets OSHA's 29 CFR ;1910.134 and ANSI Z88.2 requirements must be followed whenever workplacee conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Not available.
Appearance:	clear colorless to faint yellow
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	147.0 - 147.0 deg C @ 755.00mm Hg
Freezing/Melting Point:	0 deg C
Decomposition Temperature:	Not available.
Solubility:	Not available.
Specific Gravity/Density:	1.1140g/cm3
Molecular Formula:	C4H8OS
Molecular Weight:	104.17

**** SECTION 10 - STABILITY AND RREACTIVITY ****

Chemical Stability:
Stable under normal temperatures and preessures.
Conditions to Avoid:
Incompatible materials, strong oxidants.
Incompatibilities with Other Materials:
Not available.
Hazardous Decomposition Products:
Irritating and toxic fumes and gases.
Hazardous Polymerization: Not available.

**** SECTION 11 - TOXICOLOGICAL IINFORMATION ****

RTECS#:
CAS# 15980-15-1: RP4200000
LD50/LC50:
CAS# 15980-15-1: Oral, rat: LD50 = 2830 mg/kg.
Carcinogenicity:
1,4-oxathiane -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INNFORMATION ****

**** SECTION 13 - DISPOSAL CONSIIDERATIONS ****

Dispose of in a manner consistent with federal, sstate, and local regulations.
RCRA D-Series Maximum Concentration of Contaminanthts:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposaal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: FLAMMABLE LIQUIDS, N.O.S.

(1,4-THIOXANE)
Hazard Class: 3
UN Number: UN1993
Packing Group: II
IMO
Shipping Name: FLAMMABLE LIQUID, N.O.S.
Hazard Class: 3.2
UN Number: 1993
Packing Group: II
IATA
Shipping Name: FLAMMABLE LIQUID, N.O.S.**
Hazard Class: 3
UN Number: 1993
Packing Group: II
RID/ADR
Shipping Name: FLAMMABLE LIQUID, N.O.S.
Dangerous Goods Code: 3(3B)
UN Number: 1993
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 15980-15-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
1,4-oxathiane can be found on the following state right to know lists: Florida, Pennsylvania, Massachusetts..
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: Not available.
Risk Phrases:
R 10 Flammable.

BEST AVAILABLE COPY

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.

WGK (Water Danger/Protection)
CAS# 15980-15-1:

Canada
None of the chemicals in this product are listed on the DSL/NDSL list.
WHMIS: Not available.
CAS# 15980-15-1 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/23/1995 Revision #3 Date: 9/02/1997

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

Back to product information.

Mustard (HD)

REVISED: 30 June 95
DATE: 22 September 1988
HCSDS NO: 20058A

POISON

U.S. ARMY EDGEWOOD
RESEARCH, DEVELOPMENT
AND ENGINEERING CENTER

Emergency Telephone #s:
ERDEC Safety Office
410-671-4411 0700-1700
EST After normal duty
hours: 410-278-5201
Ask for ERDEC Staff
Duty Officer

HD, AND THD (See Addendum A)

MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Department of the Army

MANUFACTURER'S ADDRESS:
U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE COMMAND
EDGEWOOD RESEARCH DEVELOPMENT AND ENGINEERING CENTER
ATTN: SCBRD-ODR-S
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 505-60-2, 39472-40-7, 68157-62-0

CHEMICAL NAME AND SYNONYMS:

Sulfide, bis (2-chloroethyl)
Bis(beta-chloroethyl)sulfide
Bis(2-chloroethyl)sulfide
1-chloro-2(beta-chloroethylthio)ethane
beta, beta'-dichlorodiethyl sulfide
2,2'dichlorodiethyl sulfide
Di-2-chloroethyl sulfide
beta, beta'-dichloroethyl sulfide
2,2'-dichloroethyl sulfide

TRADE NAME AND SYNONYMS:

HD
Senfgas
H
Sulfur mustard
S-lost
HS
Iprit
Sulphur mustard gas
Kampstoff "Lost"
S-yperite
Lost
Yellow Cross Liquid
Mustard Gas
Yperite

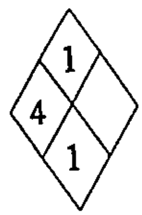
CHEMICAL FAMILY: chlorinated sulfur compound

FORMULA/CHEMICAL STRUCTURE:

$C_4(H_8)Cl_2(S)$

```
       H   H     H   H
       |   |     |   |
  Cl - C - C - S - C - C - Cl
       |   |     |   |
       H   H     H   H
```

NFPA 704 SIGNAL: Health - 4
Flammability- 1
Reactivity- 1



SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
Sulfur Mustard	$C_4(H_8)Cl_2(S)$	100	0.003 mg/m^3 (8 hr-TWA)

SECTION III - PHYSICAL DATA

BOILING POINT DEG F (DEG C): 422 DEG F (217 DEG C)

VAPOR PRESSURE (mm Hg): 0.072 mm Hg @ 20 DEG C (0.11 mm Hg @ 25 DEG C)

VAPOR DENSITY (AIR=1): 5.5

SOLUBILITY IN WATER: Negligible. Soluble in acetone, $CH_3(Cl)$, tetrachloroethane, ethylbenzoate, and ether.

SPECIFIC GRAVITY ($H_2O=1$): 1.27 @ 20 DEG C

FREEZING POINT: 14.45 DEG C

LIQUID DENSITY (g/cc): 1.268 @ 25 DEG C
1.270 @ 20 DEG C

PERCENTAGE VOLATILE BY VOLUME: 610 mg/m^3 @ 20 DEG C
920 mg/m^3 @ 25 DEG C

APPEARANCE AND ODOR: Water clear if pure. Normally pale yellow to black. Slight garlic type odor. The odor threshold for HD is 0.0006 mg/m^3.

SECTION IV - FIRE AND EXPLOSION DATA

FLASHPOINT (METHOD USED): 105 DEG C (ignited by large explosive charges)

FLAMMABILITY LIMITS (% by volume): Unknown

EXTINGUISHING MEDIA: Water, fog, foam, CO_2. Avoid use of extinguishing methods that will splash or spread mustard.

SPECIAL FIRE FIGHTING PROCEDURES: All persons not engaged in extinguishing the fire should be immediately evacuated from the area. Fires involving HD should be contained to prevent contamination to uncontrolled areas. When responding to a fire alarm in buildings or areas containing agents, fire-fighting personnel should wear full firefighter protective clothing (without TAP clothing) during chemical agent firefighting and fire rescue operations.

Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where fire-fighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

SECTION V - HEALTH HAZARD DATA

AIRBORNE EXPOSURE LIMIT (AEL): The AEL for HD is 0.003 mg/m^3 as found in "AR 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, HT". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure concentration for HD.

EFFECTS OF OVEREXPOSURE: HD is a vesicant (causing blisters) and alkylating agent producing cytotoxic action on the hematopoietic (blood-forming) tissues which are especially sensitive. The rate of detoxification of HD in the body is very slow and repeated exposures produce a cumulative effect. HD has been found to be a human carcinogen by the International Agency for Research on Cancer (IARC).

Median doses of HD in man are:

LD_{50} (skin) = 100 mg/kg
ICt_{50} (skin) = 2000 mg-min/m^3 at 70 - 80 DEG F (humid environment)
= 1000 mg-min/m^3 at 90 DEG F (dry environment)
ICt_{50} (eyes) = 200 mg-min/m^3
ICt_{50} (inhalation) = 1500 mg-min/m^3 (Ct unchanged with time)
LD_{50} (oral) = 0.7 mg/kg

Maximum safe Ct for skin and eyes are 5 and 2 mg-min/m^3, respectively.

ACUTE PHYSIOLOGICAL ACTION OF HD IS CLASSIFIED AS LOCAL AND SYSTEMIC.

LOCALLY, HD affects both the eyes and the skin. SKIN damage occurs after percutaneous resorption. Being lipid soluble, HD can be resorbed into all organs. Skin penetration is rapid without skin irritation. Swelling (blisters) and reddening (erythema) of the skin occurs after a latency period of 4-24 hours following the exposure, depending on degree of exposure and individual sensitivity. The skin healing process is very slow. Tender skin, mucous membrane, and perspiration-covered skin are more sensitive to the effects of HD. HD's effect on the skin, however, is less than on the eyes. Local action on the eyes produces severe necrotic damage and loss of eyesight. Exposure of eyes to HD vapor or aerosol produces lacrimation, photophobia, and inflammation of the conjunctiva and cornea.

SYSTEMIC ACTIONS occur primarily through inhalation and ingestion. The HD vapor or aerosol is less toxic to the skin or eyes than the liquid form. When inhaled, the upper respiratory tract (nose, throat, trachea) is inflamed after a few hours latency period, accompanied by sneezing, coughing, and bronchitis, loss of appetite, diarrhea, fever, and apathy. Exposure to nearly lethal dose of HD can produce injury to bone marrow, lymph nodes, and spleen as indicated by a drop in WBC count and, therefore, results in increased susceptibility to local and systemic infections. Ingestion of HD will produce severe stomach pains, vomiting, and bloody stools after a 15-20 minute latency period.

CHRONIC EXPOSURE to HD can cause sensitization, chronic lung impairment, (cough, shortness of breath, chest pain), and cancer of the mouth, throat, respiratory tract, skin, and leukemia. It may also cause birth defects.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION. Remove from the source IMMEDIATELY. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. Seek medical attention IMMEDIATELY.

EYE CONTACT. Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water 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 and gloves; remove victim from agent source immediately. Flush skin and clothes with 5 percent solution of sodium hypochlorite or liquid household bleach within one minute. Cut and remove contaminated clothing, flush contaminated skin area again with 5 percent sodium hypochlorite solution, then wash contaminated skin area with soap and water. If shower facilities are available, wash thoroughly and transfer to medical facility. If the skin becomes contaminated with a thickened agent, blot/wipe the material off immediately with an absorbent pad/paper towel prior to using decontaminating solution.

INGESTION. Do not induce vomiting. Give victim milk to drink. Seek medical attention IMMEDIATELY.

SECTION VI - REACTIVITY DATA

STABILITY: Stable at ambient temperatures. Decomposition temperature is 149 DEG C to 177 DEG C. Mustard is a persistent agent depending on pH and moisture, and has been known to remain active for up to three years in soil.

INCOMPATIBILITY: Conditions to avoid. Rapidly corrosive to brass @ 65 DEG C. Will corrode steel at a rate of .0001 in. of steel per month @ 65 DEG C.

HAZARDOUS DECOMPOSITION: Mustard will hydrolyze to form HCl and thiodiglycol.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Only personnel in full protective clothing (see Section 8) will be allowed in an area where mustard is spilled.

RECOMMENDED FIELD PROCEDURES:
The mustard should be contained using vermiculite, diatomaceous earth, clay or fine sand and neutralized as soon as possible using copious amounts of 5.25 percent Sodium Hypochlorite solution.

Scoop up all material and place in an approved DOT container. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

If 5.25 percent Sodium Hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, Decontamination Solution No. 2 (DS2), and Super Tropical Bleach Slurry (STB). WARNING: Pure, undiluted Calcium Hypochlorite (HTH) will burn on contact with liquid blister agent.

