Revision 1
June 2001

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Health and Safety Plan
for
RFI Phase III Investigation
at
Mustard Gas Burial Ground
(SWMU 01/12)

Naval Surface Warfare Center
Crane Division
Crane, Indiana

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Orders 0131 and 0158

June 2001

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:

5090
Ser 095/1169
25 MAY 2001

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
ATTN: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NSWC Crane) submits two copies of the Final Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) for the RCRA Facility Phase III Investigation at Solid Waste Management Unit (SWMU) 01/12, the Mustard Gas Burial Grounds. These plans are provided as enclosure (1). The permit required Certification Statement is provided as enclosure (2).

NSWC Crane point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-6160.

Sincerely,

James M. Hunsicker

James M. Hunsicker
Director, Environmental
Protection Department
By direction of the Commander

Encl:
(1) Phase III QAPP and HASP for SWMU 01/12
(2) Certification Statement

Copy to:
ADMINISTRATIVE RECORD (w/1 copy)
SOUTHNAVFACENGCOM (Code 1864) (w/o encl)
IDEM (Doug Griffin) (w/1 copy)
TTNUS (Tom Johnston) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Environmental Protection Department Manager — 5/24/01

TITLE — DATE

Revision 1
June 2001

HEALTH AND SAFETY PLAN
FOR
RFI PHASE III INVESTIGATION
AT
MUSTARD GAS BURIAL GROUND (SWMU 01/12)

NAVAL SURFACE WARFARE CENTER (NSWC)
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS
Foster Plaza 7 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0131 AND 0158

June 2001

PREPARED UNDER THE SUPERVISION OF:

Thomas Johnston

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1.0 INTRODUCTION

Authorization: This Health and Safety Plan (HASP) and the work described within are completed under the authorization of:

Contract: Comprehensive Long-Term Environmental Action Navy (CLEAN III)

Contract Number: N62467-94-D-0888

Contract Task Order: 0131

Statement of Work 134: The development of planning documentation for the investigation of the Mustard Gas Burial Ground (MGBG). This HASP consists of one element of the planning documentation.

Proposed Dates of Work: To be determined

Application: This Health and Safety Plan (HASP) has been written to encompass site activities that are to be conducted at the Naval Surface Warfare Center Crane (NSWC Crane), located in Crane, Indiana. Specifically this HASP addresses RCRA Facility Investigation (RFI) Phase III activities to be conducted at the MGBG or Solid Waste Management Unit (SWMU 01/12).

Site activities to be conducted at NSWC Crane include the following (see Section 3.1 for a detailed description):

- Multi-media sampling:
  - Groundwater
  - Surface and subsurface soils
  - Sediment
  - Surface Water
  - Seeps
- Direct push subsurface soil borings and permanent well installation.
- Permanent monitoring well installation
- Developing/Redeveloping monitoring wells in preparation for sampling.
- Geophysical and geographical surveying.

Compliance: The elements of this HASP are intended to be in compliance with the requirements established by:

- OSHA 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER)

- Applicable sections of 29 CFR 1926 "Safety and Health Regulations For Construction."
- Tetra Tech NUS Health and Safety Program

Modifications/Changes: The following conditions are considered sufficient basis for change and will serve as triggers to institute review and possible changes to this document

- The addition of activities outside of those specified in Section 3.0, Scope of Work.
- Task Modifications to those activities specified within Section 3.0, Scope of Work.
- New information becomes available through the course of the investigation or from outside sources.

All changes to this HASP will be requested through the Task Order Manager (TOM) to the Tetra Tech NUS Health and Safety Manager (HSM). It is the responsibility of the TOM to notify all affected personnel of all changes to this HASP. Changes to the HASP will be documented using a Document Review Record.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for TtNUS and subcontractor employees engaged in onsite activities. Personnel assigned to these positions will exercise the primary responsibility for all onsite health and safety. These persons will be the primary points of contact for any questions regarding the safety and health procedures and the selected control measures that are to be implemented for onsite activities.

- The TtNUS TOM is responsible for the overall direction of health and safety for this project.

- The Project Health and Safety Officer (PHSO) is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:

  i. Providing information regarding site contaminants and physical hazards associated with the site.
  ii. Establishing air monitoring and decontamination procedures.
  iii. Assigning personal protective equipment based on task and potential hazards.
  iv. Determining emergency response procedures and emergency contacts.
  v. Stipulating training requirements and reviewing appropriate training and medical surveillance certificates.
  vi. Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste work.

vii. Modifying this HASP, as it becomes necessary.

- The TtNUS Field Operations Leader (FOL) is responsible for implementation of the HASP with the assistance of an appointed Site Safety Officer (SSO). The FOL manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.

- The SSO supports site activities by advising the FOL on all aspects of health and safety on-site. In this capacity the SSO:

  i. Coordinates all health and safety activities with the FOL.
  ii. Selects, applies, inspects, and maintains personal protective equipment.
  iii. Establishes work zones and control points in areas of operation.
  iv. Implements air monitoring program for onsite activities.
  v. Verifies training and medical clearance of onsite personnel status in relation to site activities.
  vi. Implements Hazard Communication, Respiratory Protection Programs, and other associated health and safety programs as they may apply to site activities.
  vii. Coordinates emergency services.
  viii. Provides site-specific training for all onsite personnel.
  ix. Investigates all accidents and injuries (see Attachment I - Illness/Injury Procedure and Report Form)
  x. Provides input to the PHSO regarding the need to modify, this HASP, or applicable health and safety associated documents as per site-specific requirements.

- Radiation Safety Officer (RSO) supports site activities by advising the FOL on aspects of health and safety as they pertain to radiation safety on-site.

- Compliance with the requirements stipulated in this HASP is monitored by the SSO and coordinated through the TtNUS CLEAN HSM.

Note: In some cases one person may be designated responsibilities for more than one position. For example, at NSWC Crane the SSO will also be responsible for the RSO duties. This action will be performed only as credentials, experience, and availability permits.

1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: NSWC Crane

Address: Code 095 B-3260
300 Highway 361
Crane, Indiana 47522-5009

Client Contact: Mr. Thomas Brent
Environmental Site Manager
NSWC Crane

Phone Number: (812) 854-6160
Fax Number: (812) 854-4177
E-mail:

Alternate Contact: Ms. Chris Freeman

Phone Number: (812) 854-4423
Fax Number: (812) 854-4177
E-mail:

Remediation Program Manager(RPM):

Mr. William Gates
U.S. Navy
SOUTHNAVFACENGCOM

Phone Number: (843) 820-7360
Fax Number: (843) 820-7465
E-mail: gateswh@efdsouth.navfac.navy.mil

Purpose of Site Visit: This activity is divided into a multi-task operation (see Section 4.0), including surveying, soil borings (hand auger and Direct Push Technology [DPT] methods, hollow-stem auger, rotosonic), multi-media sampling, and other related activities.

Proposed Dates of Work: March 2001

Project Team:

Tetra Tech NUS Personnel:	Discipline/Tasks Assigned:	Phone No.
Thomas Johnston, Ph.D.	Task Order Manager	(412) 921-8615
Mark Francis CIH, CSP, CHMM	Deputy Task Order Manager	(412) 921-8544
Matthew M. Soltis, CIH, CSP	CLEAN Health and Safety Manager	(412) 921-8912
Thomas M. Dickson, CSP	Project Health and Safety Officer	(412) 921-8457
Jeff Schubert	Project Geologist	(412) 921-8794
Keith Simpson	Field Operations Leader (FOL)	(412) 921-8131
TBD	SSO/RSO	
TBD	Field Technician	
TBD	UXO/EOD Specialist	(770) 413-0965
Tom Patton	Equipment Manager	(412) 262-4583

NOTE: Other Project Team members are identified in Table 2-1

Non-Tetra Tech NUS Personnel	Affiliation/Discipline/Tasks Assigned	
TBD	Analytical Laboratory (MG Surety Testing)	
Kent Surface	SWLO (Chemical Testing)	
Kent Surface	SWLO (Radiological Testing)	
TBD	Surveyor (Geographical)	
TBD	Surveyor (Geophysical)	
TBD	DPT Subcontractor	
TBD	Drilling Subcontractor	
FedEx	Sample/Parcel Delivery	1(800)463-3339

Partnering Team:

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
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Doug Griffin Corrective Action Section Office of Land Quality Hazardous Waste Permits IDEM	Corrective Action Section Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, IN 46206-6015	(317) 233-2710
Bill Gates Remedial Project Manager U.S. Navy SOUTHNAVFACENGCOM	Department of Navy SOUTHNAVFACENGCOM Code 1829 2155 Eagle Drive Charleston, SC 29406	(843) 820-7360 FAX: (843) 820-7465
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code 095 B-3260 300 Highway 361 Crane, Indiana 47522-5009	(812) 854-6160 FAX: (812) 854-4177

NSWC Crane
Tetra Tech NUS, Inc.

Project Support Staff

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Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS 661 Anderson Drive Pittsburgh, PA 15220	(412) 921-8510 FAX: (412) 921-4040
Brian Lewis Statistician Tetra Tech NUS	Tetra Tech NUS 661 Anderson Drive Pittsburgh, PA 15220	(412) 921-7105 FAX: (412) 921-4040

Hazard Assessments (for purposes of 29 CFR 1910.132) and HASP preparation conducted by:

Thomas M. Dickson, CSP

1.3 FACILITY HISTORY

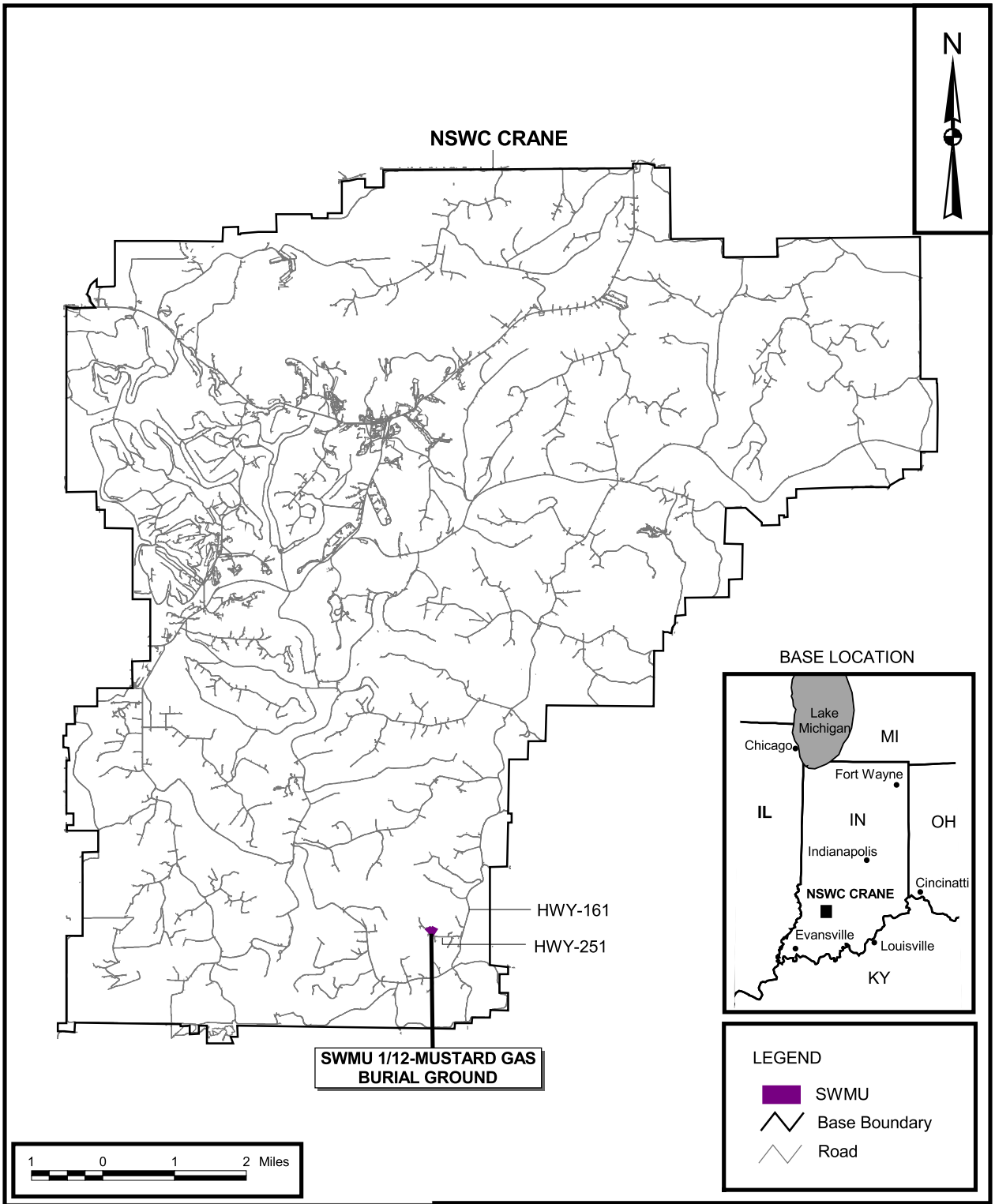
The NSWC Crane is located in Crane, Indiana, approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky. The facility encompasses approximately 98.2 square miles (62,832 acres). NSWC Crane provides material, technical, and logistical support to the Navy for equipment, weapons systems, and expendable and non-expendable ordnance items. The facility was opened in 1941 as the Naval Ammunition Depot (NAD), Burns City, to serve as an inland munitions production and storage center. In 1943, the name was changed to NAD Crane in honor of Commodore William Montgomery Crane, the first chief of the Navy's Bureau of Ordnance. The name changed again in 1975 to Naval Weapons Support Center to reflect the facility's growing involvement in high-technology weapons system.

In 1977, the Secretary of Defense combined all conventional ammunition acquisition under the responsibility of a single service. The ammunition production and storage function was assigned to the Army, and the Crane Army Ammunition Activity was established as a Crane tenant to accomplish this task for Naval ammunition. In 1992, based on changing missions and alignment, the name was changed to the Naval Surface Warfare Center Crane. The Army has assumed ordnance production, storage, and related responsibilities under the single-service management directive. All environmental activities on the installation, including permitting activities, remain the responsibility of the Navy. Although ordnance production and storage is still in existence, Crane now supplies highly technical product lines, such as microwave devices, acoustic sensors, small arms, and microelectronic technology. The Army activity is currently considered a tenant activity on the base.

1.4 SITE TO BE INVESTIGATED

The MGBG (SWMU 01/12) is located in the southeast corner of NSWC Crane adjacent to Road 251, which is accessible from Highway 161. The MGBG is located between storage bunkers 1409 and 1407 (see Figure 1-1). The site is located atop a broad ridge with gently rolling topography and approximately 5 to 10 feet of relief from the southeastern to northwestern boundary of the site. The MGBG was used between the end of WWII and 1956 for disposal of mustard munitions and other items. Several burial sites were marked or remarked in 1955 and 1956 with signs detailing the contents, or in some cases, the authority under which burial was performed. However, the signs gave little indication of the number of items actually buried. Historical documentation relative to the total amount and types of material disposed at the site is inconclusive. However, it is known that the site was used in the disposal of some chemical weapons, radioactive material, and waste chemicals.

Documentation has shown that efforts to exhume the weapons were conducted in 1974 and 1980. During these two separate excavation procedures, sixteen aerial bomb casings and a quantity of Thorium Nitrate were unearthed. Fourteen of the sixteen items (bomb cases) were empty except for mud. In addition, no trace of Mustard Gas was found in the soil surrounding the bomb cases. However, one bomb casing contained approximately ½ gallon and one bomb contained approximately 3 gallons of the mustard material. Various non-intrusive magnetometer studies have been conducted at the site to locate chemical and radioactive burial sites. In addition, three groundwater investigative projects were conducted in 1981, 1982, and 1983. The results show that the groundwater contaminants are comprised mainly of chlorinated solvents.



DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NUMBER	OWNER NO.
J. LAMEY	2/9/00		N0504	CTO 131
CHECKED BY	DATE	SITE LOCATION MUSTARD GAS BURIAL GROUND NAVAL SURFACE WARFARE CENTER CRANE, INDIANA	APPROVED BY	DATE
J. SCHUBERT	5/1/00		T. JOHNSTON	5/2/00
COST/SCHEDULE-AREA			APPROVED BY	DATE
			—	—
SCALE			DRAWING NO.	REV
AS NOTED			FIGURE 1-2	—

P:\GIS\NSWC_CRANE\SWMU01.APR SITE LOCATION 5/4/00 JAL

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an incidental or emergency release or occurrence. Tetra Tech NUS will, through necessary services, include incidental response measures for incidents such as:

- Initial stage fire fighting support and prevention
- Initial spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provide initial medical support for injuries or illnesses requiring only first-aid level support
- Provide site control and security measures as necessary

Incidental response measures will only be provided to the capabilities of on-site personnel and available resources. Incidental response measures are not considered an emergency response as per 29 CFR 1910.120 (b). Incidents and situations, that are deemed to be an emergency/emergency response as defined by 29 CFR 1910.120 (b) will be handled by outside resources. From this point on in this document "Outside Emergency Response Support" is referring to NSWC Crane Emergency Response support. This emergency action plan has been structured in accordance with 29 CFR 1910.120 (l)(ii) complying with 29 CFR 1910.38 (a)

2.2 EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, injuries or illnesses resulting from exposure to chemical or physical hazards or fire are the most probable emergencies that could be encountered during site activities.

To minimize and eliminate these potential emergency situations, emergency planning activities associated with this project include the following.

The SSO and/or the FOL are responsible for:

- Coordinating with NSWC Crane Emergency Services to ensure that Tetra Tech NUS emergency action activities are compatible with existing facility emergency response procedures.

- Establishing and maintaining information at the project staging area (support zone) or Field Office for easy access in the event of an emergency. This information will include the following:
  - Chemical Inventory (used on-site), with Material Safety Data Sheets.
  - On-site personnel medical records (medical data sheets).
  - A logbook identifying personnel on site each day.

- Identifying a chain of command for emergency action. Due to the nature of the work to be performed a Site Safety Officer (SSO) will be present during field operations. This person will serve as the emergency coordinator should an incident or emergency arise.

- Educating site workers to the hazards and control measures associated with planned activities at the site, and to provide early recognition and prevention where possible.

- Drilling and practicing incidental response measures periodically. The SSO will guide and direct all drills and will be responsible for logging, review and analysis of the drill by Tetra Tech NUS and subcontractor personnel. The Emergency Action Plan Drill Evaluation form is provided in Appendix A. This form will be completed by the SSO during on-site drills or incidental responses to document review and analyses of the drill and/or response measure.

- Ensuring that all necessary measures are completed in preparation for an incident by will completing the Emergency Action Plan Pre-Checklist Evaluation Form provided in Appendix A.

The use of two-way communication devices (cellular phones and radios) must be approved by the NSWC Crane Safety Office and such equipment will not be used until official permission is obtained.

2.3 EMERGENCY RECOGNITION AND PREVENTION

The primary focus of this section is the ability to recognize and control factors, which could contribute to an emergency situation/condition. The FOL, and/or the SSO will preview all site work location prior to committing personnel or resources. Their actions will be as follows:

- Identify, remove, and/or barricade and physical hazards within the estimated work area.

- Identify prevalent emergency conditions and their control measures and ensure they are stated on the Safe Work Permits.

- Provide the necessary equipment to control potential emergencies (i.e., safety cans for flammable liquid storage, spill containment equipment, PPE, and emergency equipment such as fire extinguishers).

- Evaluate operations to ensure that necessary measures are taken to control and/or minimize the impact of emergency situations/conditions.

- Field Crew shall:

  - Identify, remove, or barricade physical hazards within the estimated work area.
  - Follow the guidelines for control of emergency conditions
  - Report any potential emergency situation to the FOL and/or the SSO.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

Upon activation of the on-site emergency alarm system the following actions will occur:

- All operations will cease. There are no critical operations, that would require personnel to remain during an emergency.
- Field personnel will note the direction of the wind based on the position of wind socks placed on two elevated locations on the site (Magazines 1409 and 1407). Should the need arise, based on proximity, a third wind sock will be mounted on the top of the drill rig mast.
- Based on the wind direction, personnel will move cross and up wind to either the primary or secondary safe place of refuge as identified in Figure 2-1.
- All personnel will remain at this location until directed otherwise by the FOL and/or the SSO.

The FOL shall identify on the Safe Work Permit:

- A Place of Refuge (in the event of an emergency) – This location will be selected and conveyed to the Field Crews as part of issuing the Safe Work Permit. Currently, there are two locations selected as safe places of refuge (see Figure 2-1):

2.4.1 Primary Location

South of Magazine 1409 on Highway 251. This position has been selected because:

- Typical wind row patterns move southwest to northeast
- This area also represents the primary decontamination location. Should decontamination be required as part of the emergency.
- This location is the best vantage point for directing outside response crews into the area in the event of an emergency.

2.4.2 Alternate Location

The secondary location is at the southeast corner of the MGBG former fence line. This location will be used only, if wind direction makes the use of the primary location unfeasible.

The FOL or the SSO will account for all site personnel by using the site logbook to take the head count. Emergency response personnel will be immediately notified of any unaccounted personnel.

2.5 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT

During an evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. However, it is unlikely that an evacuation would occur at this site which would require workers to evacuate the site without first performing decontamination procedures. Decontamination for all personnel will proceed in accordance with Appendix J of this HASP. Decontamination of medical emergencies will proceed in the following manner.

2.5.1 Non-life threatening medical incident (bruises, cuts, scrapes, etc.)

The area of a suit penetration will be isolated from the decontamination procedure by removing the protective garments surrounding the area of the injury and applying a light gauze wrap and plastic cover. Decontamination for unaffected areas will proceed as per section Appendix J of this HASP.

2.5.2 Life threatening

- Engage emergency response protocol, notify outside support services.
- Remove outer PPE. Respiratory protection can be removed outside of the exclusion zone. Outer protective garments should be removed by assisting personnel. Removal may require the use of bandage scissors to remove the outer garments.
- Begin life saving techniques as appropriate (CPR, cooling or warming regimens, etc.).
- Wrap the injured in a blanket for transport to the hospital.

Note: One person from the field team will accompany the injured to the hospital with medical data sheets, MSDSs, a copy of this HASP, and the incident forms. This person will collect as much information as possible and transfer that information to the HSM and Work Care as per the Emergency Response Protocol provided in Figure 2-4. All other personnel will engage site control/site security measures.

2.5.3 Emergency Medical Treatment

Tetra Tech NUS and subcontractor personnel are only permitted to provide treatment to the level of First-Aid Training.

To support medical treatment until outside services arrive, two members of the field crew will be current Cardio Pulmonary Resuscitation (CPR) / First-Aid trained. The necessity to have first-aid trained personnel on-site is based on the remote location of the site and the impact this has on the response time of outside emergency services. The estimated response time to the site is a minimum of 15 minutes.

Emergency medical treatment will be initiated under the following guarded restrictions:

- Notify the FOL and/or the SSO of the incident.

- Take the necessary precautions to prevent direct contamination with the injured person's body fluids.

  - Use surgeons gloves when handling cuts, abrasions, bites, punctures, etc. or any part of the injured person. The use of safety glasses and surgeons masks maybe necessary if there is the potential for uncontrolled spread of body fluids.

  - Should Cardio-Pulmonary Resuscitation (CPR) be required, use a CPR Micro-Shield mouthpiece when administering CPR.

First-Aid Treatment/CPR – First aid training instruction is provided in Appendix B of this document as reference material should it be required.

2.6 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

There are several aspects associated with emergency alerting procedures that must be taken into account at NSWC Crane. These are as follows:

- Due to the physical setting (size and remoteness) of the sites where field activities will be conducted, readily available means of communication are not always available.

- In addition, again based on the size of the facility and location, there are limited cellular communication points on Base where a signal may be obtained. This also limits communication capabilities.

- Lastly, due to the schedule that Tetra Tech NUS, Inc. will work (10 days on; 4 days off) the potential exists for field personnel to be present during holidays, off days, and after hours. Primary safe places of refuge that would normally be accessed in the event of an emergency during normal working hours will be closed during these periods.

In order to overcome these restrictions, the Base Environmental Office will allocate a Public Works/Fire/Security Radio to be used in support of this field effort. This radio will be available 24/7 which will establish a direct link to security and emergency services.

If an emergency occurs at NSWC CRANE within the Tetra Tech NUS operations, the following procedures are to be initiated:

- Initiate an emergency notification by hand signals, voice commands, air horn, or two-way radios to the FOL/SSO. Describe to the FOL (who will serve as the Incident Coordinator) what has occurred and as many details as possible.

- Have your partner evacuate non-essential persons from the incident scene, engage initial response measures given the emergency type (i.e., spill response, fire extinguisher, first-aid) .

In the event that site personnel cannot control the incident through offensive and defensive measures, the FOL and/or SSO will enact the emergency notification procedures to secure additional outside assistance in the following manner:

Primary Means of Notification

- Emergency Notification Radio - This radio will be available 24/7 which will establish a direct link to security and emergency services.

Secondary Means of Notification

- On base call 1333 or 3300 (Table 2-1) and report the emergency. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of what occurred. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies. The Fire Dept. coordinates ambulatory service. They will provide emergency medical, ambulatory, hazardous materials response, and rescue.

  Note: On-base extensions 1333 and 3300 are the primary emergency phone numbers. From an NSWC Crane phone base extensions must be proceeded with "854". Off base numbers from a base phone can only be reached by dialing "990" or " 991" first. Furthermore, all emergencies should be subsequently reported to the Environmental office (x6160).

- Evacuate all TtNUS and subcontractor personnel to the identified safe place of refuge. Conduct a head count of site personnel using the site logbook.

2.7 PPE AND EMERGENCY EQUIPMENT

A first aid kit, eye wash units, stretcher, and fire extinguishers will be maintained on-site at the central decontamination unit and shall be immediately available for use in the event of an emergency. Based on the hazards anticipated, these incident response abatement items may be maintained at the exclusion zone of on-going operations as determine and communicated to the field crew through the Safe Work Permit. This will be and is at the discretion of the SSO.

The FOL and/or the SSO shall ensure the First-Aid Kits are stocked with the necessary equipment including:

Micro-Shield CPR Mouthpiece	Disposable Surgeons Masks	Ammonia Inhalant
Gauze Bandage (4 inch x 6 yards)	Triangular Bandage (40 inch)	Cold Pack
Gauze Pads (3 inch x 3inch)	Adhesive Bandage	Adhesive Tape
Wound Towelettes	PVP Iodine Wipes	Antibiotic Cream
Burn Cream	Compression Bandage (4 inch)	Alcohol Prep Pads
(3) Red Bags	Hard sided disposal container	Bandage Scissors
Surgeons Gloves		

In addition to the above First-Aid Kit components

(1) Fire Extinguisher
(2) Eye Wash

PPE levels to be employed in an incident response measure will not exceed those items used in the completion of identified tasks. These are as follows:

2.7.1 Incidental Spill of Investigative Derived Wastes (IDW)

- PVC Hooded Rain-suits (Hoods gathered and tied)
- PVC or Neoprene Over-boots (Pant legs on the outside of the over-boots)
- Advantage 1000 Respiratory protection with CRBC cartridges
- Nitrile inner surgeons gloves with Butyl outer gloves over top
- Hard hat as conditions or overhead hazards exist

The determination to tape seams (pant legs and sleeves to boots and gloves will be decided based on existing environmental conditions (external temperatures) and the potential for heat or cold stress. Although mustard gas is both an inhalation and contact hazard, it is not anticipated that this substance will volatize and present a hazard through the untaped seams.

Spill equipment (identified in section 11.0) will be maintained in the investigative derived waste storage area to support rapid response.

2.7.2 Fire Fighting

Standard field attire will be used to combat incipient fires, from a sufficient distance as not to endanger field personnel. All personnel will be trained to use the fire extinguishers on-site as part of site-specific training. Fire extinguishers will be maintained at the following locations:

- Support trailer
- On each drill rig
- At all locations which store, dispense or otherwise handle flammable or combustible liquids.

2.8 EMERGENCY CONTACTS

Prior to performing work, all personnel will be thoroughly briefed on the emergency procedures. A mobile phone may be available on site. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted on site where it is readily available to all site personnel. Telephone numbers for the Base Safety Office, the Base Emergency Preparedness Coordinator, and the Base Environmental Office are listed in Table 2-1.

All persons approved for participation in this field effort will be issued a card with medical data information and the emergency contact numbers on the reverse.