RECOMMENDED LABORATORY PROCEDURES:
A minimum of 65 grams of decon solution per gram of HD is allowed to agitate for a minimum of one hour. Agitation is not necessary following the first hour if a single phase is obtained. At the end of 24 hours, the resulting solution shall be adjusted to a pH between 10 and 11. Test for presence of active chlorine by use of acidic potassium iodide solution to give free iodine color. Place 3 ml of the decontaminate in a test tube. Add several crystals of Potassium Iodine and swirl to dissolve. Add 3 ml of 50 wt percent Sulfuric Acid: water and swirl. IMMEDIATE Iodine color indicates the presence of active chlorine. If negative, add additional 5.25 percent Sodium Hypochlorite solution to the decontamination solution, wait two hours, then test again for active chlorine. Continue procedure until positive chlorine is given by solution.

A 10 wt percent Calcium hypochlorite (HTH) mixture may be substituted for Sodium Hypochlorite. Use 65 grams of decon per gram of HD and continue the test as described for Sodium Hypochlorite.

Scoop up all material and place in approved DOT containers. Cover the contents of the drum with decontaminating solution as above. The exterior of the drum shall be decontaminated and then labeled IAW EPA and DOT regulations. All leaking containers shall be overpacked with vermiculite placed between the interior and exterior containers. Decontaminate and label IAW EPA and DOT regulations. Dispose of the material IAW waste disposal methods provided below. Dispose of the material used to decontaminate exterior of drum IAW Federal, state and local regulations. Conduct general area monitoring with an approved monitor (see Section 8) to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (see Section 8).

NOTE: Surfaces contaminated with HD and then rinse-decontaminated may evolve sufficient mustard vapor to produce a physiological response.

WASTE DISPOSAL METHOD: All decontaminated material should be collected, contained and chemically decontaminated or thermally decomposed in an EPA approved incinerator, which will filter or scrub toxic by-products from effluent air before discharge to the atmosphere. Any contaminated protective clothing should be decontaminated using HTH or bleach and analyzed to assure it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point. Decontamination of waste or excess material shall be accomplished in accordance with the procedures outlined above with the following exception:

---- HD on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.

Open pit burning or burying of HD or items containing or contaminated with HD in any quantity is prohibited.

NOTE: Some states define decontaminated surety material as a RCRA hazardous waste.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

Concentration mg/m3	Respiratory Protection/Ensemble Required
Less than or equal to 0.003	A full facepiece, chemical canister, air-purifying protective mask will be onhand for escape. (The M9-, M17-, and M40-series masks are acceptable for this purpose. Other masks certified as equivalent may be used.)
Greater than 0.003	NIOSH/MSHA approved pressure demand full facepiece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA PAM 385-61 for examples).

VENTILATION:

Local Exhaust. Mandatory. Must be filtered or scrubbed. Air emissions shall meet local, state and federal regulations.

Special. Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (lfpm) plus or minus 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods shall have an inward face velocity of 150 lfpm plus or minus 20 percent. Laboratory hoods shall be located such that cross drafts do not exceed 20% of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in assessing the ability of the hood to contain agent HD.

Other. Recirculation of exhaust air from agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods.

PROTECTIVE GLOVES: MANDATORY. Butyl toxicological agent protective gloves (M3, M4, gloveset).

EYE PROTECTION: As a minimum, chemical goggles will be worn. For splash hazard use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: For general lab work, gloves and lab coat shall be worn with M9 or M17 mask readily available.

In addition, when handling contaminated lab animals, a daily clean smock, foot covers, and head covers are required.

MONITORING: Available monitoring equipment for agent HD is the M8/M9 detector paper, blue band tube, M256/M256A1 kits, bubbler, Depot Area Air Monitoring System (DAMMS), Automated Continuous Air Monitoring System (ACAMS), CAM-M1, Hydrogen Flame Photometric Emission Detector (HYFED), the Miniature Chemical Agent Monitor (MINICAM), and Real Time Analytical Platform (RTAP).

Real-time, low-level monitors (with alarm) are required for HD operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
During handling, the "buddy" (two-man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit, and prior to transfering the containers from storage to work areas. Stringent control over all personnel handling HD must be exercised. Chemical showers, eyewash stations, and personal cleanliness facilities must be provided. Each worker will wash their hands before meals and shower thoroughly with special attention given to hair, face, neck, and hands using plenty of soap before leaving at the end of the work day. No smoking, eating, or drinking is permitted at the work site. Decontaminating equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. HD should be stored in containers made of glass for Research, Development, Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double-contained in liquid-tight containers when in storage.

OTHER PRECAUTIONS: For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA PAM 385-61, Toxic Chemical Agent Safety Standards", and "AR

40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT".

SECTION X - TRANSPORTATION DATA

FORBIDDEN FOR TRANSPORT OTHER THAN VIA MILITARY (TECHNICAL ESCORT UNIT)

TRANSPORT AS PER 49 CFR 172

PROPER SHIPPING NAME: Poisonous liquids, n.o.s.(Sulfide, bis2-chloroethyl)

DOT HAZARD CLASS: 6.1 Packing Group I Hazard Zone B

DOT LABEL: Poison

DOT MARKING: Poisonous liquids, n.o.s. (Sulfide, bis 2-chloroethyl) UN 2810, Inhalation Hazard

DOT PLACARD: POISON

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES: See Sections IV and VIII.

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

ADDENDUM A
ADDITIONAL INFORMATION FOR THICKENED HD

TRADE NAME AND SYNONYMS: Thickened HD, THD

HAZARDOUS INGREDIENTS: K125 (acryloid copolymer, 5%) is used to thicken HD. K125 is not known to be hazardous except in a finely-divided, powder form.

PHYSICAL DATA: Essentially the same as HD except for viscosity. The viscosity of HD is between 1000 and 1200 centistokes @ 25 DEG C.

FIRE AND EXPLOSION DATA: Same as HD.

HEALTH HAZARD DATA: Same as HD except for skin contact. For skin contact, don respiratory protective mask and remove contaminated clothing IMMEDIATELY. IMMEDIATELY scrape the HD from the skin surface, then wash the contaminated surface with acetone. Seek medical attention IMMEDIATELY.

SPILL, LEAK, AND DISPOSAL PROCEDURES: If spills or leaks of HV occur, follow the same procedures as those for HD, but dissolve the THD in acetone prior to introducing any decontaminating solution. Containment of THD is generally not necessary. Spilled THD can be carefully scraped off the contaminated surface and placed in a fully removable head drum with a high density, polyethylene lining. The THD can then be decontaminated, after it has been dissolved in acetone, using the same procedures used for HD. Contaminated surfaces should be treated with acetone, then decontaminated using the same procedures as those used for HD.

NOTE: Surfaces contaminated with THD or HD and then rinse-decontaminated may evolve sufficient mustard vapor to produce a physiological response.

SPECIAL PROTECTION INFORMATION: Same as HD.

SPECIAL PRECAUTIONS: Same as HD with the following addition. Handling the THD requires careful observation of the "stringers" (elastic, thread-like attachments) formed when the agents are transferred or dispensed. These stringers must be broken cleanly before moving the contaminating device or dispensing device to another location, or unwanted contamination of a working surface will result.

TRANSPORTATION DATA: Same as HD.

Lewsite (L)

REVISED: 30 June 95
DATE: 16 April 1988

POISON

U.S. ARMY EDGEWOOD
RESEARCH, DEVELOPMENT
AND ENGINEERING CENTER

MATERIAL SAFETY DATA SHEET

Emergency Telephone #s:
ERDEC Safety Office
410-671-4411 0700-1700
EST After normal duty
hours: 410-278-5201
Ask for ERDEC Staff
DutyOfficer

LEWISITE

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: Edgewood Research, Development and Engineering Center

MANUFACTURER'S ADDRESS:
U.S. ARMY CHEMICAL AND BIOLOGICAL DEFENSE COMMAND
EDGEWOOD RESEARCH, DEVELOPMENT & ENGINEERING CENTER
ATTN: SCBRD-ODR-S
ABERDEEN PROVING GROUND, MD 21010-5423

CAS REGISTRY NUMBER: 541-25-3

CHEMICAL NAME AND SYNONYMS:

Arsine, (2-chlorovinyl) dichloro-
Arsonous dichloride, (2-chloroethenyl)-
Chlorovinylarsine dichloride
2-Chlorovinyldichloroarsine
beta-Chlorovinyldichloroarsine
Dichloro (2-chlorovinyl) arsine

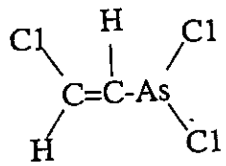
TRADE NAME AND SYNONYMS: Lewisite, L, EA 1034

CHEMICAL FAMILY: Arsenical (vesicant)

574 542

FORMULA/CHEMICAL STRUCTURE:

$C_2H_2AsCl_3$



NFPA 702 SIGNAL: Health - 4
Flammability - 1
Reactivity - 1

SECTION II - COMPOSITION

INGREDIENTS NAME	FORMULA	PERCENTAGE BY WEIGHT	AIRBORNE EXPOSURE LIMIT (AEL)
Lewisite	$C_2H_2AsCl_3$	100	* 0.003 mg/m^3

* This is a ceiling value

SECTION III - PHYSICAL DATA

BOILING POINT DEG F (DEG C): 374 (190)

VAPOR PRESSURE (mm Hg): 0.35 @ 25 DEG C
0.22 @ 20 DEG C

VAPOR DENSITY (AIR=1): 7.2

SOLUBILITY: Negligible in water, completely soluble in Et_20, $CHCl_3$, all common organic solvents, mustard, oils, and alcohol.

SPECIFIC GRAVITY (H_2O=1): 1.88 @ 25 DEG C

VOLATILITY (mg/m^3): $3.9 \times (10)^3$ @ 25 DEG C
$2.5 \times (10)^3$ @ 20 DEG C

MOLECULAR WEIGHT: 207.32

APPEARANCE AND ODOR: Pure L is a colorless oily liquid. "War gas" is an amber to dark brown liquid; characteristic odor is usually geranium-like; very little odor when pure.

SECTION IV- FIRE AND EXPLOSION DATA

FLASHPOINT (Method Used): Does not flash

FLAMMABILITY LIMITS: N/A.

EXTINGUISHING MEDIA: N/A.

SPECIAL FIRE FIGHTING PROCEDURES: Fires involving L should be contained to prevent contamination of uncontrolled areas. All persons not engaged in extinguishing the fire should be evacuated immediately. Contact with L or its vapors can be fatal. When responding to a fire alarm in building or areas containing agents, firefighting personnel should wear full firefighter protective clothing during chemical agent firefighting and fire rescue operations. Respiratory protection is required. Positive pressure, full facepiece, NIOSH-approved self-contained breathing apparatus (SCBA) will be worn where there is danger of oxygen deficiency and when directed by the fire chief or chemical accident/incident (CAI) operations officer. In cases where firefighters are responding to a chemical accident/incident for rescue/reconnaissance purposes vice firefighting, they will wear appropriate levels of protective clothing (see Section 8).

SECTION V - HEALTH HAZARD DATA

AIRBORNE EXPOSURE LIMIT (AEL): The permissible airborne exposure concentration of L for an 8-hour workday or a 40-hour work week is an 8-hour time weighted average (TWA) of 0.003 mg/m^3 as a ceiling value. A ceiling value may not be exceeded at any time. The ceiling value for Lewisite is based upon the present technologically feasible detection limit of 0.003 mg/m^3. This value can be found in "DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard H, HD, HT, and L". To date, however, the Occupational Safety and Health Administration (OSHA) has not promulgated permissible exposure concentration for L.

EFFECTS OF OVEREXPOSURE: L is a vesicant (blister agent). It also acts as a systemic poison, causing pulmonary edema, diarrhea, restlessness, weakness, subnormal temperature, and low blood pressure. In order of severity and appearance of symptoms, it is: a blister agent, a toxic lung irritant, and absorbed in tissues, a systemic poison. When inhaled in high concentrations, it may be fatal in as short a time as 10 minutes. L is not detoxified by the body. Common routes of entry into the body include occular, percutaneous, and inhalation.