In addition, TtNUS personnel who are injured or become ill on the job must notify appropriate company representatives. Figure 2-4 presents the procedure for reporting an injury/illness, and the form to use for this purpose. **If the emergency involves personnel exposures to chemicals, follow the steps in Figure 2-4.**

TABLE 2-1
EMERGENCY REFERENCE
NSWC Crane, Crane, Indiana

AGENCY	TELEPHONE
Base Emergency Number (Fire Department, Security, Ambulance)	(812) 854-3300 or (812) 854-1333
Base Environmental Office	(812) 854-6160
Base Occupational Health & Safety Department – Mr. Steve Schick	(812) 854-3491
Command Duty Officer	(812) 854-1225
Bedford Ambulance	(812) 279-6545
Bloomington Hospital (Bloomington, IN) Bedford Medical Center (Bedford, IN)	(812) 336-9515 (812) 275-1200
Poison Control Center	1-800-382-9097
National Response Center	1-800-424-8802
NSWC Medical Facility	(812) 854-1220
Base Contact, Thomas Brent	(812) 854-6160
Explosive Ordnance Division, Lt. Shaunna Corcoran	(812) 854-3456
NSWC Crane Radiation Safety Officer, Eric McQueen	(812) 854-3578
Contract Task Order Manager, Thomas Johnston, Ph.D.	(412) 921-8615
Utilities – Indiana Underground Plant Protection Services (One Call)	1 (800) 382-5544
Utilities – Public Works Department	(812) 854-1834
Project Geologist, Jeff Schubert	(412) 921-8794
Field Operations Leader, Keith Simpson	(412) 921-8131
Tetra Tech NUS Office, Pittsburgh	1-800-245-2730 (412) 921-7090
Project Health and Safety Officer, Delwyn E. Kubeldis, CIH, CSP	(412) 921-8529
CLEAN Health and Safety Manager, Matthew M. Soltis, CIH, CSP	(412) 921-8912
Ecorisk Assessment, Aaron Bernhardt	(412) 921-8433
HH Risk Assessment, Karen Smecker/Lee Ann Sinagoga	(412) 921-8893(8887)
HH Risk Assessment (radiological), Phil Young/Phil Fulmer	(803) 649-7963
Radiochemistry, Terri Solomon	(412) 921-8961
Feasibility Study Engineering, Andy Kendrick	(412) 921-8623
UXO/EOD Handling/Exhumation, Phil Blackwell/Larry Hudgins	(770) 413-0965

2.9 EMERGENCY ROUTE TO HOSPITAL

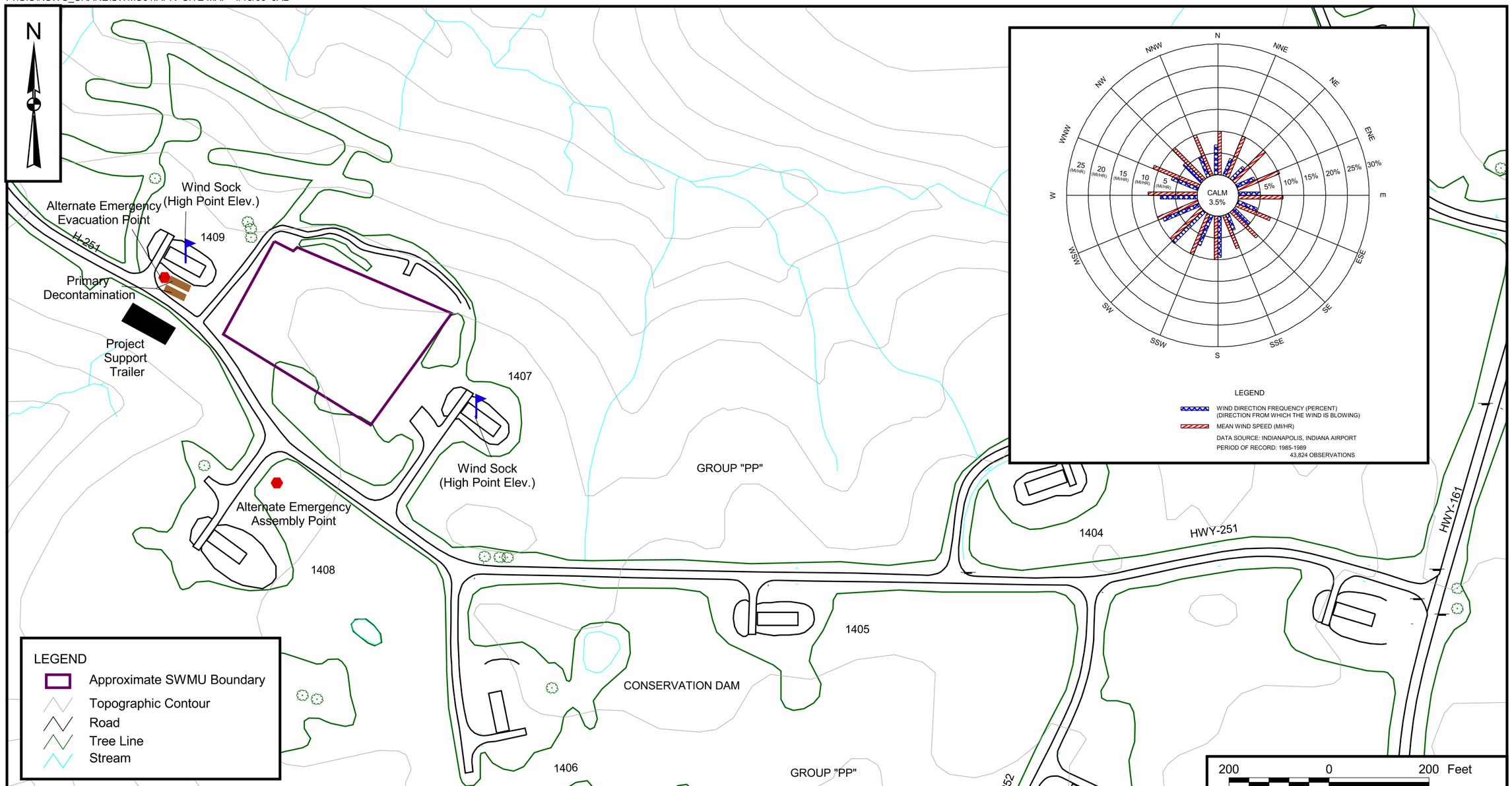
Directions to the Bloomington Hospital:*

Exit NSWC Crane on H-45 through the Bloomington gate. Follow Highway 45 North to Bloomington at Highway 45 and Highway 37. Continue going straight over the overpass (Bloomfield Road). Follow Bloomfield Road North; this road turns into 2nd Street. Follow 2nd Street, hospital will be on the right (601 West 2nd Street).

Directions to Bedford Medical Center:*
Exit the base on H-58, through the Bedford Gate. Head West on State Highway 158. State Highway 158 becomes 16th Street upon entering the City of Bedford. The medical center is on the right shortly after Plaza Drive.

***NOTE:** The Bedford Gate is open only from 0600 - 0830 and 1500 - 1800 hours Monday through Friday, whereas the Bloomington Gate is open 24 hours. See Figure 2-2 and 2-3 for the routes to these hospitals.

P:\GIS\NSWC_CRANE\SWMU01.APR SITE MAP 4/18/00 JAL



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY J. LAMEY DATE 3/23/00
CHECKED BY ____ DATE ____
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

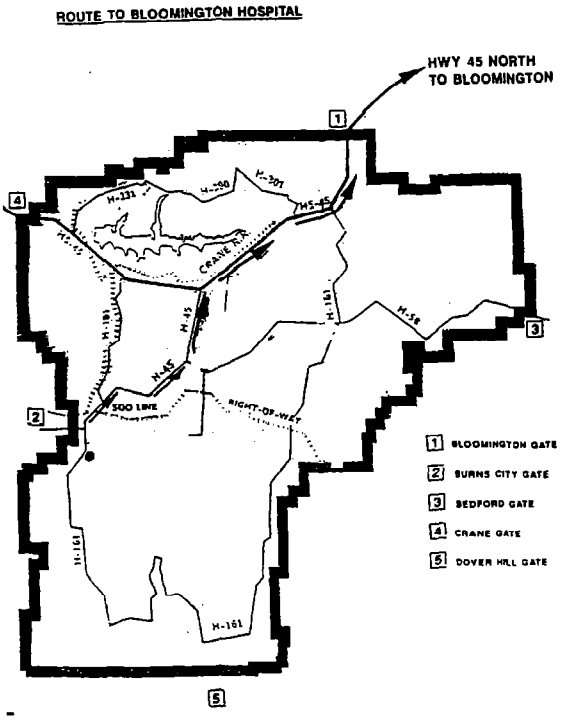
SITE MAP
MUSTARD GAS BURIAL GROUNDS
NSWC CRANE, CRANE, INDIANA

CONTRACT NUMBER N0504
OWNER NUMBER CTO 131
APPROVED BY ____ DATE ____
APPROVED BY ____ DATE ____
DRAWING NO. FIGURE 2-1
REV 0

Figure 2-2

Hospital Route Map (Bloomington Gate)

**Note: The Bloomington Gate is open 24 hours.



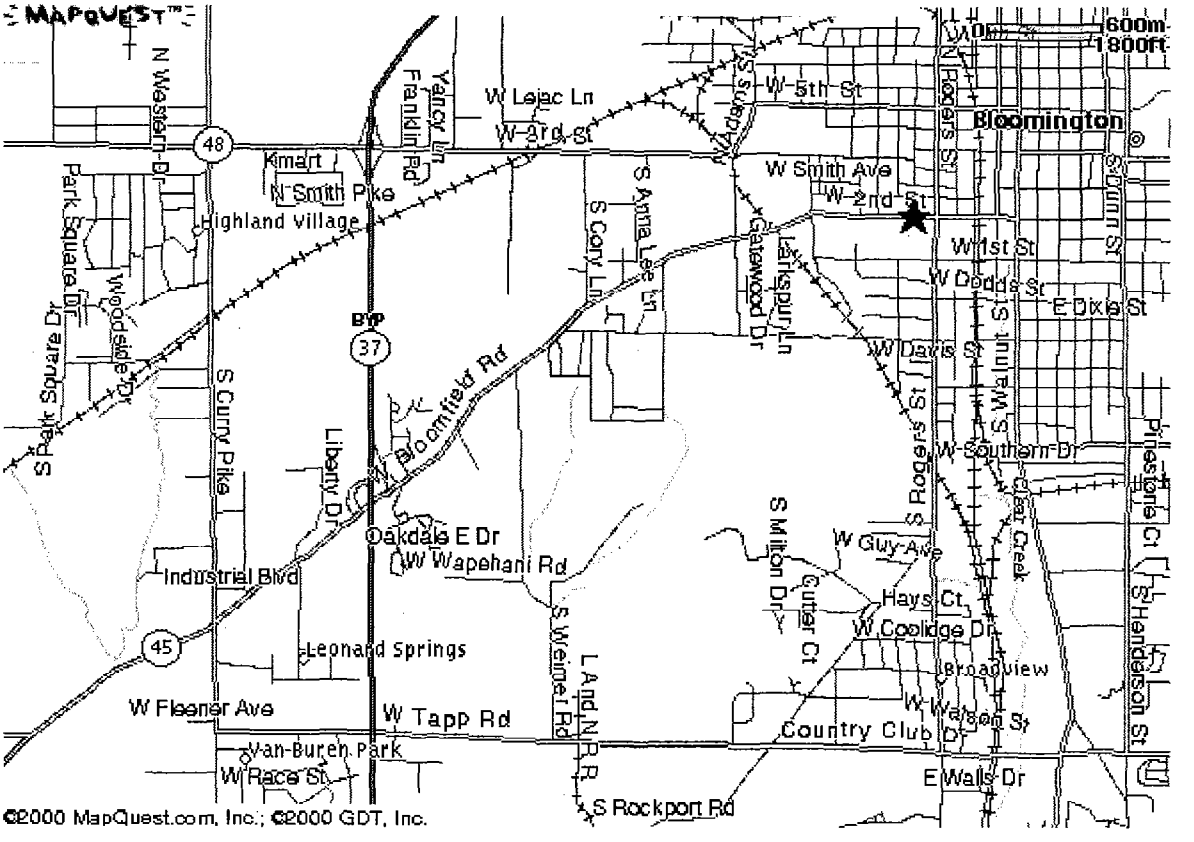
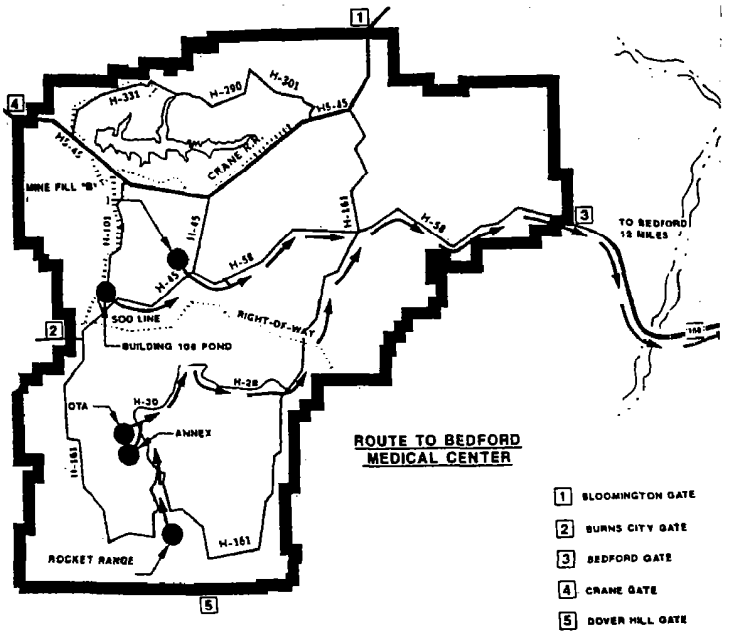


Figure 2-3

Hospital Route Map (Bedford Gate)

*Note: The Bedford Gate is open only from 0600 - 0830 and 1500 - 1800 hours; Monday through Friday.



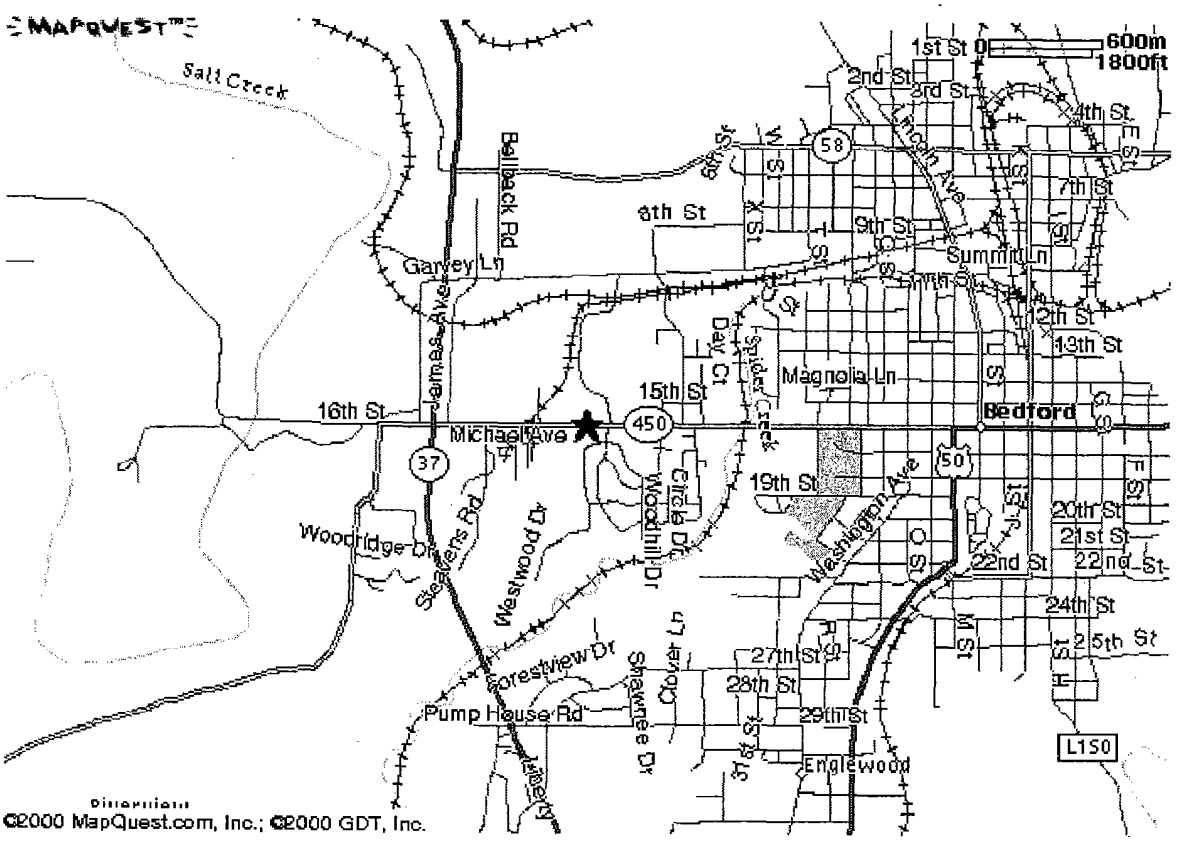


FIGURE 2-4
EMERGENCY RESPONSE PROTOCOL

The purpose of this protocol is to provide guidance for the medical management of injury situations.

In the event of a personnel injury or accident:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, and shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the injured person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the WorkCare physician. WorkCare will contact the medical facility and request specific testing which may be appropriate. WorkCare physicians will monitor the care of the victim. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
- Call WorkCare at 1-800-455-6155 and enter Extension 109, or follow the voice prompt for after hours and weekend notification and be prepared to provide:
  - Any known information about the nature of the injury.
  - As much of the exposure history as was feasible to determine in the time allowed.
  - Name and phone number of the medical facility to which the victim(s) has/have been taken.
  - Name(s) of the involved Tetra Tech NUS, Inc. employee(s).
  - Name and phone number of an informed site officer who will be responsible for further investigations.
  - Fax appropriate information to WorkCare at (714) 456-2154.
- Contact Corporate Health and Safety Department (Matt Soltis) at 1-800-245-2730, 8:00a.m. to 5:00p.m., Monday through Friday.
- As data is gathered and the scenario becomes more clearly defined, this information should be forwarded to WorkCare.

WorkCare will compile the results of all data and provide a summary report of the incident. A copy of this report will be placed in each victim's medical file in addition to being distributed to appropriately designated company officials.

Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. A personalized letter describing the individual findings/results will accompany this generalized summary. A copy of the personal letter will be filed in the continuing medical file maintained by WorkCare.

FIGURE 2-4 (continued)
WORKCARE
POTENTIAL EXPOSURE REPORT

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

Client Contact: _____ Phone No.: _____

Company Name: _____

I. Exposing Agent

Name of Product or Chemicals (if known): _____

_____

Characteristics (if the name is not known)

Solid Liquid Gas Fume Mist Vapor

II. Dose Determinants

What was individual doing? _____

How long did individual work in area before signs/symptoms developed? _____

Was protective gear being used? If yes, what was the PPE? _____

Was their skin contact? _____

Was the exposing agent inhaled? _____

Were other persons exposed? If yes, did they experience symptoms? _____

III. Signs and Symptoms (check off appropriate symptoms)

Immediately With Exposure:

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Nausea / Vomiting
Dizziness
Weakness

Delayed Symptoms:

Weakness
Nausea / Vomiting
Shortness of Breath
Cough
Loss of Appetite
Abdominal Pain
Headache
Numbness / Tingling

IV. Present Status of Symptoms (check off appropriate symptoms)

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Cyanosis
Nausea / Vomiting
Dizziness
Weakness
Loss of Appetite
Abdominal Pain
Numbness / Tingling

Have symptoms: (please check off appropriate response and give duration of symptoms)

Improved: _____ Worsened: _____ Remained Unchanged: _____

V. Treatment of Symptoms (check off appropriate response)

None: _____ Self-Medicated: _____ Physician Treated: _____

3.0 SCOPE OF WORK

The following subsections discuss the specific tasks that are to be conducted as part of this scope of work as identified by CTO 0131 and Statement of Work 134. These tasks as identified by the scope of work are the only ones addressed by this HASP. Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. The TOM or a designated representative will submit all requested modifications to this document to the HSM.

The following activities will completed in the execution of this scope of work. These are as follows:

- Mobilization and Demobilization

- Permanent monitoring well installation – Based on soil and groundwater sampling results and gaps in coverage permanent monitoring wells will be installed to monitor groundwater contamination.

- Direct push subsurface soil borings. At least 21 borings will be installed to delineate subsurface contamination horizontally and vertically in areas not currently represented by existing analytical information.

- Developing/Redeveloping monitoring wells in preparation for sampling.

- Multi-media sampling:

  - Groundwater – Existing and permanent monitoring wells will be sampled to determine level of contamination, which exists over the area represented as the MGBG. Groundwater sampling may be conducted to include sampling for and the measurement of Natural Attenuation parameters.

  - Surface and subsurface soils – Within the MGBG boundaries subsurface soil samples will be taken during permanent well installation and in areas where suspected contamination may exist (based on historical information).

  - Sediment – Sediment samples will be collected from drainage swales exiting the MGBG.

  - Surface Water – Surface water will be collected from run-off and collection locations.

- Seeps – As the MGBG is located on top of a rise in the elevation, the surrounding boundaries will be examined for signs of seeps (break-out points from the water table). When detected, a 1 foot by 1 foot hole may be hand excavated to allow for collection of the seep discharge.

- Decontamination of Equipment (Sampling and Heavy Equipment)

- Geophysical and geographical surveying.

These tasks are discussed in detail below.

3.1 MONITORING WELL INSTALLATION

Five new monitoring wells are to be installed to close gaps in radial dispersion pathways of the groundwater. Monitoring wells are to be installed at varying depths representing clusters to determine the contamination levels at varying depths within the aquifer.

The installation of monitoring wells for this field effort may comprise multiple methods based on the function of the well and the established data quality objectives. Two primary methods to be employed at NSWC Crane are Hollow Stem Auger and Direct Push. These methods are summarized below.

3.1.1 Continuous-Flight Hollow-Stem Auger Drilling

This method of drilling consists of rotating augers with a hollow stem into the ground. Cuttings are brought to the surface by the rotating action of the auger. Advantages of this type of drilling include:

- Samples can be obtained while augers remain in the ground. Sampling requires the use of split-barrel or thin-wall tube samplers advanced through the hollow core of the auger.

- No drilling fluids are required.

- A well can be installed inside the auger stem and back-filled as the augers are withdrawn.

3.1.2 Direct-Push Technology

This method uses hydraulic pressure and percussion hammer to advance tooling into the ground. For soil sampling a Macro-core sampler is advanced in 2-foot intervals for soil sample extraction. This activity

establishes a pilot hole, and in some cases, remains open above the water table. For permanent well installation pre-constructed wells are inserted into the pilot hole created during soil sampling activity. In other applications, a well screen is used in the first interval of tooling. The tooling is advanced to the desired depth and the screen is deployed by knocking out a disposable drive tip. The well is extracted 2 to 3 feet exposing the screen for discreet sample collection.

3.2 MONITORING WELL DEVELOPMENT/REDEVELOPMENT

The steps to develop or redevelop the new and existing monitoring wells are as follows:

- The depth to water and total depth of the well is measured using an M-scope or other electronic water level indicator.

- A surge block or submersible pump is lowered into the screened section of the well. The surge block or submersible pump is rapidly lowered and raised in the well causing groundwater to flow in and out of the well screen thus flushing fine sediment and debris out of the sandpack.

- A submersible pump or airlift hose is lowered into the well. The monitoring wells are pumped using a submersible pump, or by airlift. The pumping will continue until well stabilization parameters (pH, temperature, specific conductance, etc.) have stabilized or the amount of water extracted from the well has reached a predetermined volume.

3.3 MONITORING WELL SAMPLING

The monitoring wells will be sampled using low-flow purging and sampling techniques. Peristaltic pumps will be used to purge and to collect the samples. Field measurements of pH, temperature, specific conductance, and turbidity will be made during purging. These measurements will be taken at the start of purging and every 3 to 5 minutes until the parameters have stabilized. The wells will be purged until a sufficient predetermined amount of water has been removed and the water quality measurements are acceptable. All tubing used for sampling will be dedicated and disposed of after the sample has been collected.

In addition to the contaminant analysis for groundwater samples, aliquots may be removed for Natural Attenuation sampling purposes.

3.3.1 Natural Attenuation Sampling

Natural Attenuation Sampling uses a variety of testing mechanisms and reagents to measure the efficiency of degradation of contaminants within the hydrologic systems. This is accomplished through biodegradation, dispersion, dilution, sorption, volatilization and abiotic degradation mechanisms. This process utilizes chemical reagents to determine the geochemical properties of the sample substrate.

3.3.1.1 Dissolved Oxygen

Geochemical measurements of Dissolved Oxygen (DO) are made in the field using a high-resolution, low-range, test kit (HACH® Model OX-DT). The test kit for DO utilizes a digital titratrator and the azide modification of the Winkler methodology (Method 8215). The test involves chemical extraction using manganous sulfate, alkaline iodide-azide, and sulfamic acid. Titration is then performed using 0.02N sodium thiosulfate and a starch indicator solution.

3.3.1.2 Ferrous Iron

Geochemical measurements of dissolved ferrous iron (Fe^{2+}) are made in the field using a low-range, test kit (HACH® Model IR-18C). The test for Fe^{2+} involves colorimetric indication using a 1,10-phenanthroline indicator solution and ferrous iron reagent..

3.3.1.3 Hydrogen Sulfide

Geochemical measurements for dissolved hydrogen sulfide (H_2S) are made in the field using a low-range, test kit (HACH® Model HS-C). The test kit for H_2S utilizes a color chart and the effervescence of H_2S in the presence of sodium/potassium bicarbonate. The test involves colorimetric indication using copper sulfate test paper.

3.3.1.4 Carbon Dioxide

Geochemical measurements for dissolved carbon dioxide (CO_2) are made in the field using a low-range, test kit (HACH® Model CA-23). The test kit for CO_2 utilizes the drop-count titration method and involves colorimetric indication using sodium hydroxide and a phenolphthalein indicator solution.

3.3.1.5 Oxidation-Reduction Potential

The groundwater's oxidation-reduction potential (ORP), frequently referenced as REDOX or Eh, is analyzed by using a portable, water-quality probe (Hanna® Model CE). The probe is used in conjunction with a flow-through sample chamber to reduce sample aeration and contact with the atmosphere.

3.3.2 Water Level Measurements

Water level measurements will be taken at the existing and newly installed monitoring wells during this field investigation. The water levels will be taken with an electric water level indicator using the top of the well casing as the reference point for determining water depths.

3.4 MULTI-MEDIA SAMPLING

3.4.1 Surface and Subsurface Soil Samples

Surface and Subsurface soil samples will be collected utilizing a variety of techniques.

3.4.1.1 Hand Augers

The hand auger borings will be advanced to the desired depth utilizing stainless steel hand auger stems with an over size bucket. Once at the desired depth, the oversize bucket will be exchanged for a smaller diameter bucket to grab the sample. The sample is extracted from the bucket and is placed in a stainless steel bowl, scanned with a direct reading instrument, then transferred into the appropriate glass container using a stainless steel trowel.

3.4.1.2 Drill Rigs (Air, mud rotary, hollow-stem auger, and rotosonic); Direct Push Technologies

Surface and Subsurface soil sample acquisition from mechanized equipment will use split spoon, shelby tube, macro-core sampler by inserting them into either the borehole or annulus to extract a sample from a desired depth. The sample is removed from the device, scanned with the direct reading instrumentation, then transferred into the appropriate sample container.

3.4.2 Surface Water, Seeps, and Sediments

The collection of these environmental media will proceed as follows:

- Selection of location

- Direct-Reading monitoring instrument sweep.
- Transfer the selected environmental media into the containers to be sent to the analytical laboratory using direct pour, peristaltic pumps, or for sediments using stainless steel or disposable trowels

3.5 GEOGRAPHICAL/GEOPHYSICAL SURVEYING

This activity is generally non-intrusive in nature, however limited brush removal may be required using chain saws, machetes, and brush hooks. The brush removal will facilitate lines of sight and passage routes for the equipment during the survey.

3.6 DECONTAMINATION

The equipment involved in the field activities for this investigation will be decontaminated prior to, during and after the sampling activities.