LCt_{50} (inhalation, man) = 1200 - 1500 mg min/m^3
LCt_{50} (skin vapor exposure, man) = 100,000 mg min/m^3
LDLO (skin, human) = 20 mg/kg
LCt_{50} (skin, man): >1500 mg/min^3. L irritates eyes and skin and gives warning of its presence.
Minimum effective dose (ED min) = 200 mg/m^3 (30 min).
ICt_{50} (eyes, man): <300 mg min/m^3.

ANIMAL TOXICOLOGICAL DATA:

LD_{50} (oral, rat) = 50 mg/kg
LD_{50} (subcutaneous, rat) = 1 mg/kg
LCtLO (inhalation, mouse) = 150 mg/m^3 10m
LD_{50} (skin, dog = 15 mg/kg RTECS) or 38 mg/kg (CRDEC chemical agent data sheets)
LD_{50} (skin, rabbit) = 6 mg/kg
LD_{50} (subcutaneous, rabbit) = 2 mg/kg
LD_{50} (intravenous, rabbit) = 500 mg/kg
LD_{50} (skin, guineapig) = 12 mg/kg
LD_{50} (subcutaneous, guinea pig) = 1 mg/kg
LD_{50} (skin, domestic farm animals) = 15 mg/kg
LCt_{50} (inhalation, rat) = 1500 mg min/m3 (9 min)
LCt_{50} (vapor skin, rat) = 20,000 mg min m (25 min)
LCD_{50} (skin, rat) = 15 - 24 mg/kg
LD_{50} (ip, dog) = 2 mg/kg
EDmin (skin, dog) = 50 mg/m3 (30 min)
EDmin (eye, dog) = 20 mg/m3 (30 min)
EDmin (skin, rabbit) = 25 mg/m3 (30 min)
EDmin (eye, rabbit) = 1 mg/m3 (30 min)

a. Acute Exposure:

(1) Eyes. Severe damage. Instant pain, conjunctivitis and blepharospasm leading to closure of eyelids, followed by corneal scarring and iritis. Mild exposure produces reversible eye damage if decontaminated instantly, otherwise more permanent injury or blindness is possible within 1 minute of exposure.

(2) Skin. Immediate stinging pain increasing in severity with time. Erythema (skin reddening) appears within 30 minutes after exposure accompained by pain with itching and irritation for 24 hours. Blisters appear within 12 hours after exposure with more pain which diminished after 2-3 days. Skin burns are much deeper than with HD. Tender and moist skin (mucous membrane, perspiration covered;...) absorb more L and are therefore more sensitive than the skin. This, however, is counteracted by L's hydrolysis by moisture, producing less vesicant and a higher vapor pressure product.

(3) Respiratory Tract. Irritating to nasal passages and produces a burning sensation followed by a profuse nasal secretion and violent sneezing. Prolonged exposure causes coughing and production of large quantities of froth mucus. In experimental animals, injury to respiratory tract, due to vapor exposure is similar to mustard's; however, edema of the lung is more marked and frequently accompanied by pleural fluid.

(4) Systemic Effects. L on the skin, as well as in inhaled vapor, are absorbed and may cause systemic poisoning. A manifestation of this is a change in capillary permeability, which permits loss of sufficient fluid from the bloodstream to cause hemoconcentration, shock and death. In non-fatal cases, hemolysis of erythrocytes has occurred with a resultant hemolytic anemia. The excretion of oxidized products into the bile by the liver produces focal necrosis of that organ, necrosis of the mucosa of the biliary passages with periobiliary hemorrhages, and some injury to the intestinal mucosa. Acute systematic poisoning from large skin burns causes pulmonary edema, diarrhea, restlessness weakness, subnormal temperature, and low blood pressure in animals.

b. Chronic Exposure. L can cause sensitization and chronic lung impairement. Also, by comparison to agent mustard and arsenical compounds,it can be considered as a suspected human carcinogen.

EMERGENCY AND FIRST AID PROCEDURES: Always don your own protective mask and gloves before administering first aid.

INHALATION: Remove from the source immediately. If breathing has stopped give artifical respiration. If breathing is difficult, administer oxygen. Seek medical attention immediately.

EYE CONTACT: Speed in decontaminating the eyes is absolutely essential. Remove person from the liquid source, flush the eyes immediately with water for 10-15 minutes by tilting the head to the side, pulling eyelids apart with 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. See medical attention IMMEDIATELY.

SKIN CONTACT: Remove victim from source immediately and remove contaminated clothing. Immediately decon affected areas by flushing with 10 percent sodium carbonate solution. After 3-4 minutes, wash off with soap and water to protect against erythema. Seek medical attention immediately.

INGESTION: Do not induce vomiting. Give victim milk to drink. Seek medical attention immediately.

SECTION VI - REACTIVITY DATA

INCOMPATIBILITY: Corrosive to steel at a rate of 1×10^{-5} to 5×10^{-5} in/month at 65 DEG C.

HAZARDOUS DECOMPOSITION PRODUCTS:
Stability: Reasonably stable; however, in presence of moisture, it hydrolyses rapidly, losing its vesicant property. It also hydrolyses in acidic medium to form HC1 and non-volatile (solid) chlorovinylarsenious oxide, which is less vesicant than Lewisite. Hydrolysis in alkaline medium, as in decontamination with alcoholic caustic or carbonate solution or DS2, produces acetylene and trisodium arsenate (Na_3AsO_4). Therefore, decontaminated solution would contain toxic arsenic.

SECTION VII - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Only personnel in full protective clothing will be allowed in area where L is spilled (see Section 8).

RECOMMENDED FIELD PROCEDURES: The L should be contained using vermiculite, diatomaceous earth, clay, or fine sand and neutralized as soon as possible using copious amounts of alcoholic caustic, carbonate, or DS2. Caution must be exercised when using these decontaminates since acetylene will be given off. Household bleach can also be used if accompanied by stirring to allow contact. Scoop up all contaminated material and place in approved DOT containers. Cover with additional decontaminant. Decontaminate the outside of the container, label IAW DOT and EPA requirements, and dispose of as specified below. Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Sections 2 and 8).

RECOMMENDED LABORATORY PROCEDURES: A 10 wt percent alcoholic Sodium Hydroxide solution is prepared by adding 100 grams of denatured ethanol to 900 grams of 10 wt percent NaOH in water. A minimum of 200 grams of decon is required for each gram of L. The decon/agent solution is agitated for a minimum of one (1) hour. At the end of one hour the resulting pH should be checked and adjusted to above 11.5 using additional NaOH, if required.

It is permitted to substitute 10 wt percent alcoholic sodium carbonate made and used in the same ratio as the NaOH listed above. Reaction time should be increased to 3 hours with agitation for the first hour. Final pH should be adjusted to above 10.

It is permitted to substitute 5.25 percent sodium hypochlorite for the 10 percent alcoholic sodium hydroxide solution above. Allow one hour with agitation for the reaction. Adjustment of the pH is not required.

Conduct general area monitoring to confirm that the atmospheric concentrations do not exceed the airborne exposure limit (see Section 8).

WASTE DISPOSAL METHOD:
All neutralized material should be collected and contained for disposal IAW land ban RCRA regulations or thermally decomposed in an EPA permitted incinerator equipped with a scrubber which will scrub out the chlorides and be equipped with an electrostatic precipitator or other filter device to remove arsenic. Collect all the arsenic dust from the electrostatic precipitator or other filter device and containerize and label IAW DOT and EPA regulations. The arsenic will be disposed of IAW land ban RCRA regulations. Any contaminated materials or protective clothing should be decontaminated using alcoholic caustic, carbonate, or bleach analyzed to assure it is free of detectable contamination (3X) level. The clothing should then be sealed in plastic bags inside properly labeled drums and held for shipment back to the DA issue point.

NOTE: Some states define decontaminated surety material as a RCRA hazardous waste.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

Concentration (mg/m^3)	Respiratory Protection/Ensemble Required
Less than or equal to 0.003	A full facepiece, chemical canister, air-purifying, protective mask shall be on hand for escape (the M9, M17 and M40 series protective masks are acceptable for this use).
Greater than 0.003 or unknown	A NIOSH/MSHA-approved, full facepiece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA Pam 385-61)

* This represents the ceiling value determined by continuous real time monitoring (with alarm) at the 0.003 mg/m^3 level of detection.

VENTILATION: Local exhaust - Mandatory, must be filtered or scrubbed to limit exit concentration to non-detectable level. Air emissions shall meet local, state and federal regulations.

Special: Chemical laboratory hoods shall have an average inward face velocity of 100 linear feet per minute (1fpm) + 10% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods shall have an inward face velocity of 150 1fpm plus or minus 20 percent. Laboratory hoods shall be located such that cross drafts do not exceed 20 % of the inward face velocity. A visual performance test utilizing smoke producing devices shall be performed in the assessment of the inclosure's ability to contain Lewisite.

Other: Recirculation of exhaust air form agent areas is prohibited. No connection between agent area and other areas through the ventilation system is permitted. Emergency backup power is necessary. Hoods should be tested semi-annually or after modification or maintenance operations. Operations should be performed 20 cm inside hoods. Procedures should be developed for disposal of contaminated filters.

PROTECTIVE GLOVES: Norton, Chemical Protective Glove Set M3 Butyl Rubber

EYE PROTECTION: As a minimum, protective eye glasses will be worn. For splash hazard use goggles and face-shield.

OTHER PROTECTIVE EQUIPMENT: For laboratory operations, gloves and lab coat will be worn with M9, M17, or M40 mask readily available.

MONITORING: Available monitoring equipment for agent L is the M18A2 (yellow band), bubblers (arsenic and GC method), and M256 & A1 Kits.

Real-time, low-level monitors (with alarm) are required for L operations. In their absence, an IDLH atmosphere must be presumed. Laboratory operations conducted in appropriately maintained and alarmed engineering controls require only periodic low-level monitoring.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
During handling, the "buddy" (two man) system will be used. Containers should be periodically inspected for leaks, either visually or using a detector kit. Stringent control over all personnel handling L must be exercised. Chemical showers, eye wash stations, and personal cleanliness facilities must be provided; wash hands before meals and each worker will shower thoroughly with special attention given to hair, face, neck, and hands, using plenty of soap before leaving at the end of the workday. The storage or consumption of food or beverages; the storage or application of cosmetics; the smoking or storage of smoking materials, tobacco products or other products for chewing; or the chewing of such product in all laboratory areas, is prohibited. Laboratory glasswear will not be used to prepare or consume food or beverages. Decontaminating equipment shall be conveniently located. Exits must be designed to permit rapid evacuation. L should be stored in containers made of glass for Research, Development Test and Evaluation (RDTE) quantities or one-ton steel containers for large quantities. Agent shall be double contained in liquid tight containers when in storage or during transportation.

For additional information see "AR 385-61, The Army Toxic Chemical Agent Safety Program", "DA Pam 385-61, Toxic Chemical Agent Safety Standards", and "DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard H, HD, HT, and L".

SECTION X - TRANSPORTATION DATA

PROPER SHIPPING NAME: Poisonous liquids, n.o.s. (Chlorovinylarsine dichloride)

DOT HAZARD CLASSIFICATION: 6.1, Packing Group I

DOT LABEL: Poison

DOT MARKING: Poisonous liquids, n.o.s. (Chlorovinylarsine dichloride) UN 2810

DOT PLACARD: Poison

EMERGENCY ACCIDENT PRECAUTIONS & PROCEDURES: See Sections IV and VIII.