3.6.1 Sampling Equipment

All non-dedicated sampling equipment (i.e. stainless-steel hand augers, trowels, bowls) will be decontaminated prior to the initiation of field sampling, between sample locations, and at the completion of the field activities. The following decontamination steps will be taken.

- Potable water rinse
- Alconox or Liquinox detergent wash
- Deionized (DI) water rinse
- Solvent rinse (Isopropanol)
- DI water rinse
- Air dry

3.6.2 Heavy Equipment

All non-dedicated heavy equipment (i.e. auger flights, split spoons, drive rods, etc.) will be decontaminated prior to use, between sample locations, and at the completion of the field activities. The following decontamination steps will be taken.

- Potable water rinse
- Alconox or Liquinox detergent wash
- Pressure Washer
- Deionized (DI) water rinse

- Solvent rinse (Isopropanol)
- DI water rinse
- Air dry
- Instrument scan – This will be performed after air drying to ensure all chemical solvents have been effectively removed. Positive results require re-rinsing and re-scan to ensure removal of the applicable chemical solvents.

3.7 EXCAVATION OF UNIDENTIFIED ANOMALIES

The following text represents a revised scope of work and modifications to CTO 0131. The development of this revision is addressed under the designate of CTO 0158. Revision 1, CTO 0158 will address the exhumation of two unidentified anomalies discovered through a geophysical survey of the area.

Historical information indicates that both of the anomalies are located in the northwestern corner of the MGBG. Based on information derived from historical interviews, the larger of the two anomalies has been identified as a metal live stock watering trough, although this has not been confirmed. This watering trough was reported to have been employed in the decontamination process associated with the previous investigation activities. In addition, it is suspected that this anomaly may also contain metal fence posts again reportedly to have been previously employed at the site.

The second anomaly has also been described as not being ordnance-related (e.g., simple trash), but the origin and character of the debris are not specified (See QAPP Appendix A, Part 2.).

Estimated depths of both of the anomalies range from 2-4 feet bgs.

Given the nature of the task and potential contaminants, the exhumation of the anomalies will proceed as follows:

- Excavation boundaries will be defined using available maps and non-intrusive magnetic detection methods to locate and stake the anomalies.
- A radiation activity level sweep will be conducted using the radiation survey meter(s) identified over the intended dig area. This process will be repeated for each 6-inch lift or layer removed.
- Fiberglass soil probes and magnetic detection devices will be employed to insure subsurface structures (the anomalies) are not disturbed through the digging process when using the back-hoe.
- Once the overburden is removed, the last remaining soils covering the anomalies will be removed by hand using shovels.
- The anomalies will be positively identified and removed for decontamination and disposal.

The anomalies identified within the northwestern quadrant of the MGBG will be exhumed for purposes of

- Identification
- Removal (House Keeping) and Disposal
- Subsurface soil sampling within the foot-print of these anomalies - Analytical verification is required to support the position that these anomalies are not source points of contamination and have not contributed contamination to the surrounding environmental media.

Method of Excavation – Back-hoe and operator supported by two ground personnel. In addition to the exhumation these persons shall be responsible for the following support functions:

- SSO/RSO
- Ground Spotter/UXO
- Operator/UXO.

4.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

4.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section specifies health and safety training and medical surveillance requirements for both Tetra Tech NUS and subcontractor personnel participating in on site activities.

4.1.1 Requirements For All Field Personnel

All Tetra Tech NUS and subcontractor personnel who will engage in field associated activities as described in this HASP must have:

- Completed 40 hours of introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e).
- Completed 8-Hour Refresher Training, if the identified persons had introductory training more than 12 months prior to site work.
- Completed 8-hour Supervisory training in accordance with 29 CFR 1910.120(e)(4), if their assigned function will involve the supervision of subordinate personnel.

Documentation of introductory training or equivalent work experience, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

4.2 SITE-SPECIFIC TRAINING

Tetra Tech NUS will provide site-specific training to all Tetra Tech NUS employees and subcontractor personnel who will perform work on this project.

Figure 4-1 will be used to document the provision and content of the project-specific and associated training. All site personnel will be required to sign this form prior to commencement of site activities.

Due to the complex nature of the work to be performed at NSWC Crane MGBG, the personnel selected will require cross training in various support functions and specialties. Figure 4-2 Training and Medical Surveillance Tracking form has been compiled to assist the FOL and/or the SSO in tracking the status of these persons over the course of the project. This form will assist in determining who has clearance and who may perform certain tasks or support functions based on their training and/or medical qualifications.

FIGURE 4-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigatory activities at the NSWC Crane Mustard Gas Burial Grounds located in Crane, Indiana, and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health (Section 1.2)
- Safety, health, and other hazards present on site (Table 5-1, 6-1; Section 2.0)
- Use of personal protective equipment (Table 5-1 and Appendix H)
- Safe use of engineering controls and equipment (Table 5-1 and HSGM)
- Safe work practices to minimize risks from hazards (Sections 5.1 and 5.2)
- Medical surveillance requirements (Section 8.3)
- Signs and symptoms of overexposure (Table 6-1)
- Decontamination procedures (Section 3.6.1, 3.6.2, and Table 5-1)
- Contents of the Health and Safety Plan
- Emergency action procedures (evacuation and assembly points, Section 2.0 and Appendix A)
- Incipient response procedures (Section 10.0)
- Review of the contents of relevant Material Safety Data Sheets (Appendix E and Section 5.0 of the HSGM)
- Use and application of the Safe Work Permits (Section 9.4 and Appendix G)
- Spill containment program (Section 10.0)

I further state that I have been given the opportunity to ask questions, that all of my questions have been answered to my satisfaction, and that I agree to abide by the procedures and policies addresses in this plan.

I further state, by the presence of my signature below, that the date of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

FIGURE 4-2

TRAINING AND MEDICAL SURVEILLANCE TRACKING FORM

My signature below indicates that I am aware of the potentially hazardous nature of performing investigation activities at NSWC Crane, and that I have received training in the topics indicated below and have provided documentation attesting to this fact. Furthermore, the dates indicated below, as well as, documentation attesting to my medical surveillance qualifications have also been provided.

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state by the presence of my signature and initials indicated with the dates provided are accurate and correct to the best of my knowledge.

Name Signature	Site-Specific Training (Date)	40-Hour Introductory Hazardous Waste Site Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Emergency Action Plan Drill (Date)	Fire Extinguisher Training (Date)	Medical Surveillance (Date of Expiration)	First-Aid Training (Date of Expiration)	Hazard Communication Training (Date)	Respiratory Protection Training (Date)	Personal Protective Equipment Program (Date)	Hearing Conservation Training (Date)	Blood-Borne Pathogen Training (Date)	Other

4.3 MEDICAL SURVEILLANCE

4.3.1 Medical Surveillance Requirements for Tetra Tech NUS and Subcontractor Personnel

All Tetra Tech NUS and subcontractor personnel participating in project field activities will have had a physical examination. All physical examinations shall meet the minimum requirements of paragraph (f) of OSHA 29 CFR 1910.120. The physical examinations will be performed to ensure all personnel are medically qualified to perform hazardous waste site work using respiratory protection.

Documentation for medical clearances will be maintained at the job site and made available, as necessary. Subcontractor personnel may use an alternative documentation for this purpose. The "Subcontractor Medical Approval Form" can be used to satisfy this requirement, or a letter from an officer of the company. The letter should state that the persons listed in the letter participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response." The letter should further state the following:

- The persons listed have had physical examinations under this program within the frequency as determined sufficient by their occupational health care provider
- Date of the exam
- The persons identified have been cleared, by a licensed physician, to perform hazardous waste site work and to wear positive- and negative- pressure respiratory protection.

A sample Subcontractor Medical Approval Form and form letter have been provided to all eligible subcontractors in the Bid Specification package.

4.3.2 Requirements for All Field Personnel

Each field team member, including subcontractors and visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet also supplied to eligible subcontractors as part of the Bid Specifications Package and also available in Attachment III. This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

5.0 TASK HAZARDS ASSESSMENTS AND CONTROL MEASURES

Table 5-1 of this section serves as the primary portion of the site-specific HASP and identifies the tasks that are to be performed as part of the scope of work. This table will be modified and incorporated into this document as new or additional tasks are performed at the site. The anticipated hazards, recommended control measures, air-monitoring recommendations, required Personal Protective Equipment (PPE), and decontamination measures for each site task are discussed in detail. This table and the associated control measures shall be changed, if the scope of work, contaminants of concern, or other conditions change.

The FOL/SSO will utilize this table as the primary reference for completion of the task-specific Safe Work Permits. The Safe Work Permit is the primary tool for accomplishing safety and health reviews with field personnel prior to the initiation of any tasks. These permits are to be completed by the FOL/SSO and reviewed with all field personnel at the beginning of each day's activities.

5.1 GENERAL SAFE WORK PRACTICES

In addition to the task-specific work practices identified on Table 5-1, the following general safe work practices (SWP) are to be followed when conducting work involving known and unknown site hazards. These SWPs establish a pattern of general precautions and measures for reducing risks associated with hazardous site operations. This list is not inclusive and may be amended as necessary.

- Do not eat, drink, chew gum or tobacco, take medication, or smoke in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. A thorough shower and washing must be conducted as soon as possible if excessive skin contamination occurs.
- Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, or other such areas. Avoid, whenever possible, kneeling on the ground or leaning or sitting on equipment. Do not place monitoring equipment on potentially contaminated surfaces.
- Remove beards or facial hair that interfere with a satisfactory qualitative respirator fit test or routine pre-entry positive and negative pressure checks. See Appendix N - Respiratory Protection Program.
- Be familiar with, knowledgeable of, and adhere to all instructions in the site-specific HASP.

- Be aware of the location of the nearest telephone and all emergency telephone numbers. See Section 2.0, Table 2-1.
- Attend briefings on anticipated hazards, equipment requirements, SWPs, emergency procedures, and communication methods before going on site.
- Plan and delineate entrance, exit, and emergency escape routes. See Section 2.0.
- Rehearse unfamiliar operations prior to implementation.
- Use the "buddy system" whenever respiratory protection equipment is in use. Buddies should establish hand signals or other means of emergency communication in case radios break down or are unavailable.
- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity to assist each other in case of emergency.
- Establish appropriate Safety Zones including Support, Contamination Reduction, and Exclusion Zones.
- Minimize the number of personnel and equipment in contaminated areas (such as the Exclusion Zone). Non-essential vehicles and equipment should remain within the Support Zone.
- Establish appropriate decontamination procedures for leaving the site.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the Site Safety Officer (SSO).
- Matches and lighters are restricted from entering in the Exclusion Zone or Contamination Reduction Zone.
- Observe coworkers for signs of toxic exposure and heat or cold stress.
- Inform co-workers of potential symptoms of illness, such as headaches, dizziness, nausea, or blurred vision.

5.2 DRILLING SAFE WORK PRACTICES

The following Safe Work Practices are to be followed when working in or around Drill Rig Operations.

5.2.1 Before Drilling

- Identify all underground utilities and buried structures before drilling. Use the Utility Locating and Excavation Clearance Standard Operating Procedure provided in Appendix L.

- All drill rigs will be inspected by a Competent Person (the SSO or designee), prior to the acceptance of the equipment at the site and prior to the use of the equipment. All repairs or deficiencies identified will be corrected prior to use. The inspection will be accomplished using the Equipment Inspection Checklist provided in Appendix K. Inspection frequencies will be once every 10 day shift or following repairs.

- The work area around the point of operation will be graded to the extent possible to remove any trip hazards near or surrounding rotating equipment.

- As respiratory protection is planned to be used during the first phase of the project, hand signals will be determined for communication between the driller and field support staff.

- The drillers helper will establish an equipment staging and laydown plan. The purpose of this is to keep the work area clear of clutter and slips, trips, and fall hazards. Mechanisms to secure heavy objects such as drill flights will be provided to avoid the collapse stacked equipment.

- All potentially contaminated tooling will be wrapped in polyethylene sheeting for storage and transport to the centrally located decontamination unit.

5.2.2 During Drilling

- Secure frayed or loose clothing, hair, and jewelry when working with rotating equipment.

- Minimize contact to the extent possible with contaminated tooling and environmental media.

- Support functions (sampling and screening stations) will be maintained a minimum distance from the drill rig of the height of the mast plus five feet to remove these activities from within physical hazard boundaries.

- Only qualified operators and knowledgeable ground crew personnel will participate in the operation of the drill rig.

- In order to minimize contact with potentially contaminated tooling and media and to minimize lifting hazards, multiple personnel should move auger flights and other heavy tooling.

- Only personnel absolutely essential to the work activity will be allowed in the exclusion zone. Site visitors will be escorted at all times.

5.2.3 After Drilling

- All equipment used within the exclusion zone will undergo a complete decontamination and evaluation by the SSO to determined cleanliness prior to moving to the next location, exiting the site, or prior to down time for maintenance.

- All motorized equipment will be fueled prior to the commencement of the days activities. During fueling operations all equipment will be shutdown and bonded to the fuel provider.

- When not in use all drill rigs will be shutdown, emergency brakes set, and wheels chocked.

- All areas subjected to subsurface investigative methods will be restored to equal or better condition than original to remove any contamination brought to the surface and to remove any physical hazards. In situations where these hazards cannot be removed these areas will be barricaded to minimize the impact on field crews working in the area.

5.3 EXCAVATION – GENERAL SAFE WORK PRACTICES

5.3.1 Before Excavation Activities

- Identify all underground utilities and buried structures before the commencement of excavation activities. Use the Utility Locating and Excavation Clearance Standard Operating Procedure provided in Appendix L. This includes an evaluation of the intended loading areas to insure swing patterns of excavators are not nearing any overhead power lines. A minimum clearance of 20 feet must be maintained from overhead power lines unless positive control of the energy source may be obtained. See Appendix L for additional information.

- All excavation boundaries will be demarcated with appropriate signage warning of construction activities in progress. Signs shall be used also for informational purposes to direct personnel regarding area of operation PPE requirements.

- All heavy equipment will be subjected to an equipment inspection, upon arrival on-site and prior to leaving. This inspection will be recorded on the Equipment Inspection Checklist provided in Attachment II of this HASP.

- Establish traffic patterns for equipment and the loading of trucks. This pattern should form a loop to minimize the need for backing up (an activity when many accidents occur).

- Establish traffic patterns for foot and small vehicular traffic out of the pattern for heavy equipment.

- All traffic patterns for heavy equipment will be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls (excavation boundaries) Note: The standard (29 CFR 1926 Subpart P) stipulates 2 feet distance from unsupported walls for resource staging. However, a maintenance distance of 10 feet will be maintained until soil classification is complete supporting a closer distance.

- Excavation along thoroughfares will require the use of signage, barricades and flag-persons for alteration of traffic patterns, as necessary.

- All ground personnel will be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment.

5.3.2 <u>During Excavation Activities</u>

- Ground activities such as the loading of trucks and directing the operators actions should be supported with a ground spotter controlling the actions of the truck to be loaded as well as the loader. The operators will be instructed that they are to follow only the instructions provided by the ground spotter unless another party is otherwise authorized.

- If excavations are greater than four feet in total depth this plan will require modification to address sloping and shoring requirements as they may exist in accordance with 29 CFR 1926 Subpart P (Soil Classification - Class A, 53° slope or 0.75:1; Class B, 45° slope or 1:1; Class C, 34° slope or 1.5:1).

- All access into the excavation shall be controlled and limited to authorized personnel. Access to excavations deeper than four feet or trenches shall be denied unless approved by a Competent Person in accordance with 29 CFR 1926 Subpart P.

- All routes other than those traffic patterns established shall be controlled or barricaded to focus entry and exiting through control points.

5.3.3 After Excavation Activities

- Sampling within the foot-print of the excavated anomaly will occur to confirm/deny contamination associated with the anomaly. If the excavation is greater than 4-feet deep the sampling will occur, by removing the sample from the bucket of the excavator.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
NAVAL SURFACE WARFARE CENTER CRANE DIVISION, CRANE, INDIANA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Mobilization/ Demobilization	***Chemical hazards:*** 1) The on-site Hazard Communication Program (Appendix E) will be followed. All chemicals brought onto the site by Tetra Tech NUS and subcontractor personnel will be inventoried and have an MSDS on site. This effort shall include - Accurate Chemical Inventory List (Entries will match chemicals brought on-site, as the names appear on the MSDS) This list, which also includes quantities and storage locations will be provided to NSWC Crane Emergency Response Units. - MSDS's will be maintained in a central location, accessible to all personnel. All containers will have labels specifying the following information: - Chemical Identity (As it appears on the label, MSDS, and Chemical Inventory List) - Appropriate Warning (i.e., Eye and skin irritation, flammable, etc.) - Manufacturer's Name Address and Phone Number ***Physical hazards:*** 2) Lifting (strain/muscle pulls) 3) Pinches and compressions/Struck by 4) Slips, trips, and falls 5) Heavy equipment hazards (rotating equipment, hydraulic lines, etc.) 6) Vehicular and foot traffic 7) Ambient temperature extremes (heat/cold stress) ***Natural hazards:*** 8) Insect/animal bites and stings, poisonous plants, etc. 9) Inclement weather	***Chemical hazards:*** 1) All personnel will be required to review the appropriate MSDS's, prior to the use of a specified chemical substance. This direction should also be communicated on the Safe Work Permit completed for this task. 2) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques - Lift with your legs, not your back, bend your knees move as close to the load as possible, and ensure good hand holds are available. - Minimize the horizontal distance to the center of the lift to your center of gravity. Minimize turning and twisting when lifting as the lower back is especially vulnerable at this time. Break lifts into steps if the vertical distance (from the start point to the placement of the lift) is excessive. Plan your lifts – Place heavy items on shelves between the waist and chest; lighter items on higher shelves. Periods of high frequency lifts or extended duration lifts should provide sufficient breaks to guard against fatigue and injury. In determining whether you can lift an item several factors must be considered, these are as follows: - Maximum weight lifted by a single person should not exceed 70 pounds. Items over 70 pounds or the amount you feel you can confidently lift up to 70 pounds should define a point where assistance in the lift is sought. - Level of demand – Weight + frequency & duration. - Area available to maneuver the lift. - Area of the lift – Work place clutter, slippery surfaces - Overall physical condition 3) Keep any machine guarding in place. Do not modify tooling without manufacturer's expressed permission. - Avoid moving parts. - Use tools or equipment where necessary to avoid contacting pinch points. - Adjust machine guarding as necessary to minimize distance between guards and point of operation. - When staging equipment, insure all stacked loads, shelving, are adequately secure to avoid creating a hazard from falling objects. 4) Preview work locations for unstable/uneven terrain. - Cover, guard and barricade all open pits, ditches, and floor opening as necessary. The FOL and the SSO during site surveys and site preparation should identify these potential hazards. 5) All equipment will be - Inspected in accordance with OSHA and manufacturer's design. - Operated by knowledgeable operators and ground crew. 6) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom or mast + 5 feet). - Foot and vehicular traffic routes shall be well defined - Secure all loose articles. - All self-propelled equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the site requirements. - The EOD Technician as a precautionary measure shall preview traffic routes (foot and vehicular) before the commitment of personnel and resources. 7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat and cold stress is provided in Appendix F, Hazard Assessment. 8) Avoid nesting areas, use repellents. Report potential hazards to the SSO. Follow guidance presented in Appendix F, Hazard Assessment, regarding natural hazards. 9) Suspend or terminate operations until directed otherwise by SSO.	Visual observation of work practices by the SSO to minimize potential physical hazards (i.e., improper lifting, unsecured loads, etc.).	Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Reflective vest for high traffic areas* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.*	Not required.

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Decontamination of Sampling and Heavy Equipment	***Chemical hazards:*** 1) Previous analytical data identified the following compounds as contaminants of concern in the groundwater: Chlorinated Solvents - 79-34-5 1,1,2,2-Tetrachloroethane 79-01-6 Trichloroethene (TCE) 107-06-2 1,2-Dichloroethane 127-18-4 Tetrachloroethene (PCE) 79-00-5 1,1,2-Trichloroethane 156-60-5 Trans 1,2-Dichloroethene Other contaminants have been identified within the groundwater, however, the concentrations identified were not sufficient enough to present an occupational exposure threat. Other contaminants of concern that may be encountered based on past practices of disposal include 505-60-2 Mustard Gas 13823-29-5 Thorium Nitrate Table 6-1 (and Attachment IV – Mustard Gas MSDS) provides additional information about each of the identified contaminants of concern. 2) Decontamination fluids - Liquinox (detergent); isopropanol (decontamination solvent) ***Physical hazards:*** 3) Lifting (strain/muscle pulls) 4) Noise in excess of 85 dBA 5) Flying projectiles 6) Struck by 7) Slips, trips, and falls ***Natural hazards:*** 8) Inclement weather	1) and 2) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination fluids used on-site. Solvents may only be used in well-ventilated areas, such as outdoors. Use appropriate PPE as identified on MSDS or within this HASP. All chemicals used must be listed on the Chemical Inventory for the site, and site activities must be consistent with the Hazard Communication Program Appendix E. 3) Use multiple persons where necessary for lifting and handling heavy equipment, such as auger flights for decontamination purposes. - Employ proper lifting techniques as described in Table 5-1, Mobilization/Demobilization. 4) Wear hearing protection when operating the Steam Cleaner. Sound pressure levels measured during the operation of similar pieces of equipment indicate a range of 87 to 93 dBA. 5) Use eye and face protective equipment when operating the steam cleaner. All other personnel must be restricted from the area. In addition to minimize hazards (flying projectiles, water lacerations and burns) associated with this operation, the following controls will be implemented - A 25° Fan Tip will be used on pressurized systems over 3,000 psi. This will reduce the possibility of lacerations. - Thermostat control to regulate the temperature levels. - Visual evaluations of hoses and fittings for structural defects - Construct deflection screens as necessary to control overspray and to guard against dispersion of contaminants driven off by the spray. 6) Struck by – Ensure wash and drying racks are suitable construction to support heavier items such as auger flights and will secure them against falling during this process. 7) The decontamination pad should be constructed to contain wash waters generated during decontamination procedures. Temporary decontamination pads are usually 10-30 mil polyethylene or polyvinyl chloride tarp construction. Although these items when used as a liner offer containment, they also present a slipping hazard. When these temporary liners are employed, it is recommended that a light coating of sand be spread over the walking surface to provide traction. - In addition, adequate slope should be provided to the pad to permit drainage away from the object being cleaned. The collection point for wash waters should be of adequate distance that the decon workers do not have to walk through the wash waters while completing their tasks. - Hoses should be gathered when not in use to eliminate potential tripping hazards. 8) Suspend or terminate operations until directed otherwise by SSO.	Use visual observation and real-time monitoring instrumentation to ensure all equipment has been properly cleaned of contamination and dried. Instrumentation will not be used to determine airborne concentrations during this activity. Levels of protection will be initiated based on positive detections during field operational activities. After decontamination is completed and parts are visually clean. CWM - The decontamination process to be conducted is intended to remove and destroy any mustard gas or components CWM. If Mustard Gas is encountered during field investigations an increased level of protection to Level C will be initiated for this activity. Further upgrades to Level B are based on the evolution of hazardous decomposition by-products produced during the decontamination process. The level of protection selected is considered suitable for any of these materials (hydrogen chloride and/or thiodyglycol) potentially encountered. VOCs using PID/FID Screen dried equipment with a PID/FID. If any elevated readings (i.e., above background) are observed, perform rinse process again and re-screen. Repeat until no elevated PID/FID readings are noted. The intent is two-fold. First to ensure the removal of all site contaminants. Secondly, to ensure the removal of decontamination solvents to prevent cross contamination. Radiological Contaminants If radiological contamination is encountered during the subsurface investigation (readings twice that of background), then all tooling associated with this operation shall be subjected to a surface scan using the radiation survey meter. Readings in of background will require the tooling to be re-decontaminated and then re-screened. In all cases where radiological concerns are evident based on field screening ALARA (As Low As Reasonably Achievable) concepts will be practiced. This includes Clear definition of effected area boundaries - Radiological Area >5mrem but< 100 mrem - Radiological Buffer Zones <5mrem Within these areas protective clothing, respiratory protection, and personnel dosimetry will be required. Minimizing time of exposure through efficient work practices and rotational of personnel and reduced stay time in the effected areas.	**For Heavy Equipment** This applies to steam cleaning operations and soap/water wash and rinse procedures. Level D Minimum requirements: (If Mustard Gas, radiological concerns, or elevated levels of VOCs are identified during field operations, then this activity will be initiated in Level C Protection, see below for additional PPE) - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Chemical resistant boot covers - Butyl outer gloves over nitrile inner gloves - Safety glasses underneath a splash shield - Hearing protection (plugs or muffs) - Hooded PVC Rainsuits or PE or PVC coated Tyvek **For sampling equipment** (trowels, Macro-Core Samplers, bailers, etc.), the following PPE is required Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Butyl outer gloves over nitrile inner gloves - Safety glasses - Butyl Apron In the event of overspray of chemical decontamination fluids, employ PVC Rainsuits or PE or PVC coated Tyvek as necessary. **Note:** In situation where the field screening has indicated the presence of chemical warfare materials (CWM), radiological concerns, or elevated levels of VOCs the protective level during decontamination will be increased to Level C protection. Action levels for increase to Level C based on field observation - VOCs > 5.0 ppm in the breathing zone - Radiological – Twice that of background - CWM – Any positive detection during field investigations Level C protection will include the following items in addition to those identified above as Level D requirements: - Full-face APR with acid gas/HEPA cartridges. These cartridges will be used for protection against the degradation products (Hydrochloric acid) of the CWM generated through the steam cleaning process and particulate hazards associated with the radiological components. Change out schedule – Change cartridges every day. Clean and sanitize respirator for the following day. Contingency Plan – Upgrading to Level B Protection Mustard Gas will degrade to Hydrogen Chloride and thiodyglycol during decontamination. Should airborne concentrations exceed 50 ppm, then an upgrade to Level B protection will be imposed in addition to the protective items stated above in the Level D protection. This will include - Supplied Air Respirator (SAR) with airline not to exceed 300 feet, routed/linked through a 5-minute escape bottle. - Hooded PVC Rainsuits or PE or PVC coated Tyvek, seams taped. This is not anticipated and only represents a contingency action. **Note:** The Safe Work Permit(s) for this task (see Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task. Information provided in this column has been derived from Appendix H Personal Protective Equipment Program.	**Personnel Decontamination** will consist of a soap/water (water component/ 5% bleach mix) wash and rinse for reusable and non-reusable outer protective equipment (boots, gloves, PVC splash suits, as applicable) because of the Mustard Gas concerns. This decontamination function may be subdivided into two locations. Gross contamination of outer boots and outer gloves will be removed at a satellite location near the operation. Final wash and rinse will take place at the centralized decontamination pad. The sequential procedure is as follows: Stage 1: Equipment drop, remove outer protective wrapping; Decon personnel will wipe down the outer shell and pass hand equipment through as necessary. Stage 2: Soap/water wash and rinse of outer boots and gloves Stage 3: Soap/water wash and rinse of the outer splash suit, as applicable Stage 4: Disposable PPE will be removed and bagged. Stage 5: Wash face and hands Stage 6: Depending on ambient conditions, you may be required to report for medical evaluation. This evaluation consists of pulse, breathing rate, oral temperature, and body weight. This medical screening will be performed when ambient conditions dictate and during periods of acclimatization. For more information concerning personnel decontamination, See Appendix J, Decontamination. **Equipment Decontamination** - All heavy equipment decontamination will take place at a centralized decontamination pad utilizing a steam cleaner. Current technology indicates hot water deactivation (steam cleaning of equipment) of the Mustard component is the most suitable means for removal and neutralization. Heavy equipment will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will have restricted access to exclusion zones, and have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the onsite activity. **Sampling Equipment Decontamination** Sampling equipment will be decontaminated as per the requirements in the Sampling and Analysis Plan and/or Work Plan. All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving on-site, leaving the site, and between locations. No equipment will be authorized access, exit, or movement to another location without this evaluation.