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: Motor vehicles will be placarded regardless of quantity. Driver shall be given full and complete information regarding shipment and conditions in case of emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

TAB

Appendix F

APPENDIX F

574 552

UXB

PERSONNEL PROTECTIVE EQUIPMENT DONNING PROCEDURES PLAN

574 553

1.0 General PPE Donning Procedures

1.0.1 The purpose of the PPE donning procedures outlined in this Section is to ensure that site personnel don the required PPE in a manner which will afford them the greatest degree of protection Failure to adhere to these procedures may result in the protective clothing, respirator, or other PPE being ineffective against potential hazards and contamination. The general donning procedures are given as a guide and may be altered by the SSHO if the improvements are warranted by site operations and approved by the CO/COR and the UXB CIH. Alterations will be put in writing, and if approved, will be amended to this SSHP.

1.0.2 This paragraph contains general procedures and requirements for donning all levels of PPE Specific procedures for donning each level of PPE are discussed in the paragraph immediately following the description of that PPE level.

1 0..3 The general PPE donning procedures and requirements are as follows:

- Prior to donning any PPE, proceed to the PPE storage area and obtain all PPE required for performing the task specified.
- Issuance of respiratory equipment will be through the SSHO or his designated representative only.
- Always inspect protective gloves, boots/boot covers, outer garment, and respiratory protective equipment for proper fit, integrity (i.e., rips, tears, holes), and function.
- If during initial inspection or while engaged in site activities, a small tear/rip is noticed in the protective suit for Modified D, C or B, it may be repaired using a small piece of duct tape or tape provided by the manifacturer.
- If a tear/rip in protective clothing cannot be repaired with a small piece of tape, or if the tear/rip compromises the structural integrity of the clothing, that article of clothing shall be replaced, even if this involves leaving the EZ to do so.
- Whenever protective boots/boot covers or gloves are not part of the outer garment, use duct tape, or an equivalent, to connect the clothing to the gloves at the wrist and with the boots at the leg. Do not use tape on level "A" PPE.
- When taping boots or gloves to the suit, do not wrap the tape too tightly as this can cut off circulation and restrict movement; the goal is to simply attach the two items to eliminate a route of entry for chemicals into the suit or gloves.
- Whenever using tape, always leave a folded tab placed where it is visible and accessible for ease of removal.
- If planned site activities will require walking, arm movement or bending, it is best to place tape over the zipper and seams at the stress points in the crotch, arm pits and back (where the shoulder seam and hood seam meet).

- If kneeling will be necessary during site activities, avoid kneeling on any contaminated surfaces, place tape over the knee areas to reduce the possibility of tearing or wearing out the knees.

- Consult with the SSHO to suggest any other improvements which would make the suit sturdier and or improve the comfort of the suit.

2.0 Task Specific Levels of PPE

2.1 Special PPE Considerations

2.1.1 The following special considerations shall be observed in the selection of PPE for the levels discussed below:

- Hard hats will be required when working around heavy equipment or when an overhead hazard exists

- Steel toe/shank boots are required for PPE levels A, B, C, and D

- Steel toe/shank boots are not required during surface/subsurface location of UXO using magnetometers unless a serious toe hazard exists, whereupon a fiber safety toe will be used.

- Safety glasses shall be selected which provide site personnel with the best protection from not only physical hazards, such as flying objects, but also provide adequate ultra violet radiation protection.

- The OSHA standard for PPE, 29 CFR 1910.132, is very vague concerning selection of specific PPE, therefore, UXB shall continually evaluate site tasks to identify hazards and shall provide any PPE necessary to ensure the safety and health of site personnel, regardless of the activity they perform.

2.2 Donning Procedures for Modified Level D

2.2.1 To don Modified Level D, keep in mind the general recommendations of Section F.1.3 and then put on the PPE utilizing the steps listed below:

- Put on chemical/splash resistant protective suit.

- Put chemical resistant boots on over the footies and tape the boots to the suit.

- Make any strengthening modifications to the suit as deemed necessary by the planned site activities.

- Assemble and adjust all other PPE (hard hat, safety glasses, splash shield, etc.) and proceed toward the CRZ access point.

- If ear plugs are to be worn, insert them before putting on inner and outer gloves, or any other PPE that might obstruct the proper insertion of the plugs.

- Don all other PPE (hard hat, safety glasses, splash shield, etc.), saving the inner and outer gloves for last.

- Put on inner and outer glove of one hand and have buddy tape that hand, then tape one of the buddy's hands, and so on, until both hands are gloved and taped
- Proceed to the EZ access control point to be checked by the EZ access control attendant prior to being cleared for entry

2.3 Donning Procedure for Level C PPE

2.3.1 To don Level C, follow the general considerations listed in Section E.1.3 and then follow the steps listed below:

- Put on chemical/splash resistant protective suit.
- Put chemical resistant boots on over the footies and tape the boots to the suit.
- Make any strengthening modifications to the suit as deemed necessary by the planned site activities.
- Report to the SSHO or the designated representative to check out the proper respirator and cartridge assembly.
- Assemble and adjust all other PPE (hard hat, safety glasses, splash shield, etc.) and proceed toward the CRZ access point.
- If ear plugs are to be worn, insert them before putting on inner and outer gloves, respirator, or any other PPE that might obstruct the proper insertion of the plugs.
- Assemble respirator and cartridges and inspect the assembly for proper cleanliness and function.
- Don the respirator and conduct a negative and positive pressure fit check to ensure that the mask is not leaking.
- Don all other PPE (hard hat, safety glasses, splash shield, etc.), saving the inner and outer gloves for last.
- Put on inner and outer glove of one hand and have buddy tape that hand, then tape one of the buddy's hands, and so on, until both hands are gloved and taped.
- Proceed to the EZ access control point to be checked by the EZ access control attendant prior to being cleared for entry.

2.4 Donning Procedures for Level B PPE

2.4.1 The donning procedure outlined in this paragraph applies to Level B with a non-encapsulating suit equipped with an SCBA. The donning procedures to be followed for Level B with a fully encapsulating suit are the same as those outlined for Level A in Section E.2.5.

2.4.2 To don Level B with a non-encapsulating suit and SCBA, follow the general considerations listed in Section E.1.3 and then follow the steps listed below:

- Report to the SSHO or the designated representative to check out the proper SCBA respirator assembly

- Assemble and inspect the SCBA system for cleanliness and function.
- Make sure that all required PPE have been assembled at the location where it is to be donned, and make any adjustments to the equipment prior to starting the donning process

2.5 Donning Procedure for Level A PPE

2.5.1 To don Level A, or Level B with an encapsulating suit and an SCBA, follow the general considerations listed in Section F.1.3 and then follow the steps listed below:

- Report to the SSHO or the designated representative to check out the proper SCBA respirator assembly.
- Assemble and inspect the SCBA system for cleanliness and function
- Make sure that all required PPE have been assembled at the location where it is to be donned, and make any adjustments to the equipment prior to starting the donning process.
- While sitting, insert one leg after the other into the encapsulating suit, stand and pull it up to the waist (suit should have attached footies and gloves).
- While sitting, put chemical resistant boots on over the footies and tape the boots to the suit. NOTE: If the type of level "A" suit is used where you must tape boots to the suit, the suit can not be reused.
- Put on the air tank/harness assembly, adjust for a comfortable, snug fit and turn of the air, after first making sure the regulator valve is closed.
- If ear plugs are to be worn, insert them now, before putting the respirator facepiece, or any other PPE that might obstruct the proper insertion of the plugs.
- Don the SCBA facepiece, but do not connect the airline at this time, and conduct a negative and positive pressure fit check to ensure that the mask is not leaking.
- Put on inner glove liner and inner gloves then put on hard hat.
- While connecting SCBA to the facepiece, turn on the regulator valve and check air flow and breathing ease ability of the unit.
- Insert the arms into the sleeves, being sure hands fit into the gloves properly, and have the assistant "work" the suit over the SCBA, facepiece and hard hat.
- Once the suit is situated and the assistant checks to ensure the wearer is breathing freely, the assistant will zip up the suit and check all closures and valves.
- Proceed to the EZ access control point to be checked by the EZ access control attendant prior to being cleared for entry.

2.5.2 Level A suits are to be worn only when the known chemicals/vapors are highly toxic to skin contact, or when the nature and level of exposure is unknown or unmeasurable. Therefore the structural integrity and air tightness of the suit, and its seams, zippers and glove seals are extremely important. To ensure the air tightness of the suit, it should be tested IAW the manufacturer's requirements and the requirements found in Appendix A of 29 CFR 1910.120

TAB

Appendix G

APPENDIX G

UXB

RESPIRATORY PROTECTION PROGRAM

TABLE OF CONTENTS

1.0 Overview

UXB International Inc. (UXB) has developed this respiratory protection program to provide guidance to:

- Qualified individuals performing Ordnance and Explosive Waste (OEW) operations
- Qualified individuals performing Hazardous Toxic and Radiological Waste (HTRW) operations
- Approved visitors to a site potentially containing OEW or HTRW.

Elements within this program form the basis of compliance with 29 CFR 1910.134 for all UXB personnel, subcontractors, and visitors desiring to participate in field activities on a site potentially contaminated with OEW or HTRW.

Respiratory protection will be supplied by UXB as necessary to protect the health of the employee when engineering or work practice controls are unable to control respiratory hazards. Engineering controls when feasible will be used to protect employee health. Work practice controls will be used as feasible prior to instituting respirator use. Respiratory protection using respirators represents the final line of defense that will be used to protect employee health.

2.0 Respirator Selection Methods

Respiratory protection is implemented to protect employees from hazards due to oxygen deficiency and/or toxic contaminants.

Oxygen Deficiency: While normal air contains approximately 21% oxygen by volume, any concentration less than 19.5% is considered deficient under OSHA regulations. Entry into an oxygen-deficient atmosphere can rapidly lead to loss of consciousness and possible death. Oxygen deficiencies are most likely to occur in unventilated and confined spaces where oxygen may have been consumed by fire or reaction, or displaced by a simple asphyxiate such as carbon dioxide. Accordingly, inspectors should exercise extreme caution before entering any confined spaces such as steam tunnels, sump wells, boiler vessels, or storage vaults protected by deluge carbon dioxide systems. If any doubt exists, **DO NOT ENTER** such spaces until sufficient oxygen content can be assured by testing or forced ventilation.

Toxic Contaminants: The more commonly encountered class of respiratory hazard consists of air contaminants. These can occur in a variety of physical states -- Gaseous Contaminants, including gases or vapors generated by evaporation of liquids; or Particulate Contaminants, including dusts, mists, fogs, fumes, and smoke. Nevertheless, those performing inspection or remediation work should be alert to the possible presence of other air contaminants in their work environment, as the proper respirator selection may be affected.

UXB's Certified Industrial Hygienist (CIH) along with the Site Safety and Health Officer (SSHO) will select respiratory protection based on actual site conditions. The following items will be considered in the selection of respirators:

- Effectiveness of the device against the substance of concern
- Estimated maximum concentration of the substance in the work area
- General environment
- Known limitations of the respiratory protective device

- Comfort, fit, and worker acceptance; and
- Other contaminants in the environment or the potential for oxygen deficiency.

2.1.0 Classes and Characteristics of Respiratory Protection Devices

Respirators can be broadly categorized as "negative-pressure" or "positive-pressure." Negative pressure respirators are known as Air Purifying Respirators (APR's). Positive pressure respirators include Powered Air Purifying Respirators (PAPR's), Supplied Air Respirators (SAR's), and Self-Contained Breathing Apparatus (SCBA).

2.2.0 Negative Pressure Air Purifying Respirators (APRs)

In a negative-pressure respirator, one or more air purifying filters or cartridges are attached to a tight-fitting rubber facepiece via an inhalation valve. The negative pressure created by inhalation draws the contaminated air through the purifying device to the worker. A leakproof seal between the facepiece and the worker's face is critical for proper protection; leaks may be caused by improper fit, facial hair or foreign substances under the sealing surface, or cracked/damaged seals, valves, or cartridges. During inhalation (the negative pressure phase), contaminated air will readily bypass the cartridge and follow the path of least resistance through any leaks which are present, thereby exposing the worker. Because air purifying cartridges offer considerable resistance to the free flow of air, negative-pressure respirators provide <u>less protection</u> than any other respirators APR's are never used in atmospheres below 19.5 % oxygen.

2.3.0 Positive Pressure Respirators

The remaining major classes of respirators (PAPR's, SAR's, and SCBA's) are positive-pressure respirators. These devices supply adequate clean air to the user's breathing zone so that positive pressure is maintained inside the mask, even during inhalation. If adequate positive pressure is maintained, airflow through any leaks which may be present will be outward, thus protecting the worker from the influx of contaminated air [Note: This operating principle <u>does not</u> negate the need for fit testing on positive-pressure respirators that employ tight-fitting facepieces.] PAPR's do not supply oxygen and therefore will never be used in atmospheres with less than 19.5 % oxygen.

2.3.1 Powered Air Purifying Respirators (PAPRs)

Powered Air Purifying Respirators use the same types of cartridges and filters to clean the air as APRs, but are positive-pressure devices that employ a portable, rechargeable battery pack and blower that force uncontaminated air through the filter or cartridge to the worker's breathing zone. PAPRs are available in both tight-fitting and loose-fitting styles. Because the air is being drawn from the immediate work area, they offer no protection against oxygen deficiency. Nominal protection factors for PAPRs fall between that of APRs and Supplied Air Respirators. PAPR's are never used in atmospheres with less than 19.5 % oxygen.

2.3.2 Supplied Air Respirators (SARs)

Supplied Air Respirators, also referred to by the outdated designation of "Type C Respirators," use an air system to provide an adequate supply of clean air from outside the work area -- air is delivered to the mask via an air line. SARs are available in a variety of tight-fitting and loose-fitting mask styles -- half-masks (rare), full facepieces, hoods and helmets. SARs offer protection against oxygen deficiency. Protection factors for SARs are generally greater than all APRs and most PAPRs.

2.3.3 Self-Contained Breathing Apparatus (SCBA)

As the name implies, SCBA is an air-supplying respirator that employs a self-contained portable air supply; a pressurized cylinder is usually worn on the back. Different cylinder sizes are available to provide an air supply for between 5 minutes (for escape purposes) and one hour of service SCBAs, when operated in the pressure/demand mode, offer the highest level of protection available against both oxygen deficiency and toxic contaminants.

Prior to selecting respiratory protection, UXB will consider if engineering controls or work practices can control hazardous exposures. Respirator selection, when required, will be based on the potential or expected hazard, work to be performed, expected exposure time, and respirator protection factor. UXB will select only respirators that are certified by National Institute for Occupational Safety and Health (NIOSH) in accordance with 42 CFR 84. Respirators of various sizes, models and manufacturers (if necessary) will be provided to assure the best fit possible for the employee.

3.0 Medical Evaluations of Fitness to Use PPE

Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the level of effort the job requires, workplace conditions, and medical status of the employee. Therefore, all site personnel will undergo a physical exam to determine fitness to wear a respirator.

UXB will provide each employee with the required medical examination at no charge to the employee. The medical examination shall be performed by a physician or other licensed health care professional (PLHCP). The PLHCP will be provided a copy of this respiratory protection plan and a copy of 29 CFR 1910.134 Appendix C.

The PLHCP shall obtain the answers to all questions on the questionnaire, as well as, perform a complete physical examination and pulmonary function test. The PLHCP may, at his or her discretion, obtain a chest X-ray. Additional medical tests, diagnostic procedures, or consultations shall be performed for any employee answering in the affirmative to any question in Part A, Section 2, 1-8 of the medical questionnaire to allow the PLHCP to make a final determination.

All employees will be provided an opportunity to discuss the questionnaire and the results of the medical examination with the PLHCP.

All medical examinations will be conducted during normal working hours or at the convenience of the employee. All medical examinations are confidential.

UXB shall provide the PLHCP with the following information prior to examination and final determination:

- Type and weight of respirator proposed
- Duration and frequency of respirator use
- Expected physical work effort
- Additional protective equipment or clothing to be worn
- Temperature and humidity extremes that may be encountered

The PLHCP will provide a written statement to UXB indicating the employee's ability or lack thereof to wear a respirator. Employees with a negative determination will not be permitted to work in areas requiring respiratory protection. UXB shall not issue a respirator to any employee without a written medical determination. The written determination will include any limitations to respirator use, information regarding follow-up medical evaluation, and a statement that the PLHCP has provided the employee with a copy of the written determination.

UXB will provide additional medical evaluations if:

- An employee reports medical signs or symptoms that are related to his or her ability to wear a respirator
- A PLHCP, supervisor, or respirator program administrator informs an employee that they need to be reevaluated
- Information from the respiratory protection plan, including observations made during fit testing and program evaluation, indicate a need for employee reevaluation
- A change occurs in the workplace conditions (e.g., physical work effort, protective clothing, temperature, etc.) that may result in a substantial increase in the physiological burden placed on the employee.

3.1.0 Fit Testing

3.1.1 Air Purifying Respirators

Air purifying respirators use a variety of cartridges or canisters to absorb, or filter, contaminants from the air. They offer no protection against oxygen deficiency, and generally have the lowest protection factor rating of all respirator types

Fitting consists of two simple checks -- Negative Pressure Check and Positive Pressure Check -- which should be performed every time a negative-pressure respirator is donned, and before entering the hazardous environment. These checks are not a substitute for appropriate quantitative or qualitative fit checks!

After proper adjustment of the mask and headgear, the palms of both hands (or other suitable objects) are used to completely seal off the cartridge inlets. The worker then gently inhales, creating negative pressure inside the mask and thereby drawing the mask tightly against the face. When the breath is held, this negative pressure condition should be maintained for about ten seconds; if it is not, the mask and headgear should be readjusted and the check repeated

After successful completion of the negative pressure check, one palm is used to completely seal off the exhalation valve. Air is then gently exhaled into the mask, creating a positive pressure within the mask. Similarly, if this pressure cannot be maintained for about ten seconds, fit should be checked and re-check.

On failure of either of these checks, the respirator should be thoroughly inspected for holes, cracks, other damage or foreign material in or around the sealing surfaces, valve diaphragms, or valve and cartridge seats. Repeated failure indicates the need to repeat the fit testing, possibly with a different size or brand of respirator.

Fit checking must be performed on all types of respiratory protection prior to use, including: SCBA, positive pressure respirators. UXB will perform quantitative fit testing using the TSI Portacount Plus fit test system in accordance with 29 CFR 1910.134.

Once the appropriate respirator has been selected, proper fit becomes the most important factor affecting worker protection. Fit testing is essential to the effectiveness of negative pressure respirators, and will be performed on all respirators using tight-fitting facepieces at least annually. The types of fit tests include:

3.1.2 Quantitative Fit Testing (Q LFT)

Quantitative Fit Testing (QNFT) consists of various methods in which the protection factor for a particular respirator worn by a particular worker can be measured. UXB will perform QNFT using the Portacount Plus method. During QNFT, samples are drawn both from within the test area and the mask (via a leakproof probe or hose fitting). Analytical instrumentation provides a continuous readout of test agent concentrations within the test area and the mask. The protection factor is then easily calculated using the information from the readout. Although QNFT is the most accurate form of fit testing, it is often not used in the industry because of the need for complex and expensive testing equipment and specially-trained operators. For a detailed protocol of QNFT procedures appropriate for respiratory protection, refer to Appendix A of the OSHA Standard (29 CFR 1910.134).

4.0 Respirator Cleaning, Inspection, Maintenance, Sanitation, and Storage

Respirators that are used either occasionally or daily ,will be cleaned, sanitized, inspected, assembled, and maintained ready for use on a daily basis. Each respirator will be stored in a clean and sanitary container. Parts that require inspection include the valves, valve covers, nosepiece, straps, eyepiece, and the face piece and its snaps, cylinders, and canisters. The individual responsible for cleaning, inspecting, maintaining, sanitizing, and storing the respirators will be trained in the proper methods and procedures.

The following procedure is required, as a minimum, for cleaning and disinfecting:

- Remove and discard all used filters, canisters, or cartridges.
- Wash facepiece and breathing tube in a cleaner/disinfectant solution. A soft cloth may be used to remove dirt Solvents which can affect rubber and other parts must not be used.
- Rinse completely in clean, warm water.
- Air dry in a clean area.
- Clean other respirator parts as recommended by manufacturer.
- Inspect valves, headstraps, and other parts to ensure proper working condition
- Reassemble respirator and replace any defective parts with manufacturer supplied replacements.
- Place in a clean, dry plastic bag or other suitable container to maintain clean sanitary condition.

Each user will store his respirator in a clean, sealed plastic bag when not in use, unless it has been determined that the respirator is contaminated or is returned at the end of its use. If a respirator becomes chemically contaminated, it will be replaced with a clean and sanitized respirator; the contaminated respirator will be decontaminated before reuse. The respirator wearer will inspect the replacement respirator for defective parts, leaks, and re-test it if the make or model is different.

5.0 Air Quality for Supplied Respirators

Breathing air used for SARs and SCBAs will be, at a minimum, Grade D breathing air as described by ANSI /Compressed Gas Association. The compressed air will have a minimum:

- 19.5 – 23.5 percent Oxygen
- 5 mg/m^3 or less of hydrocarbons
- 10 ppm or less of CO
- 1000 ppm or less of CO_2
- No noticeable odor

All cylinders used to supply compressed air will be tested and maintained IAW 49 CFR 173 and 178.

All purchased cylinders will have a certificate or analysis from the supplier indicating that the breathing air meets the Grade D criteria. UXB will not take delivery of cylinders without a certificate of analysis.

If compressors are used to supply air, the compressor will be situated to prevent intake of contaminated air. The compressor must maintain dew point 10 degrees F below ambient temperature. The compressor must have suitable inline air purifying filters and sorbent beds. Record of filter and sorbent bed maintenance must be kept with the compressor. The compressor will have high temperature and CO monitoring alarms. The compressor must supply air that does not exceed 10 ppm CO.

Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen.

5.1.0 Chemical Cartridges and Filters

APRs and PAPRs employ air-purifying devices categorized as either Chemical Cartridges or Mechanical Filters. Chemical cartridges contain substances, which either absorb or adsorb specific gases or vapors from the air and are available in many different types. Mechanical filter cartridges are designed to remove particulate material from the air. The type of cartridge, and hence the particular hazardous substance that it provides protection against, is identified by labeling and a standardized color coding of the cartridge. Employees using APR's will use only NIOSH approved filters, cartridges, or canisters. A chemical cartridge change-out schedule will be developed as necessary. UXB's CIH shall determine the appropriate respiratory protection.