Tasks/ Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Multi-media sampling, including soils (surface and subsurface); surface water, ground water, and seeps; sediments. This task also includes well development of existing and newly installed ground water monitoring wells. **Note:** This task table does not address Natural Attenuation Sampling for groundwater. That task has been addressed on its own merit, due to the use of various reagents.	***Chemical hazards:*** 1) Previous analytical data identified the following compounds as contaminants of concern in the groundwater: Chlorinated Solvents - 79-34-5 1,1,2,2-Tetrachloroethane 79-01-6 Trichloroethene (TCE) 107-06-2 1,2-Dichloroethane 127-18-4 Tetrachloroethene (PCE) 79-00-5 1,1,2-Trichloroethane 156-60-5 Trans 1,2-Dichloroethene Other contaminants of concern that may be encountered based on past practices of disposal include 505-60-3 Mustard Gas 13823-29-5 Thorium Nitrate Table 6-1 (and Attachment IV – Mustard Gas MSDS) provides additional information about each of the identified contaminants of concern. 2) Transfer of contamination into clean areas ***Physical hazards:*** 3) Noise in excess of 85 dBA 4) Lifting (strain/muscle pulls) 5) Pinches and compressions 6) Slips, trips, and falls 7) Ambient temperature extremes (heat/cold stress) 8) Vehicular and foot traffic 9) Contact with UXO ***Natural hazards:*** 10) Insect/animal bites and stings, poisonous plants, etc. 11) Inclement weather	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.). Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, activities must be suspended until dust levels subside, or until an acceptable alternative control method can be selected. 2) Decontaminate all equipment and supplies between sampling locations and prior to leaving the site. See decontamination of heavy and sampling equipment for direction in this task. 3) When sampling at an operating DPT, Hollow Stem Auger, Rotosonic or other type of drill rig use hearing protection. The use of hearing protection outside of 25 feet from the DPT rig should be incorporated under the following condition: If you have to raise your voice to talk to someone who is within 2 feet of your location, you may be approaching excessive noise levels (80-85dBA) and hearing protection should be worn until the noise source may be positively quantified. 4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques (See Lifting Mobilization/Demobilization, Page 1 of 6, Table 5-1). 5) Avoid moving parts, do not remove any machine guarding. - Use tools or equipment where necessary to avoid contacting pinch points. - A remote sampling device must be used to sample drill cuttings near rotating tools. The equipment operator shall shutdown machinery if the sampler is near moving machinery parts. - Remove any snag points - Follow SWP and Safe Work Practices for drilling procedures when working in and around the drill rigs. 6) Preview work locations for unstable/uneven terrain. - Ruts, roots, and other tripping hazards should be eliminated from around the rotating apparatus to minimize trips and falls when approaching the rotating tooling. - Use multiple persons and small loads to pack sampling resources to remote locations. - Construct rope ladders and other engineered assistance for traversing hills and inclines > 45°. 7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat/cold stress is provided in Appendix F, Hazard Assessment. 8) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Mast or Boom + 5 feet). See Section 9 of the HASP for specific safety zones and established clearance recommendations. - All self-propelled equipment shall be equipped with movement warning systems. - When sampling along roadways, use signs to indicate men working as well flag persons, as necessary. Personnel working in and around any established traffic patterns should wear high visibility vests to increase visual recognition. 9) Work areas will be screened to ensure no UXO items are present. Site activities will not be performed until the area is cleared by an UXO or EOD Specialist. If any suspicious items are uncovered or encountered, the area will be marked, personnel will leave the area, and appropriate site contacts will be notified. The UXO SOP included as Appendix I. 10) Avoid nesting areas, use repellents approved by the FOL. Report potential hazards to the SSO. Follow guidance presented in Appendix F, Hazard Assessment. 11) Suspend or terminate operations until directed otherwise by the SSO.	Site screening will encompass monitoring for three separate and distinct parameters as well as monitoring for the Health and safety of field personnel. All samples will be screened for - Levels of radioactivity - Presence or absence of CWM. - Volatile organic concentrations **Radiological Screening** Radiation monitoring will be supported using a Ludlum Model 3 with a Pancake Geiger-Mueller Detector suitable for Alpha and beta emissions. Radiation Release Limit 2 µCi or <250 cpm above background will be considered non-hazardous from a radiological threat. >2 µCi or >250 cpm – - Notify NSWC Crane Radiation Safety Office - Segregate IDW generated from this location - Label shipping and waste storage containers appropriately. In all cases where radiological concerns are evident based on field screening ALARA (As Low As Reasonably Achievable) concepts will be practiced. This includes Clear definition of effected area boundaries Radiological Area >5mrem but< 100 mrem Radiological Buffer Zones < 5mrem Within these areas protective clothing, respiratory protection, and personnel dosimetry will be required. Minimizing time of exposure through efficient work practices and rotational of personnel and reduced stay time in the effected areas. All site personnel will be equipped with a Thermoluminescent Detector (TLD) Badges. Personnel charged with physically handling the samples will be provided with a Ring Dosimeters. Note: This information is provided as a contingency plan for incidental encounters. Irradiated materials are not anticipated. Should multiple hits occur, this HASP will be modified to include a Radiation Safety Plan (RSP). **CWM** Monitoring will be conducted using MSA/Auer CWA Detector Tube to determine the presence of gross contamination. The AP2C Chemical Agent Detector Kit shall be employed to further quantify detected CWM after a gross contamination sweep. All soil and sediment samples will be screened prior to sending to the analytical laboratories. This screening will involve the extraction of additional sample material (minimum 10 ounces) placed in a jar with aluminum foil over the top. This sample will be subjected to a hot water bath or Toaster oven to generate sufficient heat in the sample to drive off into the head space any CWM. The head space concentration will then be measured. The following represent the action levels Release limit – <0.1 mg/m^3 (0.015 ppm) the sample is considered free of CWM for shipping purposes. >0.1 mg/m^3 (0.015 ppm)– Send sample to CWM Laboratory for quantification, prior to releasing to radiological and chemical analytical laboratories. Based on quantification determine release status. When samples are impacted with CWM, efforts should be made to extract additional sample material from within the sample interval not impacted by CWM so that analytical and radiological quantification may proceed. **VOCs Screening** A direct reading Photoionization Detector (PID) equipped with a 11.7 eV lamp (Primary), or a Flameionization Detector (FID) (Secondary/Back-up), will be used to screen samples and to detect the presence of any potential volatile organics. Source monitoring of the sample collection area will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions: - Monitor the breathing zone of at-risk and downwind employees. Any sustained readings (greater than 1 minute in duration) above 5 ppm in the breathing zone of the at-risk employees requires site activities to be suspended and site personnel to retreat to an unaffected area, notify PHSO, incorporate Level C Respiratory protection. - Work may only resume if airborne readings in worker breathing zone return to below 5 ppm or based on the use of identified respiratory protection. - If concentrations exceed 50 ppm (which is not anticipated based on reported concentrations) the level of protection will be increased to Level B protection. This increase in protection in based only on PHSO and HSM approval. Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides.	Level D protection will be utilized for the following sampling activities. Surface soils, surface water, groundwater, sediments, and seeps Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (steel toe/shank) - Safety glasses - Surgical style gloves *(double-layered if necessary)* - *Reflective vest for high traffic areas* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential for soiling work attire exists.* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.* Upgrades to Level C protection will be based on the following: **VOCs -** Concentrations in air > 5 ppm in the Workers breathing zone. **CWM** – Any detection **Radioactivity** - > 250 cpm **Level C Protection:** - Full-face APR (Advantage 1000) with CBA-RCA Canister - Level D minimum requirements as stated above**.** Change out schedule – At the close of each shift, change out filter cartridges and discard with used PPE. **Level B Protection will be utilized if the following conditions are met** **VOCs -** Concentrations in air > 50.0 ppm in the Workers breathing zone. **CWM** – >0.1 mg/m^3 (0.015 ppm) **Note:** The Safe Work Permit(s) for this task (See Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.	**Personnel Decontamination** Personal decontamination will vary based on the type of sampling conducted. These are as follows: Supporting subsurface investigations at the drill rig. - Decontamination will be the same as prescribed for the drilling activity Sampling surface water, groundwater, sediments, and seeps the following provisions will apply - Upon completion of the sampling dedicated trowels, tubing, etc. will be bagged for transport back to the central decontamination area. - PPE (gloves) will be removed and also bagged for disposal. - Handi-Wipes or similar product will be used to clean hands prior to moving to the next location. **Equipment Decontamination** All equipment used in remote sampling locations will be brought back to the central decontamination area for decontamination and re-use or decontamination and gross removal of contamination prior to disposal. **Note:** Field screening instruments will be wrapped to minimize the necessary decontamination except for wiping down parts which are necessary to expose to the external environment. The equipment reference above is largely directed at hand tools. Decontamination of equipment (sampling and hand tools) will proceed as indicated in the Sampling and Analysis Plan and/or Work Plan.

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Natural Attenuation Groundwater sampling. This sampling will employ geochemical analysis of the groundwater samples obtained to determine natural attenuation propensity.	***Chemical hazards:*** 1) Previous analytical data identified the following compounds as contaminants of concern in the groundwater: Chlorinated Solvents 79-34-5 1,1,2,2-Tetrachloroethane 79-01-6 Trichloroethene (TCE) 107-06-2 1,2-Dichloroethane 127-18-4 Tetrachloroethene (PCE) 79-00-5 1,1,2-Trichloroethane 156-60-5 Trans 1,2-Dichloroethene Poison – Inhalation and subcutaneous 505-60-2 Mustard Gas During Natural Attenuation sampling the following reagents will be employed. **Dissolved Oxygen** Chemical Extraction - Manganous sulfate - Alkaline iodide azide - Sulfamic acid **Titration** - 0.02 N Sodium thiosulfate - Starch Indicator Solution **Ferrous Iron** - 1,10-phenanthroline indicator solution - Ferrous Iron Reagent **Hydrogen Sulfide** - Sodium/potassium bicarbonate **Carbon dioxide** - Sodium Hydroxide - Phenolphthalein solution **Note:** Other contaminants have been identified within the groundwater, however, the concentrations identified were not sufficient enough to present an occupational exposure threat. 2) Transfer of contamination into clean areas ***Physical hazards:*** 3) Lifting 4) Slips, trips, and falls 5) Sharps ***Natural hazards:*** 6) Insect/animal bites and stings, poisonous plants, etc. 7) Inclement weather	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.) and reagents used in the natural attenuation sampling process. Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, activities must be suspended until dust levels subside, or until an acceptable alternative control method can be selected. The MSDSs for the Natural Attenuation Sampling Reagents are included in Appendix E. All personnel identified as participating in the Natural Attenuation sampling must review the MSDSs prior to the commencement of that sampling. Establish a secondary containment (small mortar type tub) to conduct natural attenuation field screening parameter measurements. Portable Eyewash - As some of the reagent components are irritating and under extreme conditions corrosive a portable eyewash will be maintained to flush skin and/or eyes should incidental contact occur. 2) Decontaminate all equipment and supplies between sampling locations and prior to leaving the site. See Decontamination of heavy and sampling equipment for direction in this task. ***Physical hazards:*** 3) Lifting Hazards - As some of the locations may require carrying sampling equipment and supplies the following precautions should be employed: - Use machinery or multiple personnel for heavy lifts. - Use proper lifting techniques (See Lifting Mobilization/Demobilization, Page 1 of 6, Table 5-1). - Break loads to be transported into smaller lighter increments. 4) Slip, trip, and Fall - Preview work locations for unstable/uneven terrain. - Ruts, roots, and other tripping hazards should be eliminated from access paths to the extent possible. - Use multiple persons and small loads to pack sampling resources to remote locations. The consequences of a slip or fall while carrying a load could potentially magnify the severity of the outcome. - Construct rope ladders and other engineered assistance for traversing hills and inclines > 45°. 5) Sharps – Many of the reagents to be used for natural attenuation sampling are provided in glass ampules which require snapping the tip off and invert the ampule multiple times to mix the sample media with the reagent. To minimize hazards associated with this task, the following safe work practices will be used: - Invert the glass ampule and place within the sampling stream inside the collection funnel. Apply pressure to the side when snapping the ampule head, NOT downward. - The ampule will fill with sample media, leaving a bubble to facilitate mixing. Place a gloved finger over the opening, invert the ample to mix the sample and reagent. This procedure may require repeating several times. Care should be exercised as not to apply too much pressure which may result in damage to your glove. - Upon completion, broken ampule shall be rinsed and placed in a hard sided container for disposal. - If you must go into the disposable items in the trash, make sure you dump it out onto a table to retrieve the item you require. Do NOT reach into the trash. This will prevent sharp sticks in the event someone has mistakenly thrown a broken ampule away. ***Natural hazards:*** 6) Avoid nesting areas, use repellents approved by the FOL. Report potential hazards to the SSO. Follow guidance presented in Appendix F, Hazard Assessment. 7) Suspend or terminate operations until directed otherwise by the SSO.	Radiological Screening and CWM Screening for this activity will only be conducted should there be an indication during the installation of the new wells that the subsurface soils have been impacted by radioactive and/or CWM. If it is determined that the subsurface media has been impacted screening will proceed in accordance with that identified in the multimedia sampling Table 5-1. **VOCs Screening** A direct reading Photoionization Detector (PID) equipped with a 11.7 eV lamp (Primary), or a Flameionization Detector (FID) (Secondary/Back-up), will be used to screen samples and to detect the presence of any potential volatile organics. Source monitoring of the sample collection area will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions: - Monitor the breathing zone of at-risk and downwind employees. Any sustained readings (greater than 1 minute in duration) above 5 ppm in the breathing zone of the at-risk employees requires site activities to be suspended and site personnel to retreat to an unaffected area, notify PHSO, incorporate Level C Respiratory protection. - Work may only resume if airborne readings in worker breathing zone return to below 5 ppm or based on the use of identified respiratory protection. - If concentrations exceed 50 ppm (which is not anticipated based on reported concentrations) the level of protection will be increased to Level B protection. This increase in protection in based only on PHSO and HSM approval. Frequency : Monitoring will be performed at periodic intervals initially, quarter of the extraction volume is pumped; half the extraction volume is pumped. **Note:** For all newly constructed monitoring wells, the frequency of radiation and CWM monitoring may be extended, if no contaminants were encountered during the soil boring phase.	Level D protection will be utilized for the following sampling activities. Groundwater samples Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (steel toe/shank) - Safety glasses - Surgical style gloves *(double-layered or a heavy neoprene or nitrile glove for protection against the sharpedge ampoules)* - *Reflective vest for high traffic areas* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential for soiling work attire exists.* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.* The necessity of respiratory protection Upgrades to Level C protection will be based on the following: **VOCs** Concentrations in air > 5 ppm in the Workers breathing zone. CWM – Any detection Radioactivity - > 250 cpm **Level C Protection:** - Full-face APR (Advantage 1000) with CBA-RCA Canister - Level D minimum requirements as stated above**.** Change out schedule – At the close of each shift, the canisters will be removed, respirator cleaned and prepared for the following day's activities. Canisters will be made incapable of reuse and discarded with used PPE. **Note:** The Safe Work Permit(s) for this task (See Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.	**Personnel Decontamination** Personal decontamination will vary based on the type of sampling conducted. These are as follows: Sampling surface water, groundwater, sediments, and seeps the following provisions will apply - Upon completion of the sampling dedicated tubing, etc. will be bagged for transport back to the central decontamination area. - PPE (gloves) will be washed, removed and also bagged for disposal. - Handi-Wipes or similar product will be used to clean hands prior to moving to the next location, when access to soap and water is not feasible due to the location. - In all instances hands and face washing will be conducted upon arrival back at the central decontamination unit prior to scheduled breaks and when leaving the site. **Equipment Decontamination** All equipment used in remote sampling locations will be brought back to the central decontamination area for decontamination and re-use or decontamination and gross removal of contamination prior to disposal. **Note:** Field screening instruments will be wrapped to minimize the necessary decontamination except for wiping down parts which are necessary to expose to the external environment. The equipment reference above is largely directed at hand tools. Decontamination of equipment (sampling and hand tools) will proceed as indicated in the Sampling and Analysis Plan and/or Work Plan.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
NAVAL SURFACE WARFARE CENTER CRANE DIVISION, CRANE, INDIANA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Soil borings and Monitoring Well Installation These tasks will be accomplished using the following methods: **Soil boring:** - Direct-Push Technology [Geoprobe®] - Hand Augering - Drill Rig (Hollow Stem, Rotosonic, Mud Rotary **Monitoring Well Installation** - Drill Rig (Hollow Stem, Rotosonic, Mud Rotary	***Chemical hazards:*** 1) Previous analytical data identified the following compounds as contaminants of concern in the groundwater: Chlorinated Solvents - 79-34-5 1,1,2,2-Tetrachloroethane 79-01-6 Trichloroethene (TCE) 107-06-2 1,2-Dichloroethane 127-18-4 Tetrachloroethene (PCE) 79-00-5 1,1,2-Trichloroethane 156-60-5 Trans 1,2-Dichloroethene Other contaminants of concern that may be encountered based on past practices of disposal include 505-60-4 Mustard Gas 13823-29-5 Thorium Nitrate Table 6-1 (and Attachment IV – Mustard Gas MSDS) provides additional information about each of the identified contaminants of concern. Well Construction Materials - Bentonite - Grout - Filter Sand 2) Transfer of contamination into clean areas or onto persons ***Physical hazards:*** 3) Heavy equipment hazards (pinch/compressions points, rotating equipment, hydraulic lines, etc.) 4) Noise in excess of 85 dBA 5) Energized systems (contact with underground or overhead utilities) 6) Lifting (strain/muscle pulls) 7) Slips, trips, and falls 8) Vehicular and foot traffic 9) Ambient temperature extremes (heat/cold stress) 10) Flying projectiles 11) Contact with UXO ***Natural hazards:*** 10) Insect/animal bites and stings, poisonous plants, etc. 11) Inclement weather	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.). Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, activities must be suspended until dust levels subside, or until an acceptable alternative control method can be selected. -Verify monitoring well construction materials (grout, bentonite, sand, and decontamination solutions) MSDS are included in Hazard Communication Program. Ensure personnel constructing wells have reviewed the MSDS and understand potential health effects. 2) Decontaminate all equipment and supplies between boreholes and prior to leaving the site. Wrap all portable equipment to be transported across clean areas of the site to the central decontamination pad. 3) All equipment will be: - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600.601.602), and manufacturer's design. All inspections will be documented using the Equipment Inspection Checklist found in Appendix K of this HASP. - Operated and supported by knowledgeable operators, and ground crew. - Used within safe work zones, with routes of approach clearly demarcated. All personnel not directly supporting this operation will remain at least 25 feet from the point of operation. See Section 9.0 of this HASP. This will be the area identified as the exclusion zone. In addition to equipment considerations, the following safe operating procedures will be incorporated: - Hydraulic masts or other projecting devices shall be at least 20 feet from overhead power sources and a minimum of 3 feet from underground utilities. - Hand signals will be established prior to the commencement of the operation. - A remote sampling device must be used to sample drill cuttings near rotating tools - Only manufacturer-approved equipment may be used in conjunction with equipment repair procedures (e.g., flight connectors). - Work areas will be kept clear of clutter. - Secure all loose articles to avoid possible entanglement during coring activities. - All self-propelled equipment shall be equipped with movement warning systems. - All personnel will be instructed in the location and operations of the emergency shut-off device(s). This device will be tested initially (and then periodically) to ensure its operational status. - Areas will be inspected prior to the movement of the drill rig and support vehicles to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. - The drill rig and support vehicles will be moved no closer than 3 feet to unsupported side-walls of excavations and embankments. 4) Hearing protection will be used during all subsurface activities using drill rig or DPT when noise levels are between 87 and 92 dBA. (during operation). Boundaries will be established to limit noise hazard. Height of the mast + 5 feet or a minimum of 25 feet is normal. Excessive noise levels are being approach when you have to raise your voice to talk to someone within 2 feet of your location . 5) All drilling activities will proceed in accordance with the Utility Locating and Excavation Clearance SOP in Appendix L.. All utility clearances will be obtained, in writing, and locations identified and marked prior to activities. Overhead utilities will also be identified. 6) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 7) Preview work locations for unstable/uneven terrain. 8) Use traffic-warning signs, flag persons, and high visibility vests as determined by the SSO when working in or along traffic thoroughfares. 9) Wear appropriate clothing for weather conditions. Acceptable shelter and liquids for field crews. 10) Wear eye protection and hard hat when the drill rig or DPT rig is operating. Restrict all others from the area. 11) Screen work area to ensure that it is clear of UXO. Area must be cleared by the UXO/EOD Specialist prior to beginning work. Suspicious items will be marked and personnel will leave the area and notify appropriate site contacts. See Appendix I. 12) Avoid nesting areas, use repellents. Report potential hazards to the SSO. See Appendix F, Hazard Assessment for additional information concerning natural hazards. Relative to the time of the year this operation is conducted, certain natural hazards may have little bearing. 13) Suspend or terminate operations until directed otherwise by SSO.	Site screening will encompass monitoring for three separate and distinct parameters as well as monitoring for the Health and safety of field personnel. All samples will be screened for - Levels of radioactivity - Presence or absence of CWM. - Volatile organic concentrations **Radiological Screening** Radiation monitoring will be supported using a Ludlum Model 3 with a Pancake Geiger-Mueller Detector suitable for Alpha and beta emissions. Radiation Release Limit 2 µCi or <250 cpm above background will be considered non-hazardous from a radiological threat. >2 µCi or >250 cpm – - Notify NSWC Crane Radiation Safety Office - Segregate IDW generated from this location - Label shipping and waste storage containers appropriately. In all cases where radiological concerns are evident based on field screening ALARA (As Low As Reasonably Achievable) concepts will be practiced. This includes Clear definition of effected area boundaries Radiological Area >5mrem but< 100 mrem Radiological Buffer Zones < 5mrem Within these areas protective clothing, respiratory protection, and personnel dosimetry will be required. Minimizing time of exposure through efficient work practices and rotational of personnel and reduced stay time in the effected areas. All site personnel will be equipped with a Thermoluminescent Detector (TLD) Badges. Personnel charged with physically handling the samples will be provided with a Ring Dosimeters. Note: This information is provided as a contingency plan for incidental encounters. Irradiated materials are not anticipated. Should multiple hits occur, this HASP will be modified to include a Radiation Safety Plan (RSP). **CWM** Monitoring will be conducted using MSA/Auer CWA Detector Tube to determine the presence of gross contamination. The AP2C Chemical Agent Detector Kit shall be employed to further quantify detected CWM after a gross contamination sweep. All soil and sediment samples will be screened prior to sending to the analytical laboratories. This screening will involve the extraction of additional sample material (minimum 10 ounces) placed in a jar with aluminum foil over the top. This sample will be subjected to a hot water bath or Toaster oven to generate sufficient heat in the sample to drive off into the head space any CWM. The head space concentration will then be measured. The following represent the action levels Release limit – <0.1 mg/m^3 (0.015 ppm) the sample is considered free of CWM for shipping purposes. >0.1 mg/m^3 (0.015 ppm)– Send sample to CWM Laboratory for quantification, prior to releasing to radiological and chemical analytical laboratories. Based on quantification determine release status. When samples are impacted with CWM, efforts should be made to extract additional sample material from within the sample interval not impacted by CWM so that analytical and radiological quantification may proceed. **VOCs Screening** A direct reading Photoionization Detector (PID) equipped with a 11.7 eV lamp (Primary), or a Flameionization Detector (FID) (Secondary/Back-up), will be used to screen samples and to detect the presence of any potential volatile organics. Source monitoring of the sample collection area will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source or downwind location(s) which may impact operations crew will require the following actions: - Monitor the breathing zone of at-risk and downwind employees. Any sustained readings (greater than 1 minute in duration) above 5 ppm in the breathing zone of the at-risk employees requires site activities to be suspended and site personnel to retreat to an unaffected area, notify PHSO, incorporate Level C Respiratory protection. - Work may only resume if airborne readings in worker breathing zone return to below 5 ppm or based on the use of identified respiratory protection. - If concentrations exceed 50 ppm (which is not anticipated based on reported concentrations) the level of protection will be increased to Level B protection. This increase in protection in based only on PHSO and HSM approval. Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides.	Level C - (Minimum Requirements) Initiated **Subsurface Soils - Borings and well advancement** **Screening and Sampling Staff** - Full-face APR (Advantage 1000®) with CBA-RCA canister - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses - Surgical style gloves *(double-layered if necessary)* - Hard hat (when overhead hazard exists) - Tyvek® coveralls; Impermeable garments if the potential exists for soiling or saturating. - Hearing protection for high noise areas - *Reflective vest for traffic areas* **Driller and Driller Helper** - Full-face APR (Advantage 1000®) with CBA-RCA canister - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses - Nitrile inner gloves; Butyl outer gloves - Hard hat (when overhead hazard exists) - Impermeable outer garments such as PVC Rain-suit or Saranex®, PE coated Tyvek® due to contact with contaminated tooling. Tyvek® coveralls with Butyl sleeves and apron is acceptable due to heat stress. - Hearing protection for high noise areas - *Reflective vest for traffic areas* **Level B Protection will be utilized if the following conditions are met** **VOCs -** Concentrations in air > 50.0 ppm in the Workers breathing zone. **CWM** – >0.1 mg/m^3 (0.015 ppm) **Monitoring Well Construction** **Driller, Driller Helper, and Oversight** Level D - (Minimum Requirements) - SAR with 5-minute Escape Bottle - Standard field attire (Sleeved shirt; long pants) - Safety shoes (steel toe/shank) - Safety glasses - Surgical style gloves *(double-layered or a heavy neoprene or nitrile glove for protection against the sharpedge ampoules)* - *Reflective vest for high traffic areas* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Tyvek coveralls and disposable boot covers if surface contamination is present or if the potential for soiling work attire exists.* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.* **Note:** The Safe Work Permit(s) for this task (see Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task. Protective levels may require modification should this activity be required to be conducted within a controlled zone due to an on-going operation.	**Personnel Decontamination** will consist of a soap/water (water component/ 5% bleach mix) wash and rinse for reusable and non-reusable outer protective equipment (boots, gloves, PVC splash suits, as applicable). This decontamination function may be subdivided into two locations. Gross contamination of outer boots and outer gloves will be removed at a satellite location near the operation. Final wash and rinse will take place at the centralized decontamination pad. The sequential procedure is as follows: Stage 1: Equipment drop, remove outer protective wrapping; Decon personnel will wipe down the outer shell and pass hand equipment through as necessary. Stage 2: Soap/water wash and rinse of outer boots and gloves Stage 3: Soap/water wash and rinse of the outer splash suit, as applicable Stage 4: Disposable PPE will be removed and bagged. Stage 5: Wash face and hands Stage 6: Depending on ambient conditions, you may be required to report for medical evaluation. This evaluation consists of pulse, breathing rate, oral temperature, and body weight. This medical screening will be performed when ambient conditions dictate and during periods of acclimatization. For more information concerning personnel decontamination, See Appendix J, Decontamination. **Equipment Decontamination** - All heavy equipment decontamination will take place at a centralized decontamination pad utilizing a steam cleaner. Current technology indicates hot water deactivation (steam cleaning) of the Mustard component is the most suitable means for removal and neutralization. Heavy equipment will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will have restricted access to exclusion zones, and have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the onsite activity. **Sampling Equipment Decontamination** Sampling equipment will be decontaminated as per the requirements in the Sampling and Analysis Plan and/or Work Plan. All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving on-site, leaving the site, and between locations. No equipment will be authorized access, exit, or movement to another location without this evaluation.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
NAVAL SURFACE WARFARE CENTER CRANE DIVISION, CRANE, INDIANA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Surveying – Geographical and Geophysical	***Chemical hazards:*** Significant exposure to site contaminants is anticipated to be unlikely given the nature of this task. ***Physical hazards:*** 1) Slips, trips, and falls 2) Ambient temperature extremes (cold stress ***Natural hazards:*** 3) Inclement weather 4) Insect/animal bites or stings, poisonous plants, etc.	1) Preview work locations and site lines for uneven and unstable terrain. Clear necessary vegetation, establish temporary means for traversing hazardous terrain (i.e., rope ladders, etc.) 2) Wear appropriate clothing for weather conditions. Acceptable shelter and liquids for field crews. 3) Suspend or terminate operations until directed otherwise by SSO 4) Avoid nesting areas, use repellents. Report potential hazards to the SSO. See Appendix F, Hazard Assessment for additional information concerning natural hazards. Relative to the time of the year this operation is conducted, certain natural hazards may have little bearing.	No air monitoring is needed given the unlikelihood that airborne contaminants will be present. The potential for exposure to site contaminants during this activity is considered minimal. As most of this activity is conducted either before or after the intrusive aspect of this operation, therefore, minimizing potential exposure.	Surveying activities shall be performed in Level D protection Level D Protection consists of the following: - Standard field dress including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - *Safety glasses, hard hats (if working near machinery or within brushy areas)* - *Snake chaps for heavily wooded area where encounters are likely.* - *Tyvek coveralls may be worn to provide additional protection against poisonous plants and insects, particularly ticks. Work gloves may be worn if desired.* **Note:** The Safe Work Permit(s) for this task (see Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task. Protective levels may require modification should this activity be required to be conducted within a controlled zone due to an on-going operation.	**Personnel Decontamination** - A structured decontamination is not required as the likelihood of encountering contaminated media is considered remote. However, survey parties should inspect themselves and one another for the presence of ticks when exiting wooded areas, grassy fields, etc. This action will be employed to stop the transfer of these insects into vehicles, homes, and offices.