6.0 Respirator Training

UXB will provide respirator training to each employee required to wear a respirator. The training will be performed by the Site Safety and Health Officer (SSHO) at each site prior to issuing respirators. Respirator training will be performed at least annually for all employees required to wear a respirator. The training will include:

- Limitations and capabilities of respiratory protection
- Why the respirator is necessary, including a detailed discussion of the particular contaminants
- How improper fit, usage, and maintenance effect respiratory protection
- Proper emergency use
- How to inspect, don and doff the respirator

- Proper respirator storage and maintenance

- How to recognize symptoms and medical signs that may limit or prevent the effective use of a respirator

- Overview with discussion of 29 CFR 1910.134.

7.0 Program Evaluation

This program will be reviewed at least annually to assure employees are properly protected from job site hazards UXB's SSHO will determine prior to beginning (or assignment to) a new project, if this program adequately protects the employees.

The SSHO shall conduct evaluations of the job site and make recommendations for changes. The SSHO will consult with employees to determine if they are properly using and maintaining the respiratory protection. The SSHO shall identify those personnel requiring additional training or fit testing.

The respiratory protection program will be fully appraised and evaluated for effectiveness at least annually by the CIH.

8.0 Record Keeping

All medical evaluations will be maintained for a period of not less than 30 years from the last date of employment. Medical records will include the PLHCP's written evaluation and determination of employee's ability to wear a respirator.

The fit test records will contain the employees name and social security number, type of fit test performed, specific name, model, size, and style of respirator tested, date of test, and pass/fail results. The fit test results will be maintained until the next fit test is performed or 30 years from the last date of employment.

Respirator training record will be maintained with the medical evaluations.

Program evaluation records will be maintained within this program.

TAB

Appendix H

APPENDIX H

PERSONNEL DECONTAMINATION STATION SOPs

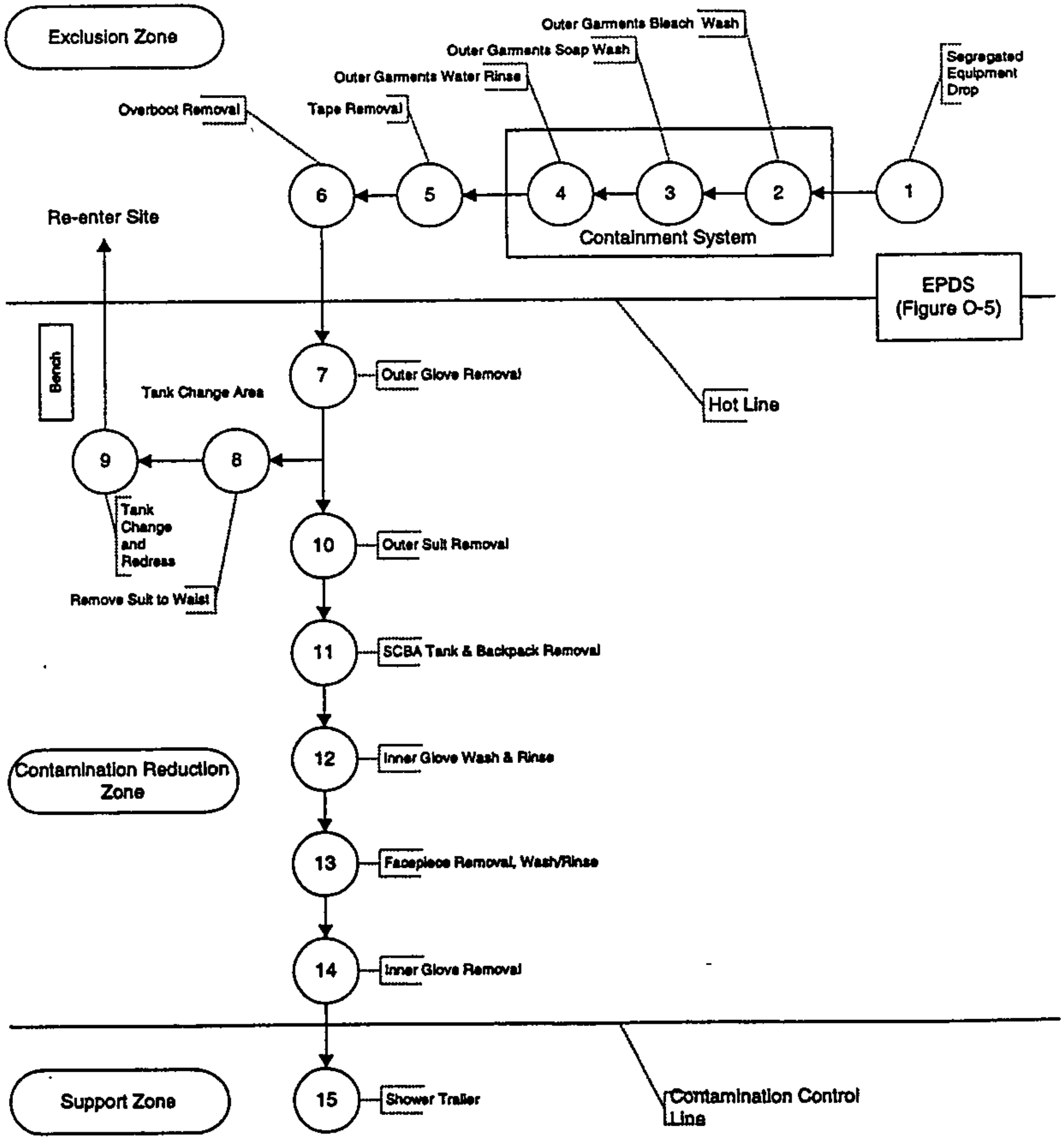
1.0 General

For the purpose of clarity, decontamination procedures for all levels of PPE are presented in this Appendix; this project at DDHU will not require decontamination of all PPE levels.

1.1.0 Levels A/B (with encapsulating Suit) Decontamination Procedure

1.1.0.1 The following PDS procedure applies to the decontamination of Level A ensembles and Level B ensembles with encapsulating suits. PDS procedures for Level B with non-encapsulating suits is addressed in paragraph H.2 of this Section. The PDS for Level A and this type of Level B with encapsulated suit will be set-up utilizing the PDS map found in Figure H-1. When processing through stations two through six, each buddy will assist the other with the decontamination procedures to be conducted at each station. If required, additional personnel will be assigned to assist with these stations.