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Decontamination Procedures
Removal of Vegetation	***Chemical hazards:*** Significant exposure to site contaminants is not anticipated given the nature of this task. ***Physical hazards:*** 1) Power equipment hazards - Struck by flying debris - Caught by rotating mechanisms - Entangled in the vegetation introduced into the feeder - Loose clothing entangled in the feeder 2) Cuts (or other injuries associated with hand and power tool use) 3) Slips, trips, and falls 4) Ambient temperature extremes (heat/cold stress) 5) Noise ***Natural hazards:*** 6) Inclement weather 7) Insect/animal bites or stings, poisonous plants, etc.	1) There are inherent hazards associated when working with chainsaws and chipper in the removal and sizing of wood and vegetation. **Chipper Safe Work Practices:** To protect workers from being caught by the chipper feed mechanism, employers should ensure the following: - All safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly before the chipper is used. - Workers are trained in safe work procedures, including operating wood chipper safety devices and safety controls. These procedures should be based on the manufacturer's recommendations for each machine. - At least two workers are in close contact with each other when operating the chipper. - Workers wear close-fitting clothing, gloves without cuffs, trousers without cuffs and skid-resistant foot wear. Clothing should be kept tucked in. - Worker's hands and feet remain outside the infeed hopper. - Workers feed brush and limbs into the infeed hopper butt end first. - Workers feeding material are positioned at the side of the machine to allow quick operation of the emergency shut-off device and minimize risk of entanglement in branches. Because of differences among machines, the manufacturer's operating manual should be consulted for guidance. Safe feeding of some disc-type chippers requires the worker to be on the right side. - Workers walk away once the feed mechanism has grabbed the material. - Workers lay short material on top of longer material that is feeding or use a longer branch to push it through the infeed hopper. - Workers load small raked-up material such as twigs and leaves directly into the chip truck or in trash cans or bags instead of feeding it into the chipper. - Workers keep the area around the wood chipper free of tripping hazards. - Workers wear hard hats, eye protection, and hearing protection. To protect workers against being struck by flying hoods covering chipper discs or drums, employers should ensure the following: - Wood chippers are inspected each working day before startup for defects such as broken or missing hood latches and pins or cracked and worn hinges. Broken, damaged, or missing machine components should be repaired or replaced before the machine is placed in service. - The hood covering the chipper knives is completely closed and latched according to manufacturer's recommendations before starting the machine. - Before processing material and unless the manufacturer recommends otherwise, the machine is run at the lowest possible speed while workers listen for noise that might indicate broken or loose machine parts. If unusual noise is detected, the machine should be shut down immediately and evaluated by a competent person. If necessary, the machine should be repaired before being placed in service. - All internal machine parts have come to a complete stop before the hood covering the chipper disc or drum is opened. Chainsaw operations - Ensure all machine guarding is in place and functional - Ensure all protective gear is properly employed (i.e., chainsaw chaps, helmet, visor, hearing protection, etc.) - Ensure the chain is properly adjusted and sharp - Ensure operators are knowledgeable in the operation of the chainsaw and the procedures for falling large trees - Place the saw on the ground, foot on pad, hand on control bar, brake is in place to start - Ensure ample clearance when falling trees over 10 feet in height - Provide a clear escape route when falling trees of substantial height 2) All tools will be inspected prior to use for broken components, insure guarding is in place and functional, and suitability for use. - All personnel not directly supporting this clearance activity will remain at least 25 feet from the point of this operation. - Work areas will be kept clear of clutter. - Brush should be cut for lines of sight as close to the ground as possible to eliminate puncture and trip hazards. All brush should be cleared from sight path where persons will have to travel. - Brush hooks, machetes, chain saws, and other tools should be kept sharp to provide ease of cutting. Broken or loose handles should be repaired prior to use. - Falling larger trees (>4 inch girth) requires a two man operation. All chipping operations require two men working closely with one another. 3) Preview work locations and site lines for uneven and unstable terrain. Clear necessary vegetation, establish temporary means for traversing hazardous terrain (i.e., rope ladders, etc.) 4) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat/cold stress and other assorted natural and physical hazards are provided in Appendix F. 5) The various motorized equipment including chainsaws and chippers are extremely noisy. Levels anticipated range between 97 and 108 dBA, therefore, will require the use of hearing protection. 6) Suspend or terminate operations until directed otherwise by SSO 7) Avoid nesting areas, use repellents. Report potential hazards to the SSO. Follow guidance presented in Appendix F.	Based on historical information and the type of activities and the contaminants of concern, it is not anticipated that field crews associated with this task will be overexposed to any of the site contaminants. Chainsaw and chipper operations exceed 85dBA, therefore no additional noise dosimetry will be conducted to further quantify noise sources.	The removal of vegetation is anticipated to be initiated in a modified Level D protection. Level D - (Minimum Requirements) For vegetation clearance activities: Hand tools (Brush hook, machete, etc.) - *Tyvek coveralls (Based on site conditions, time of the year, etc.)* - Field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Work gloves - Safety glasses (with face shield for highly overgrown areas or where hazards to the face are present/created) - *Hardhat (when overhead hazards exists, or identified as an operation requirement)* - *Snake chaps for heavily wooded area where encounters are likely.* **Chainsaw/Chipper Operation** - Same as above - Chain saw chaps - Screen visor - Hearing Protection Note: The Safe Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.	**Personnel Decontamination** It is not anticipated that site personnel engaged in this task will encounter any of the associated site contaminants. Therefore, personnel decontamination will consist of - Equipment drop - Remove disposable outer protective garments as applicable - Wash hands, face, and exposed skin areas, leave contamination reduction zone Note: A variety of plant species (i.e., poison ivy, poison oak, etc.) will cause allergic dermatitis in some persons. Care should be taken to apply barrier guards/creams to exposed skin, and wash with cool water to remove associated oils derived from contact with these plants. This precaution is recommended when these plant species are identified within the area of operation. As this activity may have personnel entering and working in high brush, field personnel should perform a visual inspection of themselves and partners of their outer garments for ticks. A closer self inspection should be performed when showering for any insects which may have gotten under your clothing and attached to your body. Areas to check closely are those which are more moisture laden, inside socks, groin area, arm-pits, etc.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES
NSWC CRANE, CRANE, INDIANA

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment	Decontamination Procedures
Excavation of Identified Anomalies at the Mustard Gas Burial Grounds (MGBG). Method of Excavation – A Back-hoe will be used to remove overburden, then the remainder of the excavation will proceed by hand using shovels to remove the last 2-6-inches. In addition to the excavation activity, this hazard assessment also includes back-filling, compaction of back-fill, and site restoration efforts. Due to the inherent hazards associated with this activity, three field team members will support this [illegible]ration. Their [illegible]s and responsibilities are as follows: - SSO/RSO - Ground Spotter/UXO - Operator/UXO.	***Chemical and Radiological hazards:*** 1) Historical information indicates the following compounds as potential contaminants of concern in the areas possibly associated with the anomalies. These are as follows: Thorium Nitrate (13823-29-5) Mustard Gas (505-60-2) Other contaminants have been identified as existing within the groundwater. However, these are not considered pertinent during this activity. Table 6-1 (and Attachment IV – Mustard Gas MSDS) provides additional information about each of the identified contaminants of concern. 2) Transfer of contamination into clean areas or onto persons. ***Physical hazards:*** 3) Unexploded Ordnance (UXO) 4) Heavy equipment/machinery hazards (moving equipment, struck by hazards, etc.) 5) Collapse of the excavation 6) Energized systems (contact with underground or overhead utilities) 7) Noise in excess of 85 dBA 8) Vehicular and equipment traffic 9) Strains from heavy lifting 10) Slips, trips, and falls 11) Cut, abrasions, and lacerations ***Natural hazards:*** 12) Inclement weather	***Chemical and Radiological hazards:*** **1) Radiological Areas/Hazards** - In all cases where radiological concerns are evident based on field screening ALARA (As Low As Reasonably Achievable) concepts will be practiced. This includes: Clear definition of effected area boundaries - Radiological Area >5mrem but< 100 mrem (Based on information derived direct reading instrument results, these areas will be properly identified and demarcated using signs or equivalent warning). Areas associated with this scope of work in excess of 100 mrem are not anticipated based on historical information. Should levels of this magnitude be encountered, field personnel will evacuate until a Radiation Safety Plan can be implemented. - Radiological Buffer Zones < 5mrem Minimizing time of exposure through efficient work practices, rotation of personnel, and reduced stay time in the effected areas. All site personnel will be equipped with a Thermoluminescent Detector (TLD) Badges. Personnel charged with physically handling the samples will be provided with a Ring Dosimeters. Within these areas protective clothing, respiratory protection, and personnel dosimetry will be required. **Chemical Warfare Materials (CWM)** - Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.). As it pertains to both radiological and CWM – The generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, activities must be suspended until dust levels subside, or until an acceptable alternative control method can be selected. **2) Transfer of contamination** - Restrict the cross use of equipment and supplies between locations and activities without first going through a suitable decontamination. Work practices including - Excavating from the furthest point on the identified anomaly and working out (into the wind) will minimize tracking contaminated materials over clean areas. - A rigid decontamination procedure at the excavation anomaly locations will ensure materials are not carried and deposited in unaffected areas. - Restriction of non-essential vehicles will be employed to minimize the spread of this material during transportation into unaffected areas. - Excavated materials should be segregated. Top 1-2-feet should be placed on polyethylene sheeting away from the rest of the materials to be removed. This top 1-2-feet removed shall serve as final or top cover when back-filling. The remainder should be placed on polyethylene sheeting in a separate pile. In all cases the soils removed from the excavation will be segregated, if instrument results indicates positive detection of CWM and/or radiological contamination above identified action levels. - Pallets or polyethylene sheeting should be maintained at the excavation site to place the anomalies on when extracted from the excavation pit. This will also assist in the transport of these items to the decontamination station for decontamination prior to disposal. **3) Unexploded Ordnance (UXO)** – The UXO/EOD technician will be responsible for screening soils as they are excavated to ensure these materials contain no UXO related materials. Suspicious items will be marked and personnel will secure the area and notify appropriate site contacts. See Appendix I. ***Physical hazards:*** **4) Heavy equipment/machinery hazards (moving equipment, struck by hazards, etc.)** - All equipment to be employed will be: - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,601, 602), and manufacturer's design, and documented as such using Equipment Inspection Checklist provided as Attachment II. - Equipment operation will be conducted by knowledgeable operators and coordinated by experienced ground crew, as applicable. - Used within safe work zones, with routes of approach clearly demarcated. All personnel directly supporting this operation will remain at least the length of a fully extended boom + 5-feet with a minimum distance of 25-feet from the point of operation during excavation. All persons not supporting this operation will remain at least 100-feet from the point of operation. The FOL may, as necessary, restrict associated activities downwind during this operation. In addition to equipment considerations, the following safe operating procedures will be incorporated: - Only manufacturer-approved equipment may be used in conjunction with equipment repair procedures (e.g., lifting attachments, etc.). - Work areas will be kept clear of clutter and unnecessary personnel. - All self-propelled equipment shall be equipped with movement warning systems. - See additional safe work procedures for excavation activities in Section 5.3 of this HASP addendum. **5) Collapse of the Excavation** - All excavations shall be in conformance with requirements established under 29 CFR 1926.650 - .652 concerning sloping, shoring, storage, and movement on and over and around trenches and excavations. - No personnel associated with this field effort will enter any excavations without expressed permission of the SSO. - All supplies, clean fill, vehicular traffic will be maintained at a minimum distance of 10 feet from the excavation until soil classification can be determined or side-wall restraining devices are employed. - The teeth of the bucket will have a flat bar or cutting bar attached to the teeth also known as a sand bar to prevent the teeth of the backhoe from snagging any undetected utility. - Site control boundaries during excavation will be accomplished through the use of barricade tape and weighted poles and signs indicating excavation in progress **6) Energized Systems** – All utility clearances shall be obtained prior to any excavation activities. All utility location and excavation clearance activities completed prior to the excavation activities, will proceed in accordance with the Utility Locating and Excavation Clearance SOP located in Appendix L of this HASP. **7) Noise in Excess of 85 dBA** - Hearing protection will be used during all subsurface activities during the excavator operation. **8) Vehicular and Equipment Traffic** – Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e., Boom + 5 feet) for operational support. - All self-propelled equipment shall be equipped with movement warning systems. - Operator(s) will wear seat belts during equipment operation. See Section 5.3.1 through 5.3.3 of this HASP for associated Safe Work Practices concerning excavation. **9) Strains from Heavy Lifting** - Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. See mobilization/demobilization for lifting recommendations. **10) Slips, Trips, and Falls** - The following additional provisions shall be employed to minimize hazards of this nature - Avoid working/walking too close to excavation and other areas of unsure footing. A Minimum distance of 3-feet for pedestrian pathways should be maintained from excavation edges. - Back filling activities should proceed in 1-foot lifts and allow compaction with the bucket. Improper/inadequate compaction may result in areas settling and creating trip and fall hazards. - Ruts, roots, and other tripping hazards should be eliminated approaching excavation edges should be minimized to the extent possible to avoid trips and falls when approaching excavation edges or boundaries. - Maintain a clutter free work area. - As part of site control efforts construct fences or other means of demarcation (i.e. signs and postings) to control and isolate traffic in the work area. Means of demarcation shall also be	Site screening will encompass monitoring for two separate and distinct parameters, as well as, monitoring for the Health and safety of field personnel. All excavated soils will be screened for - Levels of radioactivity - Presence or absence of CWM. **Radiological Screening** - Radiation monitoring will be supported using a Ludlum Model 3 with a Pancake Geiger-Mueller Detector or Squared Alpha Scintillation probe or equivalent suitable for Alpha and beta emissions. Radiation Release Limit -Less than 2 µCi (250 cpm) above background will be considered non-hazardous from a radiological threat. Radiation Retention Limit >2 µCi or >250 cpm – - Notify NSWC Crane Radiation Safety Office. - Segregate IDW generated from this location. - Label shipping and waste storage containers appropriately. **Note:** This information is provided as a contingency plan for incidental encounters. Irradiated materials are not anticipated. Should multiple hits occur, this HASP will be modified to include elements required of a Radiation Safety Plan (RSP). **CWM** - Monitoring will be conducted using MSA/Auer CWA Detector Tube or the AP2C Chemical Agent Detector Kit to detect and quantify CWM. All subsurface soil samples (taken from the foot print of the anomaly) will be screened prior to sending to the analytical laboratories. This screening will involve the extraction of additional sample material (minimum 10 ounces) placed in a jar with aluminum foil over the top. This sample will be placed in a soil oven to generate sufficient heat in the sample to drive off into the head space any CWM (Estimated temperature: 20-25°C; 68-77°F). The volatility rate for this temperature range is 90-140 ppm (600-900 mg/m^3). The head space concentration will then be measured. The following represent the action levels Release limit – <0.1 mg/m^3 (0.015 ppm) the sample is considered free of CWM for shipping purposes. >0.1 mg/m^3 (0.015 ppm)– Send sample to CWM Laboratory for quantification, prior to releasing to radiological and chemical analytical laboratories. Based on quantification determine release status. When samples are impacted with CWM, efforts should be made to extract additional sample material from within the sample interval not impacted by CWM, so that analytical and radiological quantification may proceed. **Visual Observation** - Site contaminants (radiological or CWM) may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides. **7) Noise Monitoring** - Monitoring of excessive noise levels during this activity will not be accomplished. This decision is based on the short duration of this activity and previously accumulated data. Protection from excessive noise levels during this activity will be facilitated through the use of hearing protection. **12) Inclement Weather –** **Heat Stress Monitoring - Equipment Required: oral thermometer, ambient temperature thermometer, watch with second indication, and weight scale. Heat Stress Action Levels** (70ºF and above or at SSO Discretion) **Oral Temperature** - >99 6 to 100.6ºF at the beginning of the rest period Action – Reduce next work period by 33% >100.6ºF at the end of a rest period Action – Restrict re-entry, implement more aggressive cooling measures. **Heart Rate by Pulse** - >110 beats/minute Action – Reduce next work period by 33%. >110 beats/minute at the end of a rest period Action – Restrict re-entry, implement more aggressive cooling	Excavation activities will be initiated in Level C - (Minimum Requirements) protection **Ground Support - Screening and Sampling Staff** - Full-face APR (Advantage 1000®) with CBA-RCA canister - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses - Surgical style gloves *(double-layered if necessary)* - Hard hat (when overhead hazard exists) - Tyvek® coveralls; Impermeable garments if the potential exists for soiling or saturating. - Hearing protection - Reflective vest for Ground Crew **Operator** - Escape Respirator (Full-face with 5-minute (Enclosed Cab) - Full-face APR (Advantage 1000®) with CBA-RCA canister (Open Cab) - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses - Tyvek® coveralls - Hearing protection (as necessary) **Level B Upgrade** **CWM** – >0.1 mg/m^3 (0.015 ppm) **Note:** The Safe Work Permit(s) for this task (see Appendix G) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task. Protective levels may require modification should this activity be required to be conducted within a controlled zone due to an on-going operation. ***(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)***	**Personnel Decontamination** Decontamination Solution – Soap and water wash and rinse followed by a 5.00% bleach and water solution rinse. This decontamination procedure for **Level C** protection will consist of Level C Decontamination - Equipment drop - Soap/water wash and rinse of outer boots, - Bleach and water rinse - Remove Tyvek coveralls - Removal or PPE in the following order: Boot covers, coveralls, and APR, inner gloves All levels of protection: - Wash hands and face, leave contamination reduction zone - Report for any heat/cold stress surveillance as directed.

TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES
NSWC CRANE, CRANE, INDIANA

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment	Decontamination Procedures
		constructed isolating resource and/or staging areas. - All heavy equipment shall be constructed with 3-point mounting system. 11) **Cuts, Abrasions, and Lacerations** – The excavation activities will be employed to dig up metallic objects in an area that was used for land-fill purposes. Given this condition, the potential exists to encounter sharp or potentially jagged materials. Wear leather or cut resistant gloves when handling potentially sharp or jagged excavated items. 12) **Inclement Weather** – To minimize hazards of this nature, the following provisions shall be employed: - Wear appropriate clothing for weather conditions. - Provide acceptable shelter and replacement liquids for field crews as relief from excessive ambient temperatures. - Under conditions of elevated levels of PPE, periods of acclimatization, excessive ambient temperature extremes, or if you believe someone is suffering from a heat/cold related disorder, it may be necessary to conduct heat/cold stress monitoring as prescribed in the monitoring section. - Electrical storms/high winds - Suspend or terminate operations until directed otherwise by SSO. Follow the provisions as specified in Section 4.0 of the Tetra Tech NUS, Inc. Health and Safety Guidance Manual regarding the identification and evaluation of heat/cold stress related conditions.	measures, monitor conditions. If there are little indication of the pulse rate declining, seek medical support, notify the PHSO. Body Weight Loss – 1.5% body weight over a shift. Persons based on the level of physical exertion should be encouraged to drink 2-3 4 oz. Cups of water every 15-20 minutes to maintain or 1-1.5 gallons per day to avoid dehydration. This is a recommendation based on the results indicating weight loss over a day. Visual monitoring for signs of heat stress.		

6.0 HAZARD ASSESSMENT

The following section provides information regarding the chemical, physical, and natural hazards associated with the sites to be investigated and the activities that are to be conducted as part of the scope of work. Table 6-1, which is included as part of this HASP, provides information on potential chemical contaminants, including exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data.

6.1 CHEMICAL HAZARDS

The potential health hazards associated with work to be conducted at NSWC Crane include inhalation, ingestion, and dermal contact with contaminants that may be present in ground water and shallow soils. Based on the site history and prior sampling efforts, the following have been identified as the primary classes of site contaminants, including the specific compound(s) of interest:

- Mustard Gas – Historical information indicates that aerial bombs with Mustard Gas were decommissioned and buried at the MGBG. Previous exhumation efforts indicated aerial bombs were located and removed. Of the sixteen aerial bombs removed, one had approximately ½ gallon and one contained approximately 3 gallons of Mustard material. Some mustard gas as released to the ground and decontaminated by flooding with a hypochlorite solution. See Figure 6-1, MSDS for Mustard Gas for more information on this substance. It should be noted that the MSDS provided is for a manufactured product. The information provided may not be completely representative of a substance disposed of over 20 years ago which has been subjected to external environmental conditions.

  Based on the discovery during the exhumation and the report concerning decommissioning and decontamination of these items, obvious discrepancies are identified. Therefore this field approach will proceed from the standpoint that Mustard Gas will be encountered.

- Volatile Organic Compounds (VOCs), primarily chlorinated solvents include the following substances

CAS No.	Substance
79-34-5	1,1,2,2-Tetrachloroethane
79-01-6	Trichloroethene (TCE)
107-06-2	1,2-Dichloroethane
127-18-4	Tetrachloroethene (PCE)
79-00-5	1,1,2-Trichloroethane
156-60-5	Trans 1,2-Dichloroethene
7681-52-9	Sodium Hypochlorite (non-volatile – Household bleach)

Table 6-1 provides information on these compounds and individual substances likely to be present at the sites to be investigated. Included is information on the toxicological, chemical, and physical properties of these substances. It is anticipated that the greatest potential for exposure to site contaminants is during intrusive activities (soil borings, sampling, etc.). Exposure to these compounds is most likely to occur through inhalation or dermal contact of contaminated soil or water, or through ingestion via hand-to-mouth contact during soil disturbance activities. For this reason, PPE and basic hygiene practices (e.g., washing face and hands before leaving site) will be extremely important. Inhalation exposure will be avoided by using appropriate PPE and engineering controls where necessary.

Other sources of potential chemical exposure are decontamination fluids (e.g., Liquinox, isopropanol), and analytical preservatives. For any substances brought onto the site, the SSO is responsible for instituting a site-specific Hazard Communication Program (see Appendix E) and for collecting the appropriate Material Safety Data Sheets (MSDS) from the chemical manufacturers/suppliers. The SSO is also responsible for completing the Safe Work Permit for the decontamination task using the appropriate MSDS and for reviewing the contents of the MSDSs and Safe Work Permit with anyone who will use these substances.

6.2 PHYSICAL HAZARDS

In addition to the chemical hazards discussed above, the following physical hazards may be present during the performance of the site activities.

- Slips, trips, and falls
- Cuts (or other injuries associated with hand tool use)
- Lifting (strain/muscle pulls)
- Ambient temperature extremes (cold and heat stress)
- Pinches and compressions
- Heavy equipment hazards (rotating equipment, hydraulic lines, etc.)
- Energized systems (contact with underground or overhead utilities)
- Vehicular and foot traffic
- Contact with Unexploded Ordnance (UXO)
- Noise in excess of 85 dBA
- Flying projectiles

Each of these physical hazards is discussed in greater detail in Appendix F, Hazard Assessment. Additionally, information on the associated control measures for these hazards are discussed in Table 5-1 of this HASP. Some of these hazards and the associated control measures are discussed below.

6.2.1 Slips, Trips, and Falls

Conditions such as steep terrain and/or heavy vegetation may create an increased potential for slip, trip, and fall hazards.

- The safest approach to sample points will be identified and cleared to permit field crew access to sample locations.
- Establish anchor points and rope handrails for traversing/ascending/descending angles and slopes greater than 45% grade.
- Footwear with an adequate traction.
- Prepare work areas by removing tripping hazards (ruts, roots, debris). This is especially critical around rotating equipment, where a fall into the rotating apparatus could be life threatening.

6.2.2 Cuts or Other Injuries Associated with Hand Tool Use

The clearing of brush and vegetation will be performed using hand tools that may include machetes, brush axes, chainsaws and chippers. Chainsaws and chipper operations are discussed in detail in Table 5-1. However, the use of hand tools has only briefly discussed. The control measures presented below will help minimize the potential for physical and cutting hazards.

- Wear leather or heavy cotton work gloves when using tools to protect against blisters, cuts, or other hand injuries.
- Wear eye protection (safety glasses with side shields) to protect the eyes from twigs, sticks, or flying debris.
- Clear the immediate cutting area of all personnel (radius of the tool swing area).
- Wear long pants and long-sleeved shirts to protect against abrasions.
- Wear hard hats if work will involve areas with overhead hazards (e.g., overhanging branches).
- Wear sturdy work boots.
- Inspect all hand tools [i.e., shovel handles (cracks, splinters, etc.), brush hook handles and blade attachment points, etc.)
- Ensure all hand tools are sharp to facilitate cutting action. This will avoid persons forcing the tool to cut and increasing potential hazards.
- Use the proper tool for the intended purpose. This to will avoid potential injury possibly created through improper use.

6.2.3 Contact with UXO

Because of the prior uses of the areas to be investigated, there is a possibility that UXO may be encountered during operations. All activities will be conducted consistent with the UXO procedures discussed in Appendix I of this HASP with indicated variances.

- In general, field personnel will practice UXO avoidance techniques.
  - Do not pick-up or kick any unknown materials.
  - Notify the EOD Specialist if you encounter unknown materials.
  - Where the potential exists for UXO materials the EOD Specialist will clear all access routes and work areas.

- To minimize the risk of a UXO encounter, a trained UXO or EOD Specialist will provide support during selected site activities. In all cases, an exclusion zone of 300 feet will be established before detection activities begin.

- The borehole will be cleared down to a depth of two (2) feet and a magnetic gradiometer (down-hole instrument) or similar instrument will be lowered into the hole to clear the borehole. This clearance procedure will continue until the borehole has been cleared to a depth of ten (10) feet. This will be accomplished by hand. Advancement through mechanical means may proceed within a two foot radius of the clearance boring.

The site-specific training in avoidance techniques and safe work practices will be discussed in detail during site-specific training.

6.3 NATURAL HAZARDS

Insect/animal bites and stings, poisonous plants, and inclement weather are natural hazards that may be present given the location of activities to be conducted. As previously discussed, some portions of the site include vegetated areas which increases the potential for field crews to encounter ticks, bees, mosquitoes/insects, snakes, and poisonous vegetation.

6.3.1 Insect Bites and Stings

Insect/animal bites and stings are difficult to control given the climate and environmental setting of NSWC Crane. However, in an effort to minimize this hazard the following control measures will be implemented where possible.

- Commercially available bug sprays and repellents will be used whenever possible – Pesticides analytical screening includes chlordane, endrin, lindane, methoxychlor, toxaphene and heptachlor. Commercially available repellants may be used providing they don't contain substances which appear on the analytical list for pesticide analysis. Products such as DEET should not be applied directly to the skin due to potential irritation. This product, when permitted for use, should be applied over clothing articles.

- Where possible, loose-fitting and light-colored clothing with long sleeves should be worn. This will also aid in insect control by providing a barrier between the field person and the insects and to provide easy recognition of crawling insects against the lighter background. Pant legs should be secured to the work-boots using duct tape to prevent access by ticks. Mosquito nets are also recommended for use when commercially available repellents are not permitted.

- Clothing/limited body checks for ticks and other crawling insects should be conducted upon exiting heavily vegetated areas. Workers should perform a more detailed check of themselves when showering in the evening. Ticks prefer moist areas of the body (arm-pits, genitals, etc.) and will migrate to those locations.

- The FOL/SSO will preview all access routes and work areas in an effort to identify physical hazards including nesting areas in and around the work sites. These areas will be flagged and communicated to all site personnel.

- The FOL/SSO must determine if site personnel (through completion of Medical Data Sheets), suffer allergic reactions to bee and other insect stings and bites. Field crew members who are allergic to bites should have their emergency kit containing antihistamine and a preloaded syringe of epinephrine readily available.

Any allergies (insect bites, bee stings, etc.) must be reported on the Medical Data Sheet and to the SSO.

6.3.1.1 Tick and Mosquito Transmitted Illnesses And Diseases

Ticks and mosquitoes have been identified in the transmission of diseases including Lyme's disease and malaria. Warm months (Spring through early Fall) are the most predominant time for this hazard.

Information concerning Lyme's Disease including recognition, evaluation, tick removal, and control is provided in Appendix F, Hazard Assessment of this HASP.

Malaria may occur when a mosquito or other infected insect sucks blood from an infected person, and the insect becomes the carrier to infect other hosts. The parasite reproduces within the mosquito, and is then passed on to another person through the biting action. Acute symptoms include chills accompanied by fever and general flu like symptoms. This generally terminates in a sweating stage. These symptoms may recur every 48 to 72 hours.

6.3.2 Snakes and Other Wild Animals

Indigenous animals including snakes (poisonous and non-poisonous varieties), raccoons, and other animals native to the region may be present at the site. These animals may be encountered if work locations encroach on nesting or territories claimed by these animals.

To avoid the obvious hazards conveyed as part of a direct encounter, the following actions will be taken to minimize impact on the field crews and/or operations. The FOL/SSO will preview access routes and work locations for nesting areas or signs of animal activities (tracks, foraging areas, etc.). All identified suspect areas will be communicated to the field crews. Snake chaps will be required as a precaution.

6.3.2.1 Snake Bites

All initial efforts will be directed to avoid, where possible, nesting and territorial areas. However, should field personnel come in contact with these animals and receive a bite, the following actions are necessary.

- Obtain a detailed description of the snake. This and the bite mark will enable medical personnel administering medical aid to provide prompt and correct antidotes, as necessary.

- Immobilize the bite victim to the extent possible. Physical exertion will mobilize the toxins (if poisonous varieties) from the bite point systemically through the body.

- Apply a pressure wrap (for extremities), just above and over the bite area. With a couple wraps of the pressure wrap in place over the bite area, apply a splint, and continue the application of the pressure wrap. The purpose for the splint is to restrict the movement of the extremity, this along with the pressure wrap will aid in restricting the toxins from leaving the site of the bite.

- Seek medical attention immediately.

6.3.3 Poisonous Plants

Various plants which can cause allergic reactions may be encountered during field work. These include, poison ivy, poison oak, and poison sumac. Contact with these plants may occur when clearing vegetation for access to work areas, or as a result of movement through these plants. An irritating, allergic reaction can occur after direct contact with the plant or indirect contact through some piece of equipment or clothing article. Oils are transferred from the plant to exposed skin, clothing, or piece of equipment. The degree of the irritating, allergic reaction can vary significantly from one person to the next.

Protective measures to control and minimize the effects of this hazard may include, but not be limited to, the following:

- Identify plants for field personnel.

  - Poison Ivy - Characterized by climbing vines, three leaf configuration ovate to elliptical in shape, deep green leaves with a reddish tint, greenish flowers, and white berries.

  - Poison Sumac - Characterized as a tall bush of the sumac family bearing compound leaves (7-13 entire leaflets), branched from a central axis, drooping, with axillary clusters of white fruit: However, these white fruits and berries may exist only during pubescent stages.

  - Poison oak - Characterized as similar to poison ivy consisting of a shrub, stems erect, 0.3 to 2.0 meters tall, leaflets consist of broad thick lobes coarsely serrated configuration, denser at the base, less so than the top.

- Protective measures may include wearing disposable garments such as Tyvek when clearing brush. These may be carefully removed and disposed of along with any oils accumulated from the plants.

- Personal Hygiene - The oils obtained from the plants will only elicit an allergic response when the person's bare skin layer is contacted. This can be aggravated when skin pores are open (perspiring), or through breaks in the skin such as cuts, nicks, scratches, etc. This can also be accomplished when using excessively hot water for cleaning the skin, which also causes pores to open. Prior to break time, lunchtime, etc. personnel should wash with cool water and soap to remove as much of the oils as possible. In heavily vegetated areas of these plants, additional measures including barrier creams and blocks may be used to prevent the oils from accessing and penetrating the skin.

All of these plants present an airborne sensitization hazard when burned. This is not to occur as part of this scope of work and therefore will not be addressed.

6.3.4 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather conditions arise (electrical storms, hurricanes, etc.), the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NSWC CRANE, CRANE, INDIANA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1,2- Trichloroethane	79-00-5	PID: I.P. 11.0 eV, relative response ratio unknown. FID: 85% response with FID.	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; Sampling and analytical protocol in accordance with OSHA Method #07, or NIOSH Method #1003 Halogenated Hydrocarbons.	OSHA; NIOSH; ACGIH: 10 ppm (skin) IDLH: 100 ppm	No information was found concerning odor threshold limits. The use of air-purifying respirator with organic vapor cartridge for <100 ppm for escape purposes is permitted. Exceedances above 100 ppm will require the use of airline or SCBA combination units. **Recommended glove:** Butyl rubber,solvent dipped, unsupported - >5.78 hrs; PV alcohol - >8.00 hrs; Teflon - >24.00 hrs; Viton - <24.00 hrs	**Boiling Pt:** 237°F; 114°C **Melting Pt:** -31°F-35°C **Solubility:** 0.6% **Flash Pt:** Not available **LEL/LFL:** 6% **UEL/UFL:** 15.5% **Vapor Density:** Not available **Vapor Pressure:** 19 mmHg @ 68°F; 20° C **Specific Gravity:** 1.44 **Incompatibilities:** Acids, acid fumes, oxidizers, caustics, and chemically active metals such as aluminum, magnesium, sodium, potassium, etc. **Appearance and Odor:** Colorless liquid with a sweet chloroform-like odor.	Overexposure to this substance may cause irritation to the eyes, skin, and mucous membranes of the respiratory and gastrointestinal tract. CNS effects may include sleepiness, incoordination, depression similar to a narcotic. Chronic exposure may cause liver, kidney and lung damage. This substance has demonstrated carcinogenic potential in laboratory animals. Repeated or prolonged exposure may cause dermatitis.
1,2-Dichloroethane see also Ethylene Dichloride	107-06-2	PID: I.P. 11.05 eV, 140% relative response ratio. FID: 80% response with FID.	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; Sample and analytical protocol in accordance with NIOSH Method #1003	OSHA: 50 ppm Ceiling 100 ppm ACGIH: 10 ppm NIOSH: 1 ppm IDLH: 50 ppm	Inadequate - This compound has poor warning properties (odor threshold 26 ppm) OSHA allows the use of organic vapor cartridges in certain circumstances. **Recommended glove:** Polyvinyl alcohol >8.00 hrs; Viton 6.90 hrs; Teflon >24.00 hrs; Silver Shield >6.00 hrs	**Boiling Pt:** 182°F; 83°C **Melting Pt:** -31°F; -35°C **Solubility:** 0.9% **Flash Pt:** 56°F; 13°C **LEL/LFL:** 6.2% **UEL/UFL:** 16% **Vapor Density:** Not available **Vapor Pressure:** 64 mmHg @ 68°F; 20° C **Specific Gravity:** 1.24 **Incompatibilities:** Strong oxidizers and caustics, chemically active metals such as aluminum or magnesium powder, sodium and potassium. **Appearance and Odor:** Colorless liquid with a pleasant, chloroform-like odor.	Exposure to this substance may cause CNS depression, nausea, vomiting, dermatitis, and irritation of the eyes. Chronic overexposure may result in damage to the kidneys, liver, eyes (cornea opacity), skin and CNS.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NSWC CRANE, CRANE, INDIANA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1,2,2-Tetrachloroethane	79-34-5	PID: I.P. 11.1 eV, relative response ratio unknown. FID: 100% response with FID.	Air sample using charcoal tube; carbon disulfide desorption, GC/FID detection. Sampling and analytical protocol in accordance with OSHA Method #07, or NIOSH Method #1003.	OSHA: 5 ppm (skin) ACGIH; NIOSH: 1 ppm (skin) IDLH: 100 ppm	Odor threshold for this substance is 7.3 ppm. This level in comparison to the TLV is considered poor. Air purifying elements (organic vapor/acid gas) are recommended for escape purposes only. Combination units (APR/airline respirator) are recommended for working in concentrations in excess of the TLV. **Recommended glove:** Butyl rubber 4.6 hrs; solvent dipped, unsupported. PV alcohol >8.00 hrs; Teflon >15.20 hrs; Viton >8.00 hrs	**Boiling Pt:** 296°F; 147°C **Melting Pt:** -33 to -47°F; -36 to -43.8°C **Solubility:** 0.3% **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 9 mmHg @ 86°F; 30°C **Specific Gravity:** 1.59 @ 77°F; 25°C **Incompatibilities:** Strong oxidizers, alkalis, fuming sulfuric acid, and chemically active metals. When heated to decomposition temperatures will emit toxic fumes of chlorine. **Appearance and Odor:** Colorless to pale yellow liquid with a pungent chloroform like odor.	Overexposure may result in CNS effects including depression, sleepiness, hallucinations, distorted perceptions, tremors(fingers), and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, abdominal pains, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, enlarged tender liver, jaundice, hepatitis, kidney, and lung damage.
Trichloroethylene	79-01-6	PID: I.P. 9.45 eV, High response with PID and 10.2 eV lamp. FID: 70% Response with FID.	Air sample using charcoal tube; carbon disulfide desorption; Sampling and analytical protocol shall proceed in accordance with OSHA Method #07, or NIOSH Method #1022 or #1003.	OSHA: 50 ppm 200 ppm (Ceiling) ACGIH: 50 ppm 100 ppm STEL NIOSH: 25 ppm IDLH: 1000 ppm	Inadequate - Odor threshold 82 ppm. APRs with organic vapor/acid gas cartridges may be used for escape purposes. Exceedances over the exposure limits require the use of positive pressure-demand supplied air respirator. **Recommended gloves:** PV Alcohol unsupported >16.00 hrs; Silver shield >6.00 hrs; Teflon >24.00 hrs; or Viton >24.00 hrs; Nitrile (Useable time limit 0.5 hr, complete submersion for the nitrile selection)	**Boiling Pt:** 188°F; 86.7°C **Melting Pt:** -99°F; -73°C **Solubility:** 0.1% @ 77°F; 25°C **Flash Pt:** 90°F; 32°C **LEL/LFL:** 8% @ 77°F; 25°C **UEL/UFL:** 10.5 @ 77°F; 25°C **Vapor Density:** 4.53 **Vapor Pressure:** 100 mmHg @ 90°F; 32 °C **Specific Gravity:** 1.46 **Incompatibilities:** Strong caustics and alkalis, chemically active metals (barium, lithium, sodium, magnesium, titanium, and beryllium) **Appearance and Odor:** Colorless liquid with a chloroform type odor. Combustible liquid, however, burns with difficulty.	Central nervous system effects including euphoria, analgesia, anesthesia, paresthesia, headaches, tremors, vertigo, and somnolence. Damage to the liver, kidneys, heart, lungs, and skin have also been reported. Contact may result in irritation to the eyes, skin, and mucous membranes. Ingestion may result in GI disturbances including nausea, and vomiting NIOSH lists this substance a potential human carcinogen.

TABLE 6-1

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NSWC CRANE, CRANE, INDIANA

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Tetrachloroethylene See also Perchloroethylene PERK PCE	127-18-4	PID: I.P. 9.32 eV, relative response ratio 200% with 10.6 eV lamp. FID: 70% relative response ratio with a FID.	Air sample using charcoal tube; carbon disulfide desorption; GC/FID detection. Sampling and analytical protocol shall proceed in accordance with OSHA Method #07, or NIOSH Method #1003.	ACGIH: 25 ppm 100 ppm STEL OSHA: 100 ppm 200 ppm Ceiling; 300 ppm 5-minute max peak in any 3-hr period. IDLH: 150 ppm	Odor threshold for this substance has been determined to be at airborne concentrations of approximately 47 ppm, which is considered adequate. APR with organic vapor/acid gas cartridges should be used for escape purposes only. Exceedances over the recommended exposure limits requires the use of airline or airline/APR combination units. **Recommended glove:** Viton, PV alcohol 5-16 hrs; silver shield >6.00 hrs; teflon 10-24 hrs; and Nitrile in that order. The breakthrough time for the nitrile glove ranges between 1.5 - 5.5 hrs. during complete immersion.	**Boiling Pt:** 250°F; 121°C **Melting Pt:** -2°F; 19°C **Solubility:** 0.02% **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** 5.83 **Vapor Pressure:** 14 mmHg @ 77°F; 25 °C **Specific Gravity:** 1.62 @ 77°F; 25°C **Incompatibilities:** Strong oxidizers, alkalis, fuming sulfuric acid, and chemically active metals. When heated to decomposition temperatures will emit toxic fumes of chlorine. **Appearance and Odor:** Colorless liquid with a mild chloroform like odor.	Overexposure may result in irritation to eyes, nose, throat, and skin. Potential CNS effects including sleepiness, incoordination, headaches, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. Chronic exposures may result in dermatitis, enlarged tender liver, kidney, and lung damage. This material is considered a animal carcinogen (liver tumors), however, inadequate evidence exists concerning carcinogenic potential in humans.
1,2-Dichloroethylene	540-59-0	PID: I.P. 9.65 eV, high response with PID and 10.2 eV lamp. FID: 50% response with FID.	Air sample using charcoal tube; and carbon disulfide desorption; Sampling and analytical protocol in accordance with OSHA Method #07; and NIOSH Method #1003.	OSHA; NIOSH; ACGIH: 200 ppm IDLH: 1000 ppm	Adequate- odor threshold 0.085-17 ppm. Use organic vapor/acid gas cartridges for exceedances above the TWA up to 1,000 ppm. >1,000 ppm should use pressure-demand supplied air respirator above exposure limits. **Recommended glove:** nitrile - 0.12 hrs; viton - 0.95 hrs	**Boiling Pt:** 117°F; 47°C **Melting Pt:** 7°F; -13.8°C **Solubility:** 0.4% **Flash Pt:** 36°F; 2.2°C **LEL/LFL:** 5.6% **UEL/UFL:** 12.8% **Vapor Density:** 2.0 **Vapor Pressure:** 180-260 mmHg **Specific Gravity:** 1.27 @ 90°F; 32°C **Incompatibilities:** Strong oxidizers, alkalis, potassium hydroxide, and copper. When heated to decomposition temperatures will emit toxic fumes of phosgene. **Appearance and Odor:** Colorless liquid with an acrid odor.	Overexposure may result in CNS depression with potential to cause sleepiness, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, liver, kidney, and lung damage.
Thorium (IV) Nitrate	13823-29-5	Radiation Survey Meter	TLD Badges to determine exposure levels	OSHA; NIOSH; ACGIH: Per ALARA See 1910.1096 General population < 2mR/Hr	White crystalline mass Use P100 Cartridges This material is a solid, any impermeable glove.	**Boiling Pt:** decomposes at 630°C; 1166°F **Melting Pt:**216°C; 420.8°F **Solubility:** Soluble in water and alcohol (191g/100ml of water) **Appearance and Odor:** White crystalline solid, odorless. * - As thorium metal	Poisonous by non-occupational routes of exposure (intraperitoneal, intravenous, and intratracheal). Moderately toxic via ingestion. Radioactive

7.0 HAZARD MONITORING – TYPES AND ACTION LEVELS

This section provides direction and protocol for the real time monitoring and laboratory assisted personal sampling. The monitoring of hazardous conditions has two primary objectives.

- Qualify and quantify potential hazards (chemical, physical, and biological) which, may impact the work force or sensitive receptors in the immediate area.

- Evaluate environmental sampling media, which will be sent off-site. The purpose of this evaluation will be to qualify potential hazards to provide sufficient warning to down stream parties, which may potentially encounter these hazards. This would include hazard qualification for transportation purposes as well as notification to the analytical laboratory of potentially high hazard samples.

7.1 TASKS TO BE CONDUCTED

The following tasks are to be conducted as part of the scope of work at NSWC Crane, MGBG. It is hazards associated with these tasks, which may be monitored for the purpose of quantification/ qualification of those hazards.

- Hollow Stem Auger (HSA), Rotosonic Drilling, or Direct Push Technologies (DPT)
- Monitoring Well Development/Monitoring Well Sampling/Hydraulic Conductivity Testing
- Multi-media Sampling – Surface and subsurface soils; sediment; surface waters; and seep sampling.
- Decontamination activities
- Geophysical and Geographical surveying

7.2 ASSOCIATED HAZARDS

Hazards associated with these tasks for which monitoring may be used to qualify/quantify, include, but not limited to:

- Noise – Information obtained from previous monitoring efforts indicate noise levels associated with this type of activity, dependent on the type of rig,

    - HSA/Rotosonic Drill rig sound levels range from 87 to 92 dBA- Time Weighted Average (TWA)
    - DPT range from 90 to 102 dBA-TWA

- Generators – When generators are used as portable power sources for well development or sampling, the generator should be placed a sufficient distance from the operation to eliminate the noise hazard. The generators emit approximately 82 to 88 dBA.
- Steam Cleaners and pressure washers – Previous data indicate that these machines emit from 94 to 102 dBA.

Noise dosimetry may be performed to quantify noise levels associated with the type of rig selected to perform the subsurface investigation. In addition noise quantification may be performed to insure the hearing protection devices selected attenuation capabilities are sufficient for those noise levels produced. All noise monitoring will proceed in accordance with the Hearing Conservation Program provided in Appendix M, Hearing Conservation Program.

- Chemical hazards (Contaminated environmental media exposure) – Historical information regarding groundwater contamination has been gathered and the maximum positive detection's have been identified. This information has been used to determine potential worker exposure during tasks such as monitoring well development and sampling. These contaminants represent maximum detected concentrations and are considered worst case scenario. The maximum detection's are presented in Table 7-1. Personal Protective Equipment (PPE) is to provide adequate shielding of the site personnel from the hazards. If necessary to qualify and quantify these hazards real-time monitoring instruments and personal sampling will be utilized. This information will be used to estimate employee exposure and to validate PPE selection.

- Chemical Warfare Agents (CWA) or Chemical Warfare Materials (CWM) – Historical information indicates that this site was an area used for the burial of decontaminated Mustard Gas containers and deactivated dispersion aerial bombs. Information from subsequent investigations of the area indicated that Mustard Gas was indeed recovered from the area as well as the dispersion unit which, had only been partially decontaminated. After multiple investigations Mustard Gas or Mustard Gas containers are not anticipated. However, contingency information has been incorporated into this HASP. Personal protective measures will be incorporated to protect site personnel during on-site activities. Monitoring for gross contamination will be conducted to determine potential airborne concentrations and to determine the level of challenges to the PPE ensembles selected for protection. Head space analysis of slightly heated sample aliquots will be monitored to determine if samples which are to leave the site are contaminated with Chemical Warfare Materials (CWM). This type of monitoring will be performed primarily during soil extraction activities.

- Radiological hazards – In addition to the chemical solvents and the CWM potential, historical information indicates canisters of thorium nitrate were disposed at this site through burial. Information

derived from subsequent investigations indicate removal of this substance and associated containers. Information concerning the amounts disposed, areas of disposal, and amounts retrieved are sketchy at best. Monitoring for this hazard would entail surface scans of soil cores and surface scans to determine the presence of radiological contamination above natural background levels and frisks of personnel and equipment passing through decontamination to determine impact. In addition the monitoring of discharge waters (surface scans for Beta and Gamma radiation) will be performed. The frequency of monitoring may be modified to reflect conditions associated within the soils for newly constructed wells. Historical information indicates Alpha and Beta levels within the groundwater were not significant enough to present potential occupational exposure through this media.

All efforts concerning radiation exposure will be directed at employing ALARA (As Low As Reasonably Achievable) concepts. Tools, which will be employed in accomplishing the objectives of ALARA, will include:

Minimizing time of exposure –

- Based on instrumentation and analytical results field crews may be rotated to control and limit potential exposures.
- Personnel will minimize time in effected areas.
- Only personnel critical to the operation will be permitted in the radiation area, all others will be restricted.
- Back up equipment will be maintained at the ready to minimize time in the area due to equipment failure.

Distance –

- When personnel are not actively engaged in on-site activities they will maintain a specified distance from radiological contaminated areas. The SSO will be responsible for demarcating these boundaries based on direct reading instrument results and analytical data. The postings shall indicate Caution, Soil Contamination Area with the radiological symbol

Shielding –

Shielding will be accomplished through the use of PPE and waste containerization to isolate personnel from radioactive hazards.

These practices will be employed when it is determined to be a radiation area. Measurements of >5mrem but < 100 mrem.

7.3 INSTRUMENTS TO BE USED FOR HAZARD MONITORING

The following instrument will be used for monitoring the hazards identified above.

7.3.1 Metrosonics dB-307 Noise Dosimeter or Equivalent

The db-307 is a dual purpose sound level meter and noise dosimeter. The instrument is calibrated in accordance with manufacturers instructions using a 102dBA acoustical calibrator. The instrument is calibrated pre- and post to monitoring activities in accordance with the Hearing Conservation program provided in Appendix M of this HASP. Information regarding calibration is recorded either on the Noise Dosimetry Log or the Sound Level Measurement Log, relative to the type of monitoring being performed.

7.3.1.1 Frequency of Monitoring

Noise dosimetry and sound level measurements will be performed under the following circumstances:

- Noise source exists for which no similar data is available.
- Quantification is necessary to evaluate hearing protection attenuation capabilities.

Additional monitoring will only be performed if it is necessary to quantify other noise sources or through changes in procedure that may result in higher noise levels.

This monitoring will be conducted during intervals of the project, as deemed necessary, during the operation of powered equipment capable of generating noise sources over 85 dBA.

7.3.2 Chemical Contaminant Monitoring

Monitoring for airborne chemical contaminants released from environmental media will be performed during the following intrusive activities:

- Soil boring and monitoring well installation
- Multi-media sampling and well development

Chemical air monitoring will be performed by the SSO using a photo-ionization detector (PID) as a primary screening instrument.

Primary contaminants of concern are as follows:

Contaminant	Ionization Potential (IP-eV)	Relative Response Ratio 10.6 eV Lamp	Relative Response Ratio 11.7 eV Lamp
Trichloroethylene (79-01-6)	9.45eV	0.5	0.4
1,1,1,2-Tetrachloroethane (79-34-5)	11.1	NR	0.6
1,2-Dichlorethylene (156-60-5)	9.65	0.5	0.3
1,2-Dichlorethane (107-06-2)	11.04	NR	0.6
Tetrachloroethylene (127-18-4)	9.32	0.57	0.31

NR – No response
eV – Electron volts

Note: Relative response ratio provided is in comparison to equal concentrations of the reference gas Isobutylene. Actual results obtained on the PID will be multiplied by the correction factor of 2.41, which represents the worst case scenario for the mixture. Based on historical information provided the estimated correction factor for the mixture is as follows:

$$CF = \frac{1}{(0.0037)(0.6)+(0.0565)(0.3)+(0.1212)(0.6)+(0.0441)(0.31)+(0.7732)(0.4)} = 2.41$$

Therefore, a reading of 10 ppm will actually be 24 ppm.

A flame ionization detector (FID) will be used as a secondary screening instrument should the need arise.

Contaminant	Relative Response Ratio
Trichloroethylene (79-01-6)	0.7
1,1,1,2-Tetrachloroethane (79-34-5)	1.0.
1,2-Dichlorethylene (156-60-5)	0.5
1,2-Dichlorethane (107-06-2)	0.8
Tetrachloroethylene (127-18-4)	0.7

$$CF = \frac{1}{(0.0037)(0.8)+(0.0565)(0.5)+(0.1212)(1.0)+(0.0441)(0.7)+(0.7732)(0.7)} = 1.38$$

Should information parameters change, selection of the primary screening instrument may also change to a combination PID/FID instrument the TVA 1000 by Foxboro. This would permit a wide range of components to be measured simultaneously.

The PID was selected over the FID as a primary screening instrument due to its ease of use, maintenance requirements, and resource demand. In addition, many of the chlorinated solvents within the groundwater are diluted and contaminated. This may make detection through combustion of the sample and hence detection through flameionization, difficult and unreliable. Should it be determined through initial field

application and performance, that the FID based on its relative response ratio to the contaminants in question is a better choice, then the instruments will be switched out.

7.3.3 Chemical Warfare Material (CWM) Monitoring

This activity will be supported during all intrusive phases of the project.

CWM will be monitored during sample extraction to screen samples leaving the site. This monitoring is to be performed to ensure samples leaving the site are not grossly contaminated as to present a threat during transportation or at the analytical lab. This sampling will proceed as follows:

7.3.3.1 Soils

- Once sample interval(s) are selected and the VOC sample portion is removed, approximately 156 grams or 5 ounces will be removed from the sample and weighed, using a balance scale. The 5 ounce aliquot will be minced and placed in a glass jar (volume ~12 ounces) and the head covered with aluminum foil.

- The sample container will be inserted into a toaster oven with a thermostatic control. The sample will be maintained in the Toaster Oven for 5 minutes. This is to raise the temperature of the sample to approximately 35°C (temperatures greater than 40°C may cause decomposition of the mustard gas). This evaluation must stay within reproducible parameters (i.e., weight of sample, temperature elevation limits and control, time of heating process) so all samples are exposed to the same conditions.

- The sample will be removed from the oven and a head space analysis will be conducted using an MSA/Auer CWA Detector Tube (Sensitivity 0.1 mg/m^3; go-no-go response) or AP2C Chemical Agent Detector Kit (Sensitivity 0.006 mg/m^3 quantifiable result). The release limit for the substance has been set at 0.1 mg/m^3. Any detection of bis(2-chloroethyl) sulfide above 0.1 mg/m^3 will be considered to be contaminated with mustard gas and will not be sent to analytical or radiological laboratories for analysis.

7.3.3.2 Airborne Emissions

Should multiple detections be recorded at the sources, airborne monitoring will be instituted using AP2C Chemical Agent Detector Kit (Sensitivity 0.006 mg/m^3 quantifiable result). However, this is a contingency plan and will be instituted as conditions and the SSO require.

7.3.4 Radiological Contamination Monitoring

7.3.4.1 Soil Screening

Soil samples extracted will be screened for radiological activity in the following manner:

The screening for radiological contamination will be taken after the time the CWM thermal rise has taken place. It is necessary to dry samples for alpha testing as the surface tension of the water or moisture may skew the results. Upon drying the sample the soil will be spread as thin as possible and a surface scan will be performed under a radiation survey meter. The release limit of 2 uCi or 250 cpm above background has been established as a non-radiological hazard.

7.3.4.2 Personal Monitoring and Sampling

Personnel and equipment will undergo surface scanning or frisking at the completion of the decontamination activities. This support effort will be accomplished only when radioactivity levels at the source is detected.

Personnel radiological air monitoring will be conducted, if it is determined to be necessary, by using two high flow air samplers positioned in the down gradient sectors of the work area. The air samplers will be operated for a pre-determined amount of time and then the air filter will be checked using a radiation monitoring instrument or counter. If the instrument check on the filter paper is positive, then a calculation of internal uptake for individual workers will be conducted to determine if respiratory equipment and/or engineering controls are sufficient.

Personnel will be monitored for radioactive contamination by using a Geiger-Muller (G-M) survey meter to "frisk" the individual worker in instances where contamination is suspected. If found, the area that is contaminated will be washed with soap and water and re-surveyed to determine if any contamination is still present on the individual. This process will be continued until the individual is found to be free of contamination.

Personnel will also wear thermoluminescent dosimeters (TLDs), which will be worn at all times by at-risk workers at the site. The TLDs will be collected and returned to the laboratory for analysis at the end of each month. A new TLD will be issued for continuous personnel monitoring. A radiological dose record will be kept for each individual worker to ensure exposure limits are not exceeded. As the samplers will require some direct contact during sampling procedure, a ring TLD badge may be used in support of their activity.

7.3.4.3 Equipment Used for Surveys

Instruments to measure radiation at the project site are described below:

Ludlum Model 3 Count Rate Meter with a Model 43-5 50 cm Squared Alpha Scintillation Probe or Equivalent – This instrument will be used for monitoring alpha emissions.

Alpha-Beta-Gamma Survey Equipment: Ludlum Model 3 Count Rate Meter with a Model 44-9 Pancake Geiger-Muller (G-M) Detector or Equivalent

This instrument will be used for scan surveys to detect both fixed and loose surface alpha/beta/gamma radiation. The Ludlum Model 3 has a linear scale of 0 to 500 cpm. A scale multiplier of X0.1, X1, X10 and X100 can be selected based on the radiation levels being measured. The halogen-quenched pancake G-M detector has a 1.7 mg/cm^2 mica window with an active area of 15 cm^2. This instrument detects a high percentage of the low energy beta particles (less than 200 keV).