Figure H-1
PDS for Level A and Level B with Encapsulating Suit

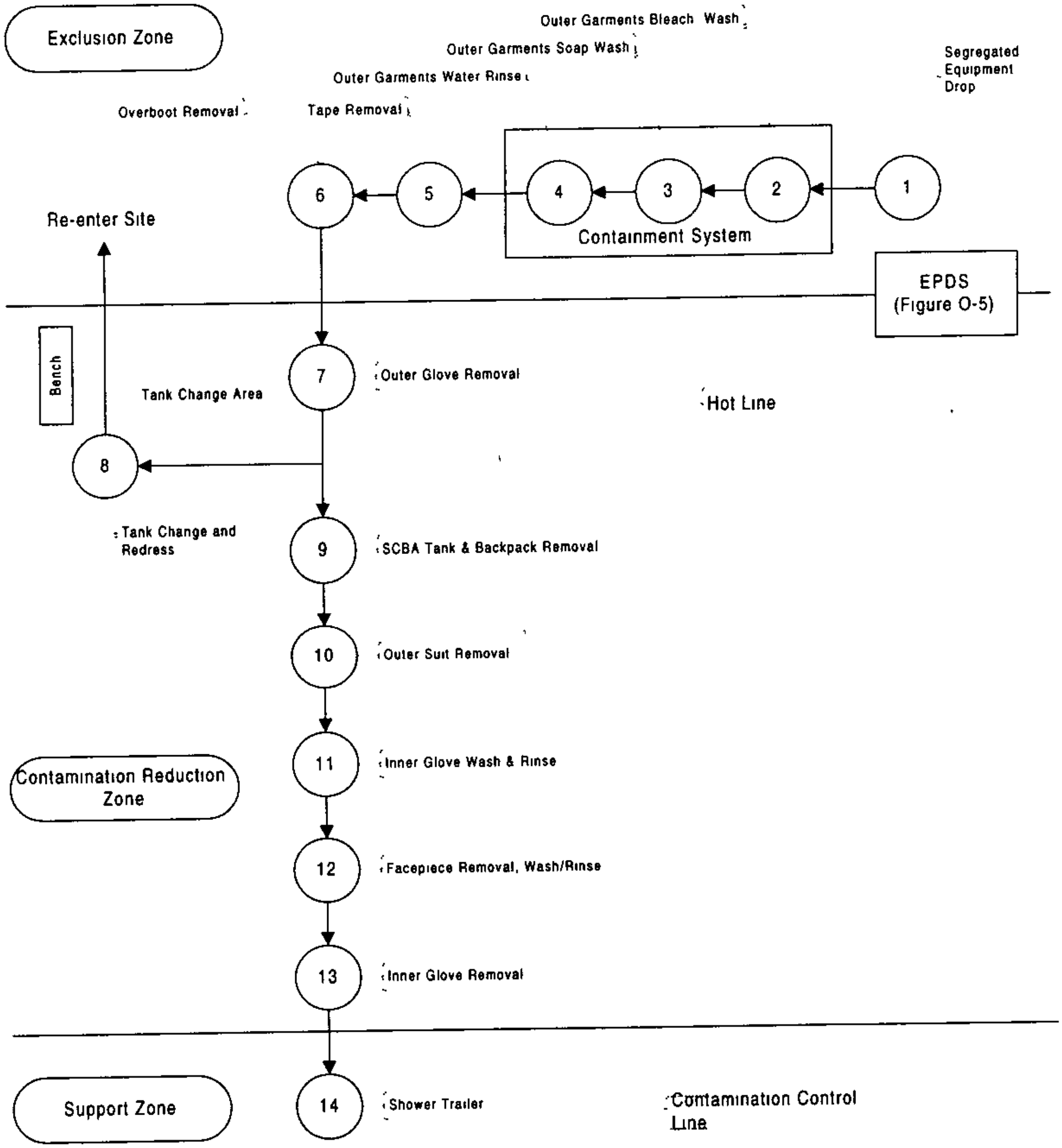


- Station 1: Equipment Drop. Enter PDS at Station 1 and deposit all reusable equipment on the drop cloth.
- Station 2· Outer Garment Decontamination (Chemical Suit, Gloves and Boots). This station involves washing all outer garments with a decontamination solution made of a 5% bleach solution. Start at the head and brush or spray down to soles of boots. Scrub boots, including the bottoms, gloves and any other part of the suit necessary to remove all dirt, mud or other foreign debris.
- Station 3. Outer Garment Wash (Chemical Suit, Gloves, and Boots). Starting at the head and working down, scrub and/or spray entire surface of outer garments, using a brush and hot soapy water.
- Station 4: Outer Garments Rinse. Starting at the head and working down, use clean water to brush off or spray all soap residue from the outer garment.
- Station 5: Tape Removal. Remove all tape that would restrict the removal of the outer garments and place it in a plastic-lined disposal container.
- Station 6: Boot/Boot Cover Removal (Boot Rack). Remove boots/boot covers and place on boot rack if serviceable; if not place in plastic-lined container. The PDS attendant may assist from the cold side of Hot Line, and will help ensure that personnel do not place unbooted feet back across the Hot Line. A chair or bench and boot jack will be provided at this station to assist in boot/boot cover removal.
- Station 7: Outer Glove Removal. Remove outer gloves and place on table, if serviceable; if not, place in plastic-lined container. Personnel should exercise extreme caution, and make every effort not to touch the inner gloves with the outside of the outer gloves during their removal.
- Station 8: Outer Suit Removal for Tank Change. A PDS attendant will assist in the removal of the outer suit. The outer suit should be removed only as far as necessary to gain access to the SCBA tank and permit its removal and replacement. Once the suit has been removed, shut down the SCBA using standard procedures and disconnect the facepiece supply hose.
- Station 9: Tank Replacement and Redress. Once the exhausted tank has been replaced with a full one, the PDS attendant will assist in redressing the worker, to include, donning/closure of the suit, replacement of the boots and outer gloves, and the taping of the boots/gloves. A bench or chair will be provided to allow the suited worker to sit during the redressing.
- Station 10: Outer Suit Removal. Using proper SCBA starting procedures, turn on tank air. Disconnect supplied airline at the pass-thu. Remove outer suit and place on table if reusable. The PDS attendant or buddy will assist in removal of the suit in an inside-out fashion, using caution to touch the outer part of the suit with the inner gloves as little as possible. If suit is unserviceable, put into plastic-lined disposal container.
- Station 11: SCBA Tank and Backpack Removal. Using proper SCBA shut-down procedures, turn off tank air and disconnect the facepiece from the supply hose. Remove tank and backpack and place on table. PDS attendant or buddy will assist.
- Station 12: Inner Glove Wash and Rinse. Wash inner gloves in hot soapy water and rinse in clean water.
- Station 13· Facepiece Removal and Wash/Rinse. Remove facepiece. Wash in hot soapy water and rinse with clean water; air dry.
- Station 14: Inner Glove Removal. Remove inner gloves and place into plastic-lined waste container, using caution not to touch the outside of the inner gloves with the hands.
- Station 15: Enter Shower Trailer. Proceed to trailer, remove clothing and enter shower. Shower entire body, including hair Exit shower and redress.

1.2.0 Level B Decontamination (Non-encapsulating Suit)

1.2.0 The following PDS procedure applies to the decontamination of Level B ensembles with non-encapsulating suits. The PDS for this type of Level B decontamination will be set-up utilizing the PDS map found in Figure H-2. When processing through stations two through six, each buddy will assist the other with the decontamination procedures to be conducted at each station. If required, additional personnel will be assigned to assist with these stations.

Figure H-2
PDS for Level B with Non-Encapsulating Suit

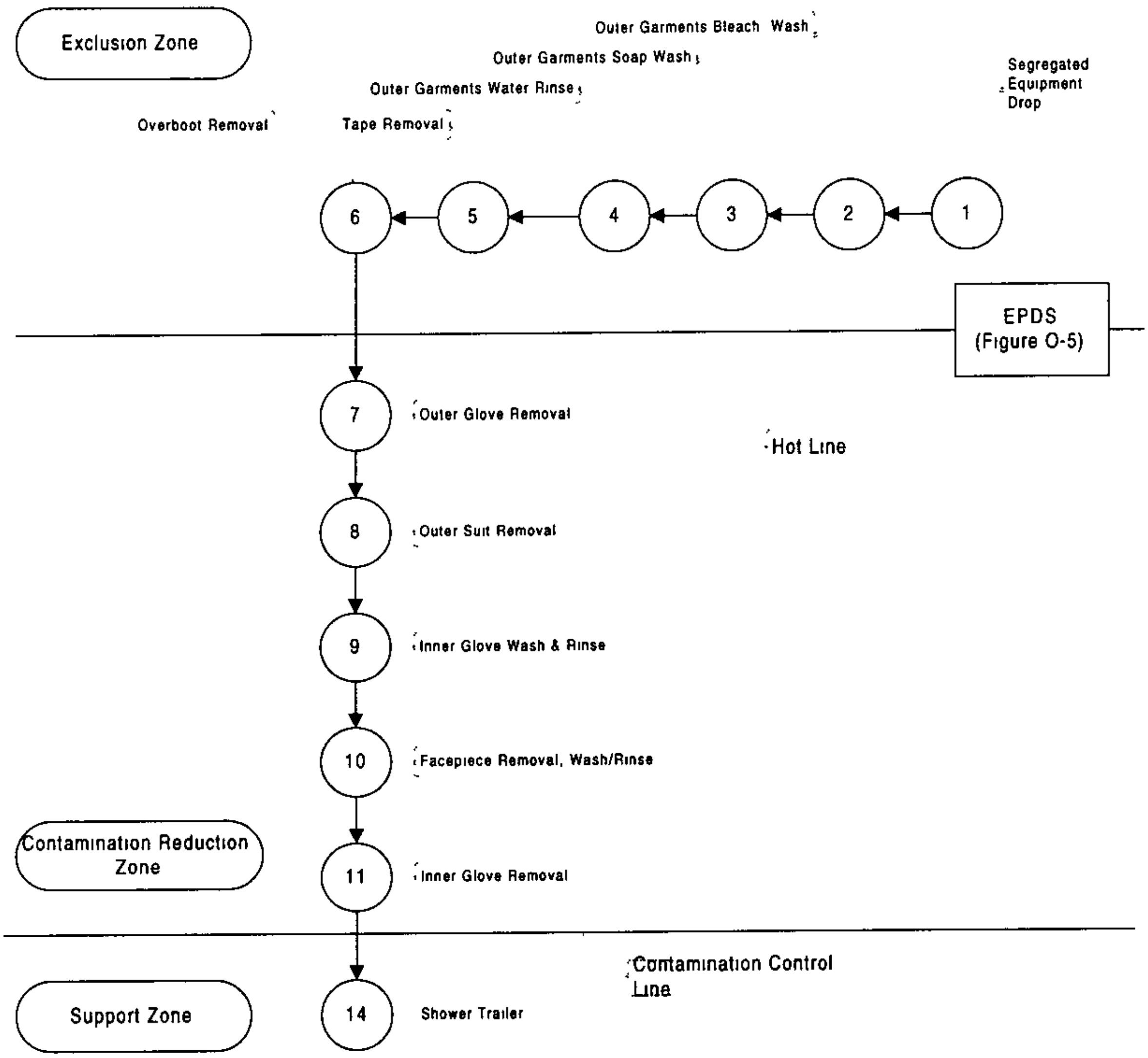


- Station 1: Equipment Drop Enter PDS at Station 1 and deposit all reusable equipment on the drop cloth.
- Station 2. Outer Garment Decontamination (Chemical Suit, Gloves, and Boots). This station involves washing all outer garments with a decontamination solution made of 5% bleach solution. Start at the head and brush or spray down to soles of boots. Scrub boots, including the bottoms, gloves and any other part of the suit necessary to remove all dirt, mud or other foreign debris.
- Station 3· Outer Garment Wash (Chemical Suit, Gloves, and Boots). Starting at the head and working down, scrub entire surface of outer garments with brush and hot soapy water.
- Station 4: Outer Garments Rinse. Starting at the head and working down, use clean water to brush off or spray all soap residue from the outer garment.
- Station 5: Tape Removal. Remove all tape that would restrict the removal of the outer garments and place it in a plastic-lined disposal container.
- Station 6. Boot Removal (Boot Rack). Remove boots and place on boot rack if serviceable; if not place in plastic-lined container. The PDS attendant may assist from cold side of Hot Line, and will help ensure that personnel do not place unbooted feet back across the Hot Line. A chair or bench and boot jack will be provided at this station to assist boot removal.
- Station 7: Outer Glove Removal. Remove outer gloves and place on table, if serviceable; if not, place in plastic-lined container. Personnel should exercise extreme caution, and make every effort not to touch the inner gloves with the outside of the outer gloves during their removal.
- Station 8: Tank Replacement and Redress. Shut down the SCBA using standard procedures, and disconnect the facepiece from the supply hose. The PDS attendant will disconnect the exhausted tank and replace it with a full one. Once this has been accomplished, the PDS attendant will assist in redressing the worker, to include, replacement of the boots and outer gloves, and the taping of the boots/gloves. A bench or chair will be provided to allow the suited worker to sit during the redressing.
- Station 9: SCBA Tank and Backpack Removal. Using proper SCBA shut-down procedures, turn off tank air and disconnect the facepiece from the supply hose. Remove tank and backpack and place on table. PDS attendant or buddy will assist.
- Station 10: Outer Suit Removal. Using proper SCBA starting procedures, turn on tank air. Disconnect supplied airline at the pass-thru. Remove outer suit and place on table if reusable. The PDS attendant or buddy will assist in removal of the suit in an inside-out fashion, using caution to touch the outer part of the suit with the inner gloves as little as possible. If suit is unserviceable, put into plastic-lined disposal container.
- Station 11: Inner Glove Wash and Rinse. Wash inner gloves in hot soapy water and rinse in clean water.
- Station 12: Facepiece Removal and Wash/Rinse. Remove facepiece. Wash in hot soapy water and rinse with clean water; air dry.
- Station 13: Inner Glove Removal. Remove inner gloves and place into plastic-lined waste container, using caution not to touch the outside of the inner gloves with the hands.
- Station 14: Enter Shower Trailer. Proceed to trailer, remove clothing and enter shower. Shower entire body, including hair. Exit shower and redress.

1.3.0 Level C Decontamination

1.3.0 The PDS for Level C decontamination will be set-up utilizing the PDS map found in Figure H-3. When processing through stations two through six, each buddy will assist the other with the decontamination procedures to be conducted at each station. If required, additional personnel will be assigned to assist with these stations

Figure H-3
PDS for Level C



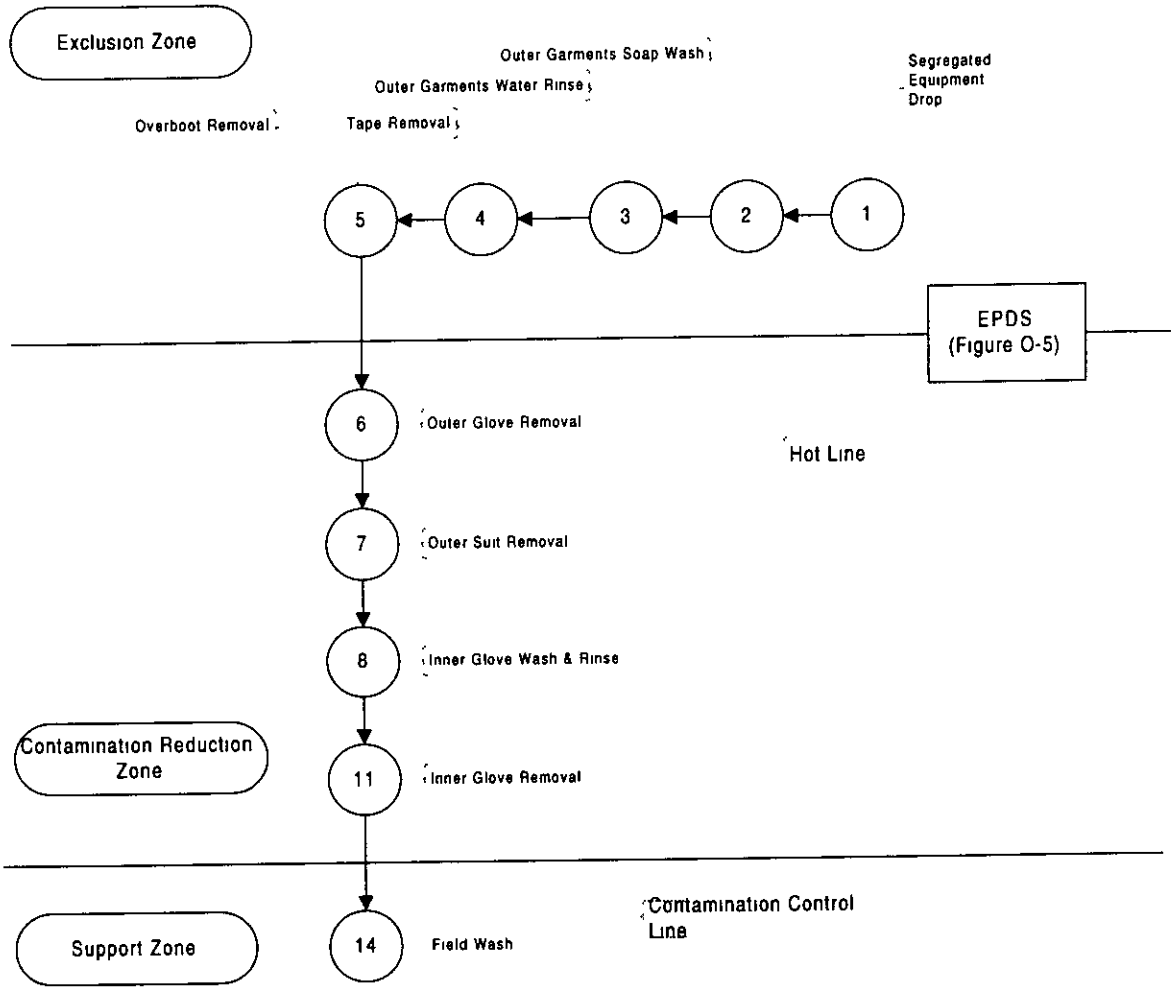
- Station 1: Equipment Drop. Enter Decontamination Line at Station 1 and deposit all reusable equipment on the drop cloth.
- Station 2: Outer Garment Decontamination (Chemical Suit, Gloves, and Boots). This station involves washing all outer garments with a decontamination solution made of 5% bleach solution. Start at head and brush or spray down to soles of boots. Scrub boots, including the bottoms, gloves and any other part of the suit necessary to remove all dirt, mud or other foreign debris.
- Station 3: Outer Garments Wash (Chemical Suit, Gloves, and Boots). Starting at the head and working down, scrub entire surface of outer garments with brush and hot soapy water.

- Station 4: Outer Garments Rinse. Starting at the head and working down, use clean water and brush off or spray all soap residue from the outer garment.
- Station 5. Tape Removal. Remove all tape that would restrict the removal of the outer garments and place it in a plastic-lined disposal container.
- Station 6. Boot Removal (Boot Rack). Remove boots and place on boot rack if serviceable; if not place in plastic-lined container. The PDS attendant may assists from cold side of Hot Line, and will help ensure that personnel do not place unbooted feet back across the Hot Line. A chair or bench will be provided and a boot jack placed at this station to assist in boot removal.
- Station 7: Outer Glove Removal. Remove outer gloves and place on table, if serviceable; if not, place in plastic-lined container. Personnel should exercise extreme caution and make every effort not to touch the inner gloves with the outside of the outer gloves during their removal.
- Station 8: Outer Suit Removal. Remove outer suit and place on table if reusable. The PDS attendant or buddy will assist in removal of the suit in an inside out fashion, using caution to touch the outer part of the suit with the inner gloves as little as possible. If suit is unserviceable, put into plastic-lined disposal container.
- Station 9: Inner Glove Wash and Rinse. Wash inner gloves in hot soapy water and rinse in clean water.
- Station 10: Respirator Removal and Wash/Rinse. Remove respirator facepiece. Wash in hot soapy water and rinse with clean water, air dry.
- Station 11: Inner Glove Removal. Remove inner gloves and place into plastic-lined waste container, using caution not to touch the outside of the inner gloves with the hands.
- Station 12: Conduct Field Wash. Using soap and water, or handi-wipes, wash hands, face and neck.
- Station 12a: Shower Trailer. Enter shower trailer, remove clothing and enter shower. Shower entire body, including hair. Exit shower and redress.

1.4.0 H.4 Modified Level D Decontamination

1.4 0 1 The PDS for Modified Level D decontamination will be set-up utilizing the PDS map found in Figure H-4. When processing through stations two through five, each buddy will assist the other with the decontamination procedures to be conducted at each station If required, additional personnel will be assigned to assist with these stations.

Figure H-4
PDS for Modified Level D



- Station 1: Equipment Drop. Enter PDS at Station 1 and deposit all reusable equipment on the drop cloth. This includes the unused five minute escape pack.
- Station 2: Outer Garments Wash (Chemical Suit, Gloves, and Boots). Starting at the head and working down, scrub entire surface of the outer garments, to include the bottoms of the boots, with brush and soapy water solution made of 5% bleach solution.
- Station 3: Outer Garments Rinse. Starting at the head and working down, use clean water and brush off or spray all soap residue from the outer garment.
- Station 4: Tape Removal. Remove all tape that would restrict the removal of the outer garments and place it in a plastic-lined disposal container.
- Station 5: Boot Removal (Boot Rack). Remove boots and place on boot rack, if serviceable; if not, place in plastic-lined container. The PDS attendant may assist from the cold side of Hot

Line, and will help ensure that personnel do not place unbooted feet back across the Hot Line A chair or bench and boot jack will be placed at this station to assist in boot removal

- Station 6: Outer Glove Removal. Remove outer gloves and place on table, if serviceable, if not, place in plastic-lined container. Personnel should exercise extreme caution, and make every effort not to touch the inner gloves with the outside of the outer gloves during their removal.
- Station 7: Outer Suit Removal. Remove outer suit and place on table if reusable. The PDS attendant or buddy will assist in removal of the suit in an inside-out fashion, using caution to touch the outer part of the suit with the inner gloves as little as possible. If suit is unserviceable, put into plastic-lined disposal container
- Station 8: Inner Glove Wash and Rinse. Wash inner gloves in hot soapy water and rinse in clean water.
- Station 9: Inner Glove Removal. Remove inner gloves and place into plastic-lined waste container, using caution not to touch the outside of the inner gloves with the hands.
- Station 10: Conduct Field Wash. Using soap and water, or handi-wipes, wash hands, face and neck.
- Station 10a: Shower Trailer. Enter shower trailer, remove clothing and enter shower. Shower entire body, including hair. Exit shower and redress.

1.5.0 PDS Attendant Duties

1.5.0.1 The PDS attendant plays an integral role in ensuring that the PDS is set-up and operated in a manner which prevents the contamination of site personnel and equipment and eliminates the migration of contamination to clean areas of the site. Depending upon site conditions, level of protection and number of personnel working in the EZ, more than one PDS attendant may be needed to ensure smooth conduct of the PDS. In support of the PDS, the PDS attendant will have the following duties:

- On a daily basis, after the safety brief, prepare, and direct assembly of, the PDS required for the day's operation.
- Assist EZ personnel as they process through the PDS; assist in tank changes for Levels A and B.
- Receive and put away all equipment passed from the hot side of the hot line after ensuring items have been cleaned and decontaminated thoroughly.
- After the final person has passed through the PDS, the attendant will retrieve and store away reusable equipment that has been previously decontaminated, including respirators, gloves, boots and suits.
- At the end of each day, the attendant will secure the PDS and dispose of all materials, as required, including, securing of disposal containers and transfer of used decontamination solutions to approved containers.
- Ensure that once the PDS is secured, each respirator is placed in a separate plastic bag. ERDEC will conduct an offgas check to ensure that the facepieces are not contaminated. If contaminated, the facepieces will be disposed of as IDW. In not contaminated, the facepieces will be cleaned with hot soapy water, rinsed in clean water, and allowed to air dry

1.5.0.2 The PDS attendant shall wear a level of PPE which will provide adequate protection from the hazards associated with assisting site personnel through the PDS. The PDS attendant will wear PPE that is one level below that of the site personnel

1.5.0.3 After assisting EZ personnel after the last work period, the PDS attendant, with the assistance of a buddy, will secure the PDS using procedures that allow the attendant to simultaneously decontaminate as the PDS is secured. To do this, the PDS attendant will initiate securing the PDS at the outer garment wash and work back conducting personal decontamination and PDS security at the same time. This will be accomplished using the following general procedures:

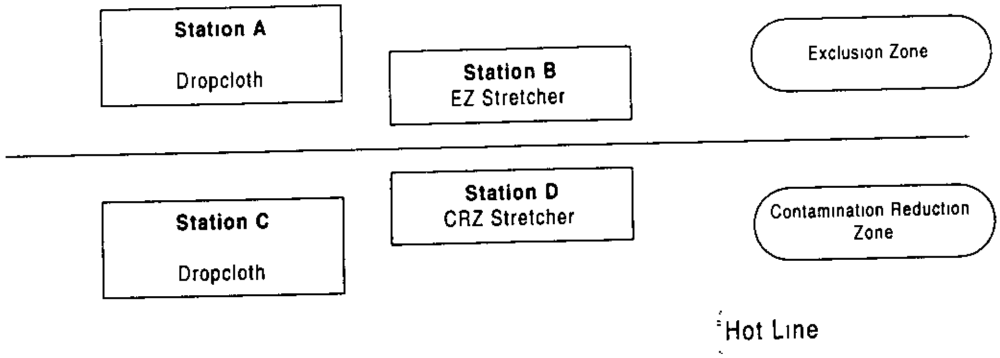
- First gather and remove from the PDS all reusable equipment and transfer to the SZ to be stowed.
- Wearing appropriate PPE (as specified in Section 8.0 of this SSHP), cross the hot line, if applicable, wash and rinse suit and then, moving from dirtiest to cleanest, transfer decontamination solutions to their respective storage containers.
- Proceed down the line, remove tape, if applicable, then secure tape disposal container.
- Move to boot removal, remove boots while stepping across the hot line; reaching back across the hot line, secure the boot disposal container.
- At outer glove removal, remove outer gloves and secure the outer glove disposal container.
- At outer garment removal, remove outer garment, if applicable, and secure the outer garment disposal container
- At inner glove wash/rinse station, wash inner gloves and transfer inner glove wash solution to appropriate disposal container, then rinse inner gloves and dispose of rinse solution, and secure wash/rinse containers.
- At facepiece station (Level C PDS and above) transfer both solutions to appropriate disposal containers and secure the containers, if wipes were used, secure disposal container.
- Move to inner glove removal station, remove gloves and secure container.

1.6.0 Emergency PDS (EPDS)

1.6.0.1 As stated earlier, an EPDS will be set-up within the PDS. If an emergency occurs inside the EZ resulting in personal injury or illness which prevents the affected individual from processing through the PDS, the victim will be processed out of the EZ through the EPDS. The function of the EPDS is to make available all the resources necessary to allow for the combined efforts of first aid and decontamination personnel. The EPDS will be set-up so as to allow for the rapid decontamination of an injured worker, rapid removal of PPE, and safe transport of the injured worker across the Hot Line. The EPDS will be set-up as outlined in Figure H-5 and will, as a minimum, include the following stations and supplies:

- Station A. Dropcloth for positioning one gallon of 5% bleach solution, five gallons of water, and blunt-nosed scissors.
- Station B. Porous stretcher for EZ side of the Hot Line.
- Station C Drop cloth for location of: first aid kit, eye wash kit, burn blanket, bloodborne pathogen universal controls kit, fire extinguisher.
- Station D. Stretcher for the PDS side of the Hot Line.

Figure H-5
Emergency Personal Decontamination Station



1.7.0 Alternate PDS

1.7.0.1 An alternate PDS is not required for this project since there is only one entrance/exit to the filtered containment structure.

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ADMINISTRATIVE RECORD

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