Each instrument will be checked daily prior to use by source check and verifying meter response.

7.3.4.4 Natural Background Determination

Natural background radiation levels (i.e., counts per minute [cpm], cpm/probe area, micro-rem per hour [μR/hr]) will be determined by taking background radiation measurements at locations unaffected by site operations.

Natural background radiation will represent an averaged value measured and calculated from the same media to be sampled. A grid over the sample area will be laid out to represent nine points. A reading will be taken at each location. These readings will be averaged to determine background. It should be noted that this background determination will occur prior to the drill rig moving in. Addition measurements will be taken if it is determined that the constructed material of the drill rig is influencing natural background.

A threshold for declaring the presence of radioactivity will be a multiple of the background rate measured at any given time. A common value that is used by nuclear facilities is two times the background rate (i.e., if a survey shows a measured dose rate that is twice the background rate measured just before surveying the item, then the item would be assumed to be contaminated).

7.4 INSTRUMENT PREPARATIONS FOR FIELD SERVICE

All direct reading instruments will require calibration prior to use. The frequency of this calibration is stated below.

- Noise Dosimeter - Manufacturer yearly service and primary calibration
  In the field – Pre and Post secondary calibration to a yearly calibrated acoustical reference.

- PID/FID – Manufacturer yearly service and primary calibration
  In the field – Pre and Post secondary calibration to a reference gas

- MSA/Auer Detection Tubes – Quarterly calibration of the Sample Draw Mechanism

- AP2C Chemical Agent Detector Kit – As per manufacturers instruction.

- Radiation Survey Meters – Manufacturer yearly service and primary calibration
  In the field – Pre and Post operations checks with an mounted source

All instruments will operated and calibrated in accordance to manufacturers instructions.

Calibration information will be recorded on the equipment calibration sheet provided as Figure 7-1.

7.5 INSTRUMENT MAINTENANCE

Maintenance activities to be conducted on site are as follows:

- Wiping down the outer shells of the monitoring equipment used – Daily
- Battery charging – Daily (As applicable)
- PID – Lamp Cleaning – Once per 10-day shift or as conditions dictate
- PID/FID – Filter Replacement – Daily

Maintenance greater than that mentioned above will require the attention of a certified technician and will not be performed on site.

Table 7-1
Summary of Maximum Positive Detections
Of Existing Monitoring Wells

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date sampled	Hazard Type
Methylene Chloride	Well 01-01; GW	8 (10/05/82)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,1,1,2-Tetrachloroethane	Well 01-02; GW	589,000	Inhalation
Trichloroethylene	Well 01-02; GW	133,000	Inhalation
1,2-Dichlorethylene	Well 01-02; GW	2,650	Inhalation
1,2-Dichlorethane	Well 01-02; GW	4,070	Inhalation
Dibromochloromethane	Well 01-02; GW	3,040	Inhalation
Tetrachlorethylene	Well 01-02; GW	4,200	Inhalation
Chloroform	Well 01-02; GW	2,000	Inhalation
Methylene Chloride	Well 01-02; GW	47	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,1,2,2-Tetrachloroethane	Well 01-03; GW	58 (10/05/82)	Inhalation
Trichloroethylene	Well 01-03; GW	3 (10/05/82)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Arsenic	Well 01-05; GW	10 (10/05/82)	Ingestion
1,1,2,2-Tetrachloroethane	Well 01-05; GW	85 (10/05/82)	Inhalation
Trichloroethylene	Well 01-05; GW	2,900 (10/05/82)	Inhalation
Trichloroethylene	Well 01-05; GW	1,010 (01/07/85)	Inhalation
Trichloroethylene	Well 01-05; GW	380 (01/29/86)	Inhalation
Tetrahydofuran	Well 01-05; GW	11 (01/29/86)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Methylene Chloride	Well 01-07; GW	40 (11/18/82)	Inhalation
Trichloroethylene	Well 01-07; GW	3 (11/18/82)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Methylene Chloride	Well 01-08; GW	2 (11/18/82)	Inhalation
Trichloroethylene	Well 01-08; GW	1 (11/18/82)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Methylene Chloride	Well 01-09; GW	5 (11/18/82)	Inhalation
Trichloroethylene	Well 01-09; GW	5 (11/18/82)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Methylene Chloride	Well 01-10; GW	5 (01/25/83)	Inhalation
Trichloroethylene	Well 01-10; GW	8 (01/23/83)	Inhalation

1,1,1-Trichloroethane	Well 01-10; GW	5 (01/25/83)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Trichloroethylene	Well 01-16; GW	513 (01/07/85)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
Chlorform	Well 01-17; GW	8 (02/15/83)	Inhalation
Tetrachlorethylene	Well 01-17; GW	68 (2/15/83)	Inhalation
1,1,2,2-Tetrachloroethane	Well 01-17; GW	32 (01/29/86)	Inhalation
Methylene Chloride	Well 01-17; GW	5 (01/25/83)	Inhalation
1,2-Dichlorethane	Well 01-17; GW	5 (02/15/83)	Inhalation
Trichloroethylene	Well 01-17; GW	67 (02/15/83)	Inhalation
1,1,1-Trichloroethane	Well 01-17; GW	23 (02/15/83)	

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,2-Dichlorethane	Well 01-19; GW	19 (06/27/83)	Inhalation
1,2-Dichlorethane	Well 01-19; GW	10 (01/28/86)	Inhalation
Chloroform	Well 01-19; GW	15 (06/27/83)	Inhalation
1,1,2,2-Tetrachloroethane	Well 01-19; GW	300 (01/28/86)	Inhalation
1,1,2,2-Tetrachloroethane	Well 01-19; GW	146 (01/08/85)	Inhalation
Methylene Chloride	Well 01-19; GW	5 (01/25/83)	Inhalation
1,2-Dichlorethylene	Well 01-19; GW	12 (01/08/85)	Inhalation
Trichloroethylene	Well 01-19; GW	350 (06/27/83)	Inhalation
Trichloroethylene	Well 01-19; GW	221 (01/08/85)	Inhalation
Trichloroethylene	Well 01-19; GW	240 (01/28/86)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,1,2,2-Tetrachloroethane	Well 01-20; GW	160 (01/29/86)	Inhalation
Trichloroethylene	Well 01-20; GW	430 (06/27/83)	Inhalation
Trichloroethylene	Well 01-20; GW	75 (01/29/86)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,1,2,2-Tetrachloroethane	Well 01-22; GW	50 (07/14/83)	Inhalation
1,1,2,2-Tetrachloroethane	Well 01-22; GW	65 (01/08/85)	Inhalation
1,1,2,2-Tetrachloroethane	Well 01-22; GW	120 (01/28/86)	Inhalation
Trichloroethylene	Well 01-22; GW	80 (07/14/83)	Inhalation
Trichloroethylene	Well 01-22; GW	117 (01/08/85)	Inhalation
Trichloroethylene	Well 01-22; GW	140 (01/28/86)	Inhalation

Parameter Name	Location/Media Type (1)	Concentration (ug/L); Date Sampled	Hazard Type
1,1,2,2-Tetrachloroethane	Well 01-25; GW	42 (01/28/86)	Inhalation
Trichloroethylene	Well 01-25; GW	59 (01/28/86)	Inhalation

(1) Media type abbreviations:
GW – Groundwater
SW - Surface water
SS – Surface Soils
SBS – Subsurface soils
SD - Sediments

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: _____ PROJECT NO.:_____

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

8.0 SITE OPERATIONS AND CONTROL

Site operations and control will be facilitated through the use of established work zones and security and control of those zones. These activities will minimize the impact and spread of contaminants brought to the surface through subsurface investigative methods as well as protect personnel and visitors within these zones during ongoing operations.

8.1 WORK ZONES

Tetra Tech NUS will delineate and use work zones in conjunction with decontamination procedures to prevent the spread of contaminants to other areas of the site. A three-zone approach will be used for work at this site; an Exclusion Zone, a Contamination Reduction Zone, and a Support Zone. These will be used to control access to the work areas, restricting the general public, avoiding potentials to spread any contaminants, and to protect individuals who are not cleared to enter by way of training and/or medical surveillance qualifications.

8.1.1 Exclusion Zone

An Exclusion Zone will be established at each sampling point/location. The purpose of the exclusion zone is to define a area where a more rigorous protocol for workers within what is determined to be an impact area. The impact area is that area which could be adversely impacted by either chemical, physical, or energetic hazards. Exclusion zone size and dimensions will vary based on activities. Impact areas dimensions will be influenced by the following considerations:

- Physical and topographical features of the site
- Weather conditions
- Field and analytical measurements of air and environmental contaminants
- Air dispersion calculations
- Potential for explosion and dispersion
- Physical, chemical and toxicological properties of the contaminants being investigated
- Tasks to be conducted
- Decontamination procedures
- Potential for exposure

As conditions change the dimensions of the exclusion zone will change. However, the following dimension represent a starting point from which the exclusion zones will be expanded:

- Monitoring well installation (Hollow stem auger, Rotosonic, Mud/air rotary, Direct Push Technology). The exclusion zone for this activity will be set at the height of the mast, plus five feet surrounding the point of operation, with a minimum of 25 feet. This distance will also apply when subsurface soil sampling from behind these type rigs.

- A table will be set up to screen all soil samples for Chemical Warfare Materials (CWM), radiological presence, and the presence of UXO materials. A toaster oven will be used to heat samples in order to measure head space concentrations of CWM. They will also be used to to dry samples to determine alpha emissions. UXO presence will be determined through a visual examination. This screening location will have a 10 foot exclusion zone.

- Monitoring well development and sampling. The exclusion zone for this activity will be set at 10 feet surrounding the well head and discharge collection container.

- Surface soils, sediments, seeps, and surface water sampling. The exclusion zone for this activity will be set at five feet surrounding the point of operation.

- Clearing and grubbing. The exclusion zone for this activity will be set at 10 feet surrounding someone with a brush hook or machete. 50 feet surrounding a person using a chainsaw or a chipping operation.

- Decontamination operation. The exclusion zone for this activity will be set at 25 feet surrounding the gross contamination wash and rinse as well as 25 feet surrounding the heavy equipment decontamination area.

- Any suspected UXO materials as identified by the on-site EOD Technician. The exclusion zone for this activity will be set at 50 feet surrounding the point of discovery.

- Investigative Derived Waste (IDW) area will be constructed and barricaded. Only authorized personnel will be allowed access.

All exclusion zones shall remain marked until the SSO has evaluated the restoration effort and has authorized changing the zone status.

Exclusion zones will be marked using barrier tape, traffic cones and/or drive poles. Signs will be posted to inform and direct site personnel and site visitors.

8.1.2 Contamination Reduction Zone

The contamination reduction zone will be split to represent two separate functions. The first function will be a control/supply point for supporting exclusion zone activities. The second function, which may take place a sufficient distance from the exclusion zone, is the decontamination of personnel and heavy equipment.

In order to move from the exclusion zone to a separate location the following activities will be used:

- As samplers move from location to location during sampling activities, dedicated sampling devices and PPE will be washed of gross contamination, removed, separated, and bagged. Personnel will use hygenic wipes, such as Handy Wipes, as necessary.

- Muddy over-boots and gloves may be required to go through a gross contamination wash at the exclusion zone.

- Potentially contaminated tooling will be wrapped, when necessary, for transport to the decontamination area.

- Upon completion of the assigned tasks all personnel will move through the central decontamination area to clean reusable PPE and field equipment. All personnel and field equipment will be frisked at the termination of decontamination procedures. Based on ambient conditions medical evaluations will take place at the termination point of the decontamination line. These evaluations will include pulse rate, oral temperature, breathing rate to evaluate physiological demands on site personnel. As stated earlier, these evaluations will be based on ambient conditions and acclimation periods.

8.1.3 Support Zone

The Support Zone will consist of a field trailer, storage, laydown areas, or some other uncontaminated, controlled point. The Support Zone for this project will include a staging area where site vehicles can be parked, equipment will be unloaded, and where food and drink containers will be maintained. In all cases, the support zones will be established in clean areas of the site.

8.2 SAFE WORK PERMITS

All Exclusion Zone work conducted in support of this project will be performed using Safe Work Permits (SWP) to guide and direct field crews on a task by task basis. An example of the Safe Work Permit is included in Figure 8-1. The daily meetings conducted by the FOL/SSO will further support these work

permits. The use of these permits will ensure that site-specific considerations and changing conditions are incorporated into the planning effort. All SWP will require the signatures of either the FOL or the SSO. All personnel engaged in onsite activities must be made aware of the elements indicating levels of protection and precautionary measures to be used.

The use of these permits will establish and provide for reviewing protective measures and hazards associated with each operation. This HASP will be used as the primary reference for selecting levels of protection and control measures. The SWP will take precedence over the HASP when more conservative measures are required based on specific site conditions.

Upon completion of the work for which the SWP was assigned, the SWP will be turned into the FOL or the SSO. Concerns, complaints, and suggestions may be made on the reverse of the SWP for consideration by the FOL and/or the SSO.

The SWP and the HASP will serve as the primary reference for work place evaluations and audits conducted to determine if the task is being conducted under the direction conveyed by the HASP and the SWP.

8.3 SITE MAP

Once the areas of contamination, access routes, topography, dispersion routes are determined, a site map will be generated and adjusted as site conditions change. This map will be posted to illustrate up-to-date information of contaminants and adjustment of zones and access points. This map will be posted at the field support trailer. Figure 8-2 will serve as the preliminary version until investigation reveals more information.

8.4 BUDDY SYSTEM

Personnel engaged in on-site activities will practice the "buddy system" to ensure the safety of all personnel involved in this operation.

8.5 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

Tetra Tech NUS personnel will provide MSDSs for all chemicals brought on-site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application or the substances on-site. The MSDSs will be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request. The SSO will be responsible for implementing a site-specific Hazard Communication Program (See Appendix E). This includes collection

of MSDSs, creation and maintenance of an accurate Chemical Inventory Listing, addressing container labeling and personnel training issues, and other aspects as defined in that appendices.

8.6 COMMUNICATION

It is anticipated that site personnel will be working in close proximity during proposed field activities. In the event that site personnel are in isolated areas or are separated by significant distances, a supported means of communication between field crews will be utilized. Two-way radio communication devices, if needed, will be used only with NSWC Crane approval.

External communications will be accomplished utilizing telephones at predetermined and approved locations or through cellular phones. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of site activities, the FOL will determine and arrange for telephone communications, if it is determined a cellular means will not be used.

The hand-held radios and cellular phones which will be used if permitted are as follows:

Motorola HT-1000	Power Output 5 watts
Cellular Phone	Power Output 5 watts

There are several aspects associated with emergency alerting procedures that must be taken into account at NSWC Crane. These are as follows:

- Due to the physical setting (size and remoteness) of the sites where field activities will be conducted, readily available means of communication are not always available.

- In addition, again based on the size of the facility and location, there are limited cellular communication points on Base where a signal may be obtained. This also limits communication capabilities.

- Lastly, due to the schedule that Tetra Tech NUS, Inc. will work (10 days on; 4 days off) the potential exists for field personnel to be present during holidays, off days, and after hours. Primary safe places of refuge that would normally be accessed in the event of an emergency during normal working hours will be closed during these periods.

In order to overcome these restrictions, the Base Environmental Office will allocate a Public Works/Fire/Security Radio to be used in support of this field effort. This radio will be available 24/7 which will establish a direct link to security and emergency services.

If an emergency occurs at NSWC CRANE within the Tetra Tech NUS operations, the following procedures are to be initiated:

- Initiate an emergency notification by hand signals, voice commands, air horn, or two-way radios to the FOL/SSO. Describe to the FOL (who will serve as the Incident Coordinator) what has occurred and as many details as possible.

- Have your partner evacuate non-essential persons from the incident scene, engage initial response measures given the emergency type (i.e., spill response, fire extinguisher, first-aid) .

In the event that site personnel cannot control the incident through offensive and defensive measures, the FOL and/or SSO will enact the emergency notification procedures to secure additional outside assistance in the following manner:

Primary Means of Notification

- Emergency Notification Radio - This radio will be available 24/7 which will establish a direct link to security and emergency services.

Secondary Means of Notification

- On base call 1333 or 3300 (Table 2-1) and report the emergency. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of what occurred. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies. The Fire Dept. coordinates ambulatory service. They will provide emergency medical, ambulatory, hazardous materials response, and rescue.

  Note: On-base extensions 1333 and 3300 are the primary emergency phone numbers. From an NSWC Crane phone base extensions must be proceeded with "854". Off base numbers from a base phone can only be reached by dialing "990" or " 991" first. Furthermore, all emergencies should be subsequently reported to the Environmental Office (x6160).

8.7 SITE VISITORS

Potential site visitors that may be encountered during the performance of the field work could include the following:

- Personnel invited to observe or participate in operations by Tetra Tech NUS.
- Regulatory personnel (i.e., DOD, ILEM, EPA, OSHA, etc.)
- Southern Division Navy personnel
- Other authorized visitors

All non-DOD personnel working on this project are required to gain initial access to the base by coordinating with the TtNUS TOM or designee and following established base access procedures.

Once access to the base is obtained, all personnel who require access to Tetra Tech NUS work sites (areas of ongoing operations) will be required to obtain permission from the FOL and the Base Contact. Upon gaining access to the work site, all site visitors wishing to observe operations in progress will be required to meet the minimum requirements as stipulated below.

- All site visitors will be routed to the FOL, who will sign them into the field logbook. Information to be recorded in the logbook will include the individuals name (proper identification required), who they represent, and the purpose for the visit. **The FOL is responsible for ensuring that site visitors are escorted at all times.**

- All site visitors will be required to produce the necessary information supporting clearance on to the site. This includes information attesting to applicable training (40-hours of HAZWOPER training required for all Southern Division Navy Personnel), and medical surveillance as stipulated in Section 8.3, of this document. In addition, to enter the sites operational zones during planned activities, all visitors will be required to first go through site-specific training covering the topics stipulated in Section 4.2 of this HASP.

Once the site visitors have completed the above items they will be permitted to enter the site and applicable operational areas. All visitors are required to observe the protective equipment and site restrictions in effect at the work areas visited. Any and all visitors not meeting the requirements as stipulated in this plan for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause all on-site activities to be terminated until that visitor can be removed. Removal of unauthorized visitors will be accomplished with

support form the Base Contact, if necessary. At a minimum, the Base Contact will be notified of any unauthorized visitors.

8.8 SITE SECURITY

As this activity will take place at a Navy facility, the first line of security will be provided by the base gate restricting the general public. The second line of security will take place at the work site referring interested parties to the FOL and Base Contact.

Security at the work areas will be accomplished using field personnel. This is a multiple person operation, involving multiple operational zones. Tetra Tech NUS personnel will retain complete control over active operational zones.

The Base Contact will serve as the focal point for base personnel and interested parties and will serve as the primary enforcement contact.

8.9 SANITATION AND BREAK AREAS

This section will address the following items:

- Toilets
- Potable water
- Showers and change rooms
- Break Areas

8.9.1 Toilets

One toilet will be provided for every 20 people. All toilets will be unisex and will have locking doors. The toilet provided will either be a be a chemical toilet and service provider or the flush toilet associated with the decontamination trailer and a service provider.

8.9.2 Potable Water

Potable water as well as electrolyte balance sports drinks such as Gatorade will be provided to the field crews for fluid replacement. Storage and dispensing will proceed as follows:

- All containers will be clean and replenished daily.

- All containers will clearly marked as to their contents (Potable Water – Drinking Water Only; Gatorade, etc.).

- Dispensing locations will be placed in identified break areas within the support zone. The most likely location will be a break trailer. This will serve as an area for cooling or warming as well as an identified food and drink consumption area.

- If larger containers are used, dispensing cups will be provided.

- The coolers used for storage of potable drinks and cups will be stored in plastic bags away from potentially contaminating materials.

Fluid intake recommendations will be made based on the medical evaluations conducted at the end of the decontamination process.

8.9.3 Showers and Change Rooms

A decontamination trailer providing shower facilities and locker rooms as well as provisions for respirator cleaning will support this operation. This trailer is a self-contained unit for storage of potable shower water and holding tanks for gray water and toilets.

8.9.4 Break Areas

Suitable locations will be provided for field personnel for the following use:

- Break areas for food and drink consumption
- Areas suitable for warming and cooling regimens
- Areas suitable for Safety Meetings

This location will be either the project trailer, or its own separate trailer based on the crew size. This area will be climate control to provide suitable shelter to combat heat or cold stress.

FIGURE 8-1
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to ____

SECTION I: General Job Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ _____
TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required
Level D ☐ Level B ☐
Level C ☐ Level A ☐

Respiratory equipment required
Full face APR ☐ Escape Pack ☐
Half face APR ☐ SCBA ☐
SKA-PAC SAR ☐ Bottle Trailer ☐
Skid Rig ☐ None ☐

Modifications/Exceptions: _____

V. Chemicals of Concern	Action Level(s)	Response Measures

VI. Additional Safety Equipment/Procedures

Hardhat	☐ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No	Safety belt/harness	☐ Yes	☐ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☐ No	Barricades	☐ Yes	☐ No
Splash suit/coveralls (Type:_____)	☐ Yes	☐ No	Gloves (Type)	☐ Yes	☐ No
Steel toe/shank Workboots	☐ Yes	☐ No	Work/rest regimen	☐ Yes	☐ No
Chemical Protective Over-boots (Type:_____)	☐ Yes	☐ No			

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☐	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment inspected	☐	☐	Assembly points	☐	☐

VII. Site Preparation

	Yes	No	NA
Utility Locating and Excavation Clearance completed	☐	☐	☐
Equipment and Foot Traffic Routes Cleared and Established	☐	☐	☐
Physical Hazards Barricaded and Isolated	☐	☐	☐
Emergency Equipment Staged	☐	☐	☐

VIII. Additional Permits required (Hot work, confined space entry, excavation, etc.). ☐Yes ☐No
If yes, See SSO for appropriate permit

IX. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____

9.0 SPILL PREVENTION AND CONTAINMENT PROGRAM

9.1 SCOPE AND APPLICATION

This program applies to the single or aggregate accumulation of bulk storage materials (over 55-gallons). As the classification of certain materials such as IDW is unknown, all materials will be treated as hazardous, pending laboratory certification to the contrary. The types of materials for which this program will apply are as follows:

- Investigative Derived Wastes (IDW) such as decontamination fluids, soil cuttings, and purge and well development waters
- Resource Storage – Limited fuel and lubricant storage

The spill containment and control will be engaged any time free Mustard is encountered to minimize associated hazards.

9.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated that all IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of these analyses will determine the method of disposal.

9.3 CONTAINMENT AREAS

In order to facilitate leak and spill inspection and response, and to minimize potential hazards which may impact the integrity of the storage containers, the staging area for these substances will be structured as follows:

9.3.1 IDW

- 55 Gallon Drums (United Nations 1A2 configurations) – 4 Drums to a Pallet; labels and the retaining ring bolt and nut on the outside of each drum to facilitate easy access; Minimum 3 feet between each row of pallets. Size and dimensions will be restricted to the estimated volume plus 10 percent for rain water and container displacement. The decision to construct a bermed and lined area will be the decision of project management .

- Storage Tank – Polyethylene Construction – Tank shall be placed into a bermed enclosure of sufficient size to accommodate 110% of anticipated volume (Largest container plus 10% for rainwater and container displacement).

Regardless of container types selected, the staging area will be identified as a Satellite Storage Area with proper signage, points of contact in the event of an emergency, alternate contacts, and identification of stored material (i.e, Purge or decontamination waters, soil cuttings, etc.).

An Inventory Log will be maintained by the FOL regarding types of IDW and volumes generated. An updated Inventory List will be provided by the FOL to the designated Emergency Response Agency during days off and between shifts or phases of operations.

9.3.2 Flammable/POL Storage

Flammable Storage [i.e., fuels, decontamination solvents (Isopropanol)] and Petroleum/oil/lubricants (POL) will require proper dispensing containers and necessary storage for cumulative volumes in excess of 25 gallons. Storage and dispensing will comply with the following requirements:

- All fuels, which will be stored and dispensed from portable containers, will utilize safety cans.
- All portable hand held storage containers will be labeled per Hazard Communication requirements.
- Larger volumes stored for fueling equipment will be stored in approved mobile Above Ground Storage Tanks with secondary containment capable of holding the tank volume plus 10%.
- All portable flammable liquid storage tanks will be properly grounded and will have bonding capabilities for the transfer of loading and off-loading of its contents.
- All dispensing locations will be supported by a Fire Extinguisher positioned no closer than 50 feet from the storage tank, properly mounted and identified.
- The storage location will be well marked with proper signage, protective bumper poles and will have straight through access/egress for vehicles.

9.4 MATERIALS HANDLING

To minimize the hazards associated with moving drums and containers (i.e, lifting, pinch and compression points) material handling will be supported in the following manner:

- A drum cart with pneumatic tires will be required, if drums are used for IDW storage. This cart will be used to relocate drums within the staging and satellite storage location.

- In addition, a mechanized means such as a suitably equipped skid loader or back-hoe will be provided to move IDW containers from the field location to the staging and satellite storage location. This piece of equipment will also be used in site clearance and restoration as deemed appropriate and necessary.

Other means of material handling will be evaluated by the SSO based on their ability to minimize or eliminate material handling hazards.

9.5 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums or in the Resource Deployment area will be conducted during working hours to visually determine that storage vessels are not leaking. If a leak is detected, the FOL will be notified and the Spill Containment/Control Response Plan as specified in Section 9.8 will be engaged. All inspections will be documented in the project logbook.

9.6 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and/or the SSO will serve as the Spill Response Coordinators for this operation, should the need arise. Personnel through the course of this project will be drilled as part of testing the EAP.

9.7 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment that will be maintained at the staging areas at all times for the purpose of supporting this Spill Containment/Control Plan.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry)
- Extra Drums (55-gallon U.N. 1A2) should the need to transfer material from leaking containers arise.

- Pumps (Gas or Electric necessary for transferring liquids from leaking containers)/tubing
- Drum Repair Kit
- Shovels, rakes, and brooms
- Container labels
- Personal Protective Equipment
  - Nitrile outer gloves
  - Splash Shield
  - Impermeable over-boots
  - Rain suit

9.8 SPILL CONTAINMENT/CONTROL RESPONSE PLAN

This section describes the procedures the Tetra Tech NUS field personnel will employ upon the detection of a spill or leak.

- Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove all non-essential personnel.

- Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

- Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.

- Recontainerize spills, including 2-inch of top cover (if over soils) impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures specified in Section 2.0 of this HASP.

Although it is not anticipated that drums and containers of an unknown origin will be unearthed as this investigation of environmental media proceeds, this spill and containment procedure would also support that activity. Should a drum and/or container of an unknown origin be unearthed the Drum and Container Management Plan provided in Appendix O will be instituted.

9.8.1 Spill Response Involving Mustard Gas

It is not anticipated that Mustard Gas (Liquid) will be encountered during this field event. However, as a contingency the following measures will be employed should Mustard Gas be encountered.

9.8.1.1 Intact Containers

- Notify NSWC Crane
- Assess structural integrity of the container to the extent possible without moving it.
- Prepare a suitable over-pack with absorbent materials.
- Full Splash suit/Level B Protection for over packing the container.
- Spill response crew at the ready with spray pumper with 5% Bleach solution to neutralize any materials that could spill.
- Over pack and label

9.8.1.2 Broken Containers/Skinned Over Liquids

- Notify NSWC Crane
- Extract and containerize materials which can be collected without disruption.
- Materials which cannot be collected, treat in place using the spray pumper with 5% bleach solution
- Full Splash suit/Level B Protection for treatment.
- Collect treated materials using shovels. Collect the treated materials and the top ground covering impacted by the treatment process.
- Label Over Pack, stage in IDW Staging area.

10.0 CONFINED SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces**. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.
- A Permit-Required Confined Space is one that:
- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space operations, consult the SSO or call the PHSO. If confined space operations are to be performed this HASP will require modification to address, detailed procedures training requirements, and emergency rescue.

11.0 MATERIALS AND DOCUMENTS

The TtNUS FOL shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for all chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- Follow-up Reports
- A full-size OSHA Job Safety and Health Poster (posted in the site trailers)
- Training/Medical Surveillance Documentation Form (Blank)
- Emergency Reference Form (Section 2.0, extra copy for posting)

11.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted at the site for quick reference purposes. In situations where posting of these documents is not feasible (such as no office trailer), these documents should be filed in a transportable file container and immediately accessible. The file should remain in the FOL's possession.

Chemical Inventory Listing - This list represents all chemicals brought on site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc.. This list should be posted in a central area.

Material Safety Data Sheets (MSDSs) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster - This poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. The FOL or the SSO shall ensure that this poster is not defaced, altered, or covered by other material.

Site Clearance Posting - This list is found within the training section of the HASP (See Figure 4-1). This list identifies all site personnel, dates of training (including site-specific training), medical surveillance, etc. and indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) - This list of emergency numbers and hospital directions will be maintained at all phone communications points and in each site vehicle.

Site Maps – A periodically updated map will be posted in the Office trailer and at the entry to the Mustard Gas Burial Grounds. This map will be updated periodically by the FOL and/or the SSO. The information to be contained shall include control zones, points of entry, site layout information, the position of ongoing operations. As contaminant level are determined this information will also be added to the map.

Medical Data Sheets/Cards - Medical Data Sheets will be filled out by all on-site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention. to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

Hearing Conservation Standard (29 CFR 1910.95) - This standard will be posted anytime hearing protection or other noise abatement procedures are employed.

Personnel Monitoring - All results generated through personnel sampling (levels of airborne toxics, noise levels, etc.) will be posted to inform individuals of the results of that effort.

Placards and Labels - Where chemical inventories have been separated, because of quantities and incompatibilities, these areas will be conspicuously marked using Department of Transportation (DOT) placards and acceptable [Hazard Communication 29 CFR 1910.1200 (f)] labels. The Tetra Tech NUS FOL shall ensure the following materials/documents are taken to the project site and utilized as required.

Signs and Postings – Signs and posting for regulated areas (i.e., Satellite Waste Accumulation Area, All Visitors Report to the Site Office Trailer, Exclusion Zone, etc.)

12.0 GLOSSARY

μR/hr	micro-rem per hour
ACGIH	American Conference of Governmental Industrial Hygienist
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm^2	square centimeters
CO_2	Carbon dioxide
cpm	counts per minute
CPR	Cardio Vascular Resuscitation
CSP	Certified Safety Professional
CTO	Contract Task Order
CWA	Chemical Warfare Agent
CWM	Chemical Warfare Material
dBA	Decibles
DI	De-Ionized Water
DO	Dissolved Oxygen
DPT	Direct Push Technology
DRI	Direct Reading Instruments
EAP	Emergency Action Plan
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
eV	electron Volts
Fe	Iron
FID	Flame Ionization Detector
FOL	Field Operations Leader
G-M	Geiger-Muller
H_2S	Hydrogen sulfide
HAS	Hollow Stem Auger
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
IDEM	Indiana Department of Environmental Management
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative Derived Waste

IP	Ionization Potential
KeV	kilo electron volts
mg/m^3	milligrams per cubic meter
MGMB	Mustard Gas Burial Grounds
MSDS	Material Safety Data Sheet
N/A	Not Available
NAD	Naval Ammunition Depot
NIOSH	National Institute Occupational Safety and Health
NSWC	Naval Surface Warfare Center
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PCE	Tetrachloroethene
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photo Ionization Detector
POL	Petroleum/oil/lubricants
PPE	Personal Protective Equipment
PPM	Parts Per Million
PVC	Poly Vinyl Chloride
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
SWMU	Solid Waste Management Unit
SWP	Safe Work Practice/Permit
SWP	Safe Work Permit
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leachate Procedure
TLD	Thermoluminescent dosimeters
TOM	Task Order Manager
TtNUS	Tetra Tech NUS
TWA	Time Weighted Average
UN	United Nations
UXO	Unexploded Ordnance
WP	Work Plan

ATTACHMENT I

INJURY/ILLNESS PROCEDURE AND REPORT FORM

CASE NO. _____

TETRA TECH NUS, INC.

INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

WHAT YOU SHOULD DO IF YOU ARE INJURED OR DEVELOP AN ILLNESS AS A RESULT OF YOUR EMPLOYMENT:

- If injury is minor, obtain appropriate first aid treatment.
- If injury or illness is severe or life threatening, obtain professional medical treatment at the nearest hospital emergency room.
- If incident involves a chemical exposure on a project work site, follow instructions in the Health & Safety Plan.
- Immediately report any injury or illness to your supervisor or office manager. In addition, you must contact your Human Resources representative, Marilyn Diethorn at (412) 921-8475, and the Corporate Health and Safety Manager, Matt Soltis at (412) 921-8912 within 24 hours. You will be required to complete an Injury/Illness Report (attached). You may also be required to participate in a more detailed investigation from the Health Sciences Department.
- If further medical treatment is needed, The Hartford Network Referral Unit will furnish a list of network providers customized to the location of the injured employee. These providers are to be used for treatment of Worker's Compensation injuries subject to the laws of the state in which you work. Please call Marilyn Diethorn at (412) 921-8475 for the number of the Referral Unit.

ADDITIONAL QUESTIONS REGARDING WORKER'S COMPENSATION:

Contact your local human resources representative, corporate health and safety coordinator, or Corporate Administration in Pasadena, California, at (626) 351-4664.

Worker's compensation is a state-mandated program that provides medical and disability benefits to employees who become disabled due to job related injury or illness. Tetra Tech, Inc. and its subsidiaries (Tetra Tech or Company) pay premiums on behalf of their employees. The type of injuries or illnesses covered and the amount of benefits paid are regulated by the state worker's compensation boards and vary from state to state. Corporate Administration in Pasadena is responsible for administering the Company's worker's compensation program. The following is a general explanation of worker's compensation provided in the event that you become injured or develop an illness as a result of your employment with Tetra Tech or any of its subsidiaries. Please be aware that the term used for worker's compensation varies from state to state.

WHO IS COVERED:

All employees of Tetra Tech, whether they are on a full-time, part-time or temporary status, working in an office or in the field, are entitled to worker's compensation benefits. All employees must follow the above injury/illness reporting procedures. Consultants, independent contractors, and employees of subcontractors are <u>not</u> covered by Tetra Tech's Worker's Compensation plan.

CASE NO. _____

WHAT IS COVERED:

If you are injured or develop an illness caused by your employment, worker's compensation benefits are available to you subject to the laws of the state you work in. Injuries do not have to be serious; even injuries treated by first aid practices are covered and must be reported. Please note that if you are working out-of-state and away from your home office, you are still eligible for worker's compensation benefits.

CASE NO. _____

TETRA TECH NUS, INC.
INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

To: Corporate Health and Safety Manager
Human Resource Administrator

Prepared by: _____

Position: _____

Project Name: _____

Office: _____

Project No. _____

Telephone: _____

Information Regarding Injured or Ill Employee:

Name: _____

Office: _____

Home address: _____

Gender: M ☐ F ☐ No. of dependents: _____

_____

Marital status: _____

Home telephone: _____

Date of birth: _____

Occupation (regular job title): _____

Social Security No.: _____

Department: _____

Date of Accident: _____ **Time of Accident:** _____

Location of Accident Was place of accident or exposure on employer's premises Yes ☐ No ☐

Street address: _____

City, state, and zip code: _____

County: _____

Narrative Description of How Accident Occurred: (Be specific. Explain what the employee was doing and how the accident occurred.)

TETRA TECH, INC.
INJURY/ILLNESS REPORT

Did employee die? Yes ☐ No ☐
Was employee performing regular job duties? Yes ☐ No ☐
Was safety equipment provided? Yes ☐ No ☐
Was safety equipment used? Yes ☐ No ☐
Note: Attach any police reports or related diagrams to this accident report.

Witness(es):

Name:

Address:

Telephone:

Describe the Illness or Injury and Part of Body Affected:

Name the Object or Substance which Directly Injured the Employee:

Medical Treatment Required:

☐ No ☐ Yes ☐ First Aid Only

Physician's Name: _____

Address: _____

Hospital or Office Name: _____

Address: _____

_____

Telephone No.: _____

Lost Work Days:

☐ No. of Lost Work Days _____

Last Date Worked _____

Time Employee Left Work _____

Date Employee Returned to Work _____

☐ No. of Restricted Work Days _____

☐ None

Corrective Action(s) Taken by Unit Reporting the Accident:

Corrective Action Still to be Taken (by whom and when):

Name of Tetra Tech employee the injury or illness was first reported to: _____

Date of Report: _____ Time of Report: _____

	Printed Name	Signature	Telephone No.	Date
Project or Office Manager				
Site Safety Coordinator				
Injured Employee				

To be completed by Human Resources:

Date of hire: Hire date in current job:

Wage information: $ _____ per _____ (hour, day, week, or month)

Position at time of hire:

Shift hours:

State in which employee was hired:

Status: ☐ Full-time ☐ Part-time Hours per week: _____ Days per week: _____

Temporary job end date:

To be completed during report to workers' compensation insurance carrier:

Date reported: Reported by:

TeleClaim phone number:

TeleClaim account number:

Location code:

Confirmation number:

Name of contact:

Field office of claims adjuster:

ATTACHMENT II

EQUIPMENT INSPECTION CHECKLIST

EQUIPMENT INSPECTION

COMPANY:_____ **UNIT NO.**_____
FREQUENCY: Inspect daily, document prior to use and as repairs are needed.

Inspection Date: ____/____/____ Time: _____ Equipment Type:_____
(e.g., bulldozer)

	Good	Need Repair	N/A
Tires or tracks	❒	❒	❒
Hoses and belts	❒	❒	❒
Cab, mirrors, safety glass	❒	❒	❒
- Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	❒	❒	❒
- Is the equipment equipped with audible back-up alarms and back-up lights?	❒	❒	❒
Horn and gauges	❒	❒	❒
Brake condition (dynamic, park, etc.)	❒	❒	❒
Fire extinguisher (Type/Rating -_____)	❒	❒	❒
Fluid Levels:			
- Engine oil	❒	❒	❒
- Transmission fluid	❒	❒	❒
- Brake fluid	❒	❒	❒
- Cooling system fluid	❒	❒	❒
- Windshield wipers	❒	❒	❒
- Hydraulic oil	❒	❒	❒
Oil leak/lube	❒	❒	❒
Coupling devices and connectors	❒	❒	❒
Exhaust system	❒	❒	❒
Blade/boom/ripper condition	❒	❒	❒
Accessways: Frame, hand holds, ladders, walkways (non-slip surfaces), guardrails?	❒	❒	❒
Power cable and/or hoist cable	❒	❒	❒
Steering (standard and emergency)	❒	❒	❒

Safety Guards:	**Yes**	**No**
– Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact?_____	❒	❒
– Hot pipes and surfaces exposed to accidental contact?_____	❒	❒
– All emergency shut offs have been identified and communicated to the field crew?_____	❒	❒
– Have emergency shutoffs been field tested? _____	❒	❒
– Results?_____	❒	❒
– Are any structural members bent, rusted, or otherwise show signs of damage?_____	❒	❒
– Are fueling cans used with this equipment approved type safety cans?_____	❒	❒

– Have the attachments designed for use (as per manufacturer's recommendation) with this equipment been inspected and are considered suitable for use?_____ ❒ ❒

Portable Power Tools:

– Tools and Equipment in Safe Condition?_____ ❒ ❒

– Saw blades, grinding wheels free from recognizable defects (grinding wheels have been sounded)? ❒ ❒

– Portable electric tools properly grounded?_____ ❒ ❒

– Damage to electrical power cords?_____ ❒ ❒

– Blade guards in place?_____ ❒ ❒

– Components adjusted as per manufacturers recommendation?_____ ❒ ❒

Cleanliness:

– Overall condition (is the decontamination performed prior to arrival on-site considered acceptable)?_____
– Where was this equipment used prior to its arrival on site?_____
– Site Contaminants of concern at the previous site?_____
– Inside debris (coffee cups, soda cans, tools and equipment) blocking free access to foot controls?_____

Operator Qualifications (as applicable for all heavy equipment):

– Does the operator have proper licensing where applicable, (e.g., CDL)?_____
– Does the operator, understand the equipments operating instructions?_____
– Is the operator experienced with this equipment? _____
– Does the operator have emotional and/or physical limitations which would prevent him/her from performing this task in a safe manner?_____
– Is the operator 21 years of age or more?_____

Identification:

– Is a tagging system available, for positive identification, for tools removed from service?___

Additional Inspection Required Prior to Use On-Site

	Yes	No
– Does equipment emit noise levels above 90 decibels?	❒	❒
– If so, has an 8-hour noise dosimetry test been performed?	❒	❒

– Results of noise dosimetry:_____

– Defects and repairs needed:_____

– General Safety Condition: _____

– Operator or mechanic signature:_____

Approved for Use: ❒ Yes ❒ No

_____
Site Safety Officer Signature

ATTACHMENT III

MEDICAL DATA SHEET

MEDICAL DATA SHEET

This Medical Data Sheet must be completed by all on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts?_____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals _____

_____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

_____

Name, Address, and Phone Number of personal physician: _____

_____

_____

I am the individual described above. I have read and understand this HASP.

_____ _____

Signature Date

ATTACHMENT IV

MUSTARD GAS MSDS

Distilled Mustard (HD)

Date: 22 September 1988
Revised: 29 September 1999

In the event of an emergency:
Telephone the SBCCOM Operations
Center's 24-hour emergency
Number: 410-436-2148

Section I - General Information

Manufacturer's Address:
U.S. Army Soldier and Biological Chemical Command (SBCCOM)
Edgewood Chemical Biological Center (ECBC)
ATTN: AMSSB-RCB-RS
Aberdeen Proving Ground, MD 21010-5424
CAS Numbers 505-60-2, 39472-40-7, 68157-62-0
Chemical Name: Bis-(2-chloroethyl)sulfide
Trade name and synonyms:
H; HD; HS
Mustard Gas
Sulfur mustard; Sulphur mustard gas
Sulfide, bis (2-chloroethyl)
Bis(beta-chloroethyl)sulfide
1,1'-thiobis(2-chloroethane)
1-chloro-2(beta-chloroethylthio)ethane
Beta, beta'-dichlorodiethyl sulfide
2,2'dichlorodiethyl sulfide
Di-2-chloroethyl sulfideBeta, beta'-dichloroethyl sulfide
Iprit S-Lost; S-yperite; Schewefel-lost
Senfgas
Yellow Cross Liquid
Yperite;Y
EA 1033

Chemical Family: Chlorinated sulfur compound

Formula/Chemical Structure:
C4 H8 C12 S

Cl CH2 CH2--S--CH2 CH2 Cl

NFPA 704 Signal:
Health - 4
Flammability - 1
Reactivity - 1
Special - 0

Section II - Ingredients

Ingredients/Name: Sulfur Mustard
Percentage by Weight: 100%
Threshold Limit Value (TLV): 0.003mg/m^3

Section III - Physical Data

Boiling Point °F (°C): Calculated 423.5 °F (217.5 °C) (decomposed)
Vapor Pressure (mm Hg):

0.069 @ 20 °C

0.11 @ 25 °C

Vapor Density (Air = 1): 5.5
Solubility (g/100g solvent): Negligible in water (0.92 @ 22 °C). Soluble in fats and oils, gasoline, kerosene, acetone, carbon tetrachloride, alcohol, tetrachloroethane, ethylbenzoate, and ether. Miscible with the organophosphorus nerve agents.
Specific Gravity (H_20=1): 1.27 @ 25 °C
Freezing/Melting Point (°C): 14.45.
Liquid Density (g/mL):

1.274 g/mL @ 20 °C

1.268 g/mL @ 25 °C

Volatility (mg/m^3):

600 @ 20 °C

910 @ 25 °C

Viscosity (Centipoise): 5.175 @ 20 °C
Molecular Weight (g/mol): 159.08
Appearance and Odor: Normally amber to black colored liquid with garlic or horseradish odor. Water clear if pure. The odor threshold for HD is 0.6 mg/m^3 (0.0006 mg/L).

Section IV - Fire and Explosion Data

Flashpoint: 105 °C (Can be ignited by large explosive charges)
Flammability Limits (% by volume): Unknown
Extinguishing Media: Water, fog, foam, CO_2. Avoid use of extinguishing methods that will cause splashing or spreading of HD.
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, firefighting personnel should wear full firefighter protective clothing (flame resistant) 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, they will wear appropriate levels of protective clothing (See Section VIII). Do not breathe fumes. Skin contact with nerve agents must be avoided at all times. Although the fire may destroy most of the agent, care must still be taken to ensure the agent or contaminated liquids do not further contaminate other areas or sewers. Contact with the agent, liquid or vapor, can be fatal.

Section V - Health Hazard Data

Airborne Exposure Limit (AEL): The AEL for HD is 0.003 mg/m^3 as found in "DA Pam 40-173, Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT." To date, 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:
LD50 (skin) = 100 mg/kg
ICt50 (skin) = 2000 mg-min/m^3 at 70 - 80 °F (humid environment)
= 1000 mg-min/m^3 at 90 °F (dry environment)

ICt50 (eyes) = 200 mg-min/m^3
ICt50 (inhalation) = 1500 mg-min/m^3
LD50 (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.
Local Actions: HD effects both the eyes and the skin. Skin damage occurs after percutaneous absorption. Being lipid soluble, HD can be absorbed 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 is 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: Occurs 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 doses of HD can produce injury to bone marrow, lymph nodes, and spleen as shown by a drop in white blood cell count, thus resulting 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: HD can cause sensitization, chronic lung impairment,(cough, shortness of breath, chest pain), cancer of the mouth, throat, respiratory tract and skin, and leukemia. It may also cause birth defects.
Emergency and First Aid Procedures:
Inhalation: Hold breath until respiratory protective mask is donned. Remove from the source **Immediately**. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Mouth-to-mouth resuscitation should be used when approved mask-bag or oxygen delivery systems are not available. Do not use mouth-to-mouth resuscitation when facial contamination is present. Seek medical attention **Immediately**.
Eye Contact: Speed in decontaminating the eyes is absolutely essential. Remove the person from the liquid source, flush the eyes **Immediately** with water for at least 15 minutes by tilting the head to the side, pulling the eyelids apart with the fingers and pouring water slowly into the eyes. Do not cover eyes with bandages but, if necessary, protect eyes by means of dark or opaque goggles. Transfer the patient to a medical facility **Immediately**.
Skin Contact: Don respiratory protective mask. Remove the victim from agent sources **Immediately**. Immediately wash skin and clothes with 5% solution of sodium hypochlorite or liquid household bleach within one minute. Cut and remove contaminated clothing, flush contaminated skin area again with 5% sodium hypochlorite solution, then wash contaminated skin area with soap and water. Seek medical attention **Immediately**.
Ingestion: Do not induce vomiting. Give victim milk to drink. Seek medical attention **Immediately**.

Section VI - Reactivity Data

Stability:
Stable at ambient temperatures. Decomposition temperature is 100-351 °F (149-117 °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: Rapidly corrosive to brass @ 65 °C. Will corrode steel at a rate of 0.0001 in. of steel per month @ 65 °C.
Hazardous Decomposition: Mustard will hydrolyze to form HCl and thiodiglycol.
Hazardous Polymerization: Does 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 VIII) will be allowed in an area where HD is spilled. See Section V for emergency and first aid instructions.
Recommended Field Procedures: The HD should be contained using vermiculite,diatomaceous earth, clay, or fine sand and neutralized as soon as possible using copious amounts of 5.25% sodium hypochlorite solution. Scoop up all material and place in an approved DOT container. Cover the contents with decontaminating solution as above. The exterior of the container will be decontaminated and labeled according to EPA and DOT regulations. All leaking containers will be over packed with sorbent (e.g. vermiculite) placed between the interior and exterior containers. Decontaminate and label according to EPA and DOT regulations. Dispose of the material in accordance with waste disposal methods provided below. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Sections II and VIII). If 5.25% sodium hypochlorite solution is not available then the following decontaminants may be used instead and are listed in the order of preference: Calcium Hypochlorite, contamination Solution No. 2 (DS2), and Super Tropical Bleach Slurry (STB).
Warning: Pure, undiluted calcium hypochlorite (HTH) will burn on contact with liquid HD.
Recommended Laboratory Procedures:
Decontamination solution for each gram of HD. Allow 24 hours for decontamination to take place. Agitate solution at least one hour. Agitation is not necessary after the first hour. Testing for presence of active chorine by use of acidic potassium iodide solution to give free iodine color. Adjust the resulting solution pH to between 10 and 11.
Place three millileters (ml) of decontaminated solution in a test tube. Add several crystals of potassium iodine and swirl to dissolve. Add 3 ml of 50 wt.% sulfuric acid:water and swirl. IMMEDIATE iodine color shows the presence of active chlorine. If negative, add additional decontaminant to the decontamination solution, wait two hours, and test again for active chlorine. This works for either 5.5% sodium hypochlorite or 10% calcium hypochlorite decontamination solution.
Scoop up all materials and clothing and place in an approved DOT container. The exterior of the container will be decontaminated and labeled according to EPA and DOT regulations. All leaking containers will be over packed with sorbent (e.g. vermiculite) placed between the interior and exterior containers. Decontaminate and label according to EPA and DOT regulations. Dispose of the material in accordance with waste disposal methods provided below. Conduct general area monitoring with an approved monitor to confirm that the atmospheric concentrations do not exceed the airborne exposure limits (See Section VIII).
Note: Surfaces contaminated with HD, then rinsed and decontaminated may evolve sufficient HD vapor to produce a physiological response. HD on laboratory glassware may be oxidized by its vigorous reaction with concentrated nitric acid.
Waste Disposal Method: Open pit burning or burying of HD or items containing or contaminated with HD in any quantity is prohibited. Decontamination of waste or excess material shall be accomplished according to the procedures outlined above and can be destroyed by incineration in EPA approved incinerators according to appropriate provisions of Federal, State, and local Resource Conservation Recovery Act (RCRA) regulations.

Note: Some decontaminant solutions are hazardous waste according to RCRA regulations and must be disposed of according to those regulations.

Section VIII - Special Protection Information

Respiratory Protection:

Concentration

<= 0.003 mg/m^3 as an 8-hr TWA

Respiratory Protective Equipment

Protective mask not required to be worn provided that:
(a) Monitoring will be conducted to confirm that engineering controls are properly maintaining concentrations <= 0.003 mg/m^3 as an 8-hr TWA.
(b) M40-series mask is available for emergency escape purposes.
(c) Exposure has been limited to the extent practicable by engineering controls (remote operations, ventilation, and process isolation) and work practices.
If these conditions are not met, then follow the guidance for >=0.003 mg/m^3 as an 8-hr TWA.

Concentration

>= 0.003 mg/m^3 as an 8-hr TWA

Respiratory Protective Equipment

NIOSH/MSHA approved, pressure demand full face piece SCBA suitable for use in high agent concentrations with protective ensemble. (See DA Pam 386-61 for examples).

Ventilation

Local Exhaust: Mandatory. Must be filtered or scrubbed. Air emissions shall meet local, state, and federal regulations.

Special: Chemical laboratory hoods will have an average inward face velocity of 100 linear feet per minute (lfpm) ±20% with the velocity at any point not deviating from the average face velocity by more than 20%. Existing laboratory hoods will have an inward face velocity of 150 lfpm ±20%. Laboratory hoods will be located such that cross drafts do not exceed 20% of the inward face velocity. A visual performance test using smoke producing devices will 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 semiannually or after modification or maintenance operations. Operations should be performed 20 centimeters inside hoods.

Protective Gloves: Butyl Rubber gloves M3 and M4 Norton, Chemical Protective Glove Set

Eye Protection: As a minimum, chemical goggles will be worn. For splash hazards use goggles and face shield.

Other Protective Equipment: For laboratory operations, wear lab coats, gloves, and have mask readily accessible. In addition, daily clean smocks, foot covers, and head covers will be required when handling contaminated lab animals.

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 (DAAMS), 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 Immediately Dangerous to Life and Health (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: When handling agents, the buddy system will be incorporated. No smoking, eating, or drinking in areas containing agents is permitted. Containers should be periodically inspected for leaks, (either visually or using a detector kit). Stringent control over all personnel practices must be exercised. Decontaminating equipment will be conveniently located. Exits must be designed to permit rapid evacuation. Chemical showers, eyewash stations, and personal

cleanliness facilities must be provided. Wash hands before meals and shower thoroughly with special attention given to hair, face, neck, and hands using plenty of soap and water before leaving at the end of the work day.

Other Precautions: 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 containers will be stored in a single containment system within a laboratory hood or in a double-containment system.

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 HD Agents H, HD, and HT."

Section X - Transportation Data

Note: Forbidden for transport other than via military (Technical Escort Unit) transport according to 49 CFR 172

Proper Shipping Name: Toxic liquids, n.o.s.

DOT Hazard Class: 6.1, Packing Group I, Hazard Zone B

DOT Label: Poison

DOT Marking: Toxic liquids, n.o.s. Bis-(2-chloroethyl) sulfide UN 2810, Inhalation Hazard

DOT Placard: Poison

Emergency Accident Precautions and Procedures: See Sections IV, VII, and VIII.

Precautions To Be Taken In Transportation: Motor vehicles will be placarded regardless of quantity. Drivers will be given full information regarding shipment and conditions in case of an emergency. AR 50-6 deals specifically with the shipment of chemical agents. Shipment of agents will be escorted in accordance with AR 740-32.

The Edgewood Chemical Biological Center (ECBC), Department of the Army, believes that the data contained herein are actual and are the results of the tests conducted by ECBC experts. The data are not to be taken as a warranty or representation for which the Department of the Army or ECBC assumes legal responsibility. They are offered solely for consideration. Any use of this data and information contained in this MSDS must be determined by the user to be in accordance with applicable Federal, State, and local laws and regulations.

Addendum A

Additional Information For Thickened HD

Trade Name and Synonyms: Thickened HD, THD

Trade Name and Synonyms for Thickener:

Acrylic acid butyl ester
Polymer with styrene
Butyl acrylate-styrene polymer
Butyl acrylate-styrene copolymer
N-Butyl acrylate-styrene polymer
Polymer with styrene acrylic acid butyl ester
2-Propenoic acid
Butyl ester
Polymer with ethenylbenzene
Acronal 4D
Acronal 290D
Acronal 295D
Mowilith DM60
Sokrate LX 75
OSH22097

Hazardous Ingredients: Styrene-butyl acrylate copolymer is used to thicken HD and is not known to be hazardous except in a finely-divided, powder form.

Physical Data: Essentially the same as HD.

Fire and Explosion Data: Same as HD and slight fire hazard when exposed to heat or flame.

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 HD occur, follow the same procedures as those for HD, but dissolve THD in acetone before 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. 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 and then rinse-decontaminated may evolve sufficient HD 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. Avoid contact with strong oxidizers, excessive heat, sparks, or open flame.

Transportation Data: Same as HD.

APPENDIX A

EMERGENCY ACTION PLAN PRE-EVALUATION CHECKLIST AND DRILL/INCIDENTAL RESPONSE EVALUATION FORM

Emergency Action Plan
Pre-Evaluation Checklist
and
Drill/Incidental Response
Evaluation Form

1.0 EMERGENCY ACTION PLAN PRE-EVALUATION CHECKLIST

The Emergency Action Plan Pre-Evaluation Checklist provides a check list verification, for the necessary measures needed to be conducted in preparation of a emergency. This is to be completed prior to the commencement of on-site activities. The checklist has been compiled from the OSHA Compliance Guidelines.

Instructions for Completion:

Prior to the commencement of on-site activities the SSO or FOL will complete the evaluation checklist to ensure that all the elements of the Emergency Action Plan are in place.

2.0 EMERGENCY ACTION PLAN DRILL/INCIDENTAL RESPONSE EVALUATION FORM

This form provides written documentation of emergency action drills, incidental response measures, and emergency response support provided by outside support agencies.

Instructions for Completion:

The following form will be completed by the SSO, FOL, or ranking team member on-site in the event of

- Emergency Action Drill
- Incidental response measure
- Emergency response requiring outside assistance

Upon completion this form will be forwarded to the PHSO for review and analysis. Documentation of any of the above events will be maintained with the Emergency Action Plan Section 2.0 of this HASP.

NSWC Crane
Emergency Action Plan
Pre-Evaluation Checklist

Measurement Criteria	Standard Reference	Criteria Met Y/N/NA
If the employer does not have an Emergency Response Plan but expresses an intent to evacuate all personnel and not allow any employees to respond, does the employer have an emergency action plan in accordance with 29 CFR 1910.38(a)	1910.38(a)	
Emergency Action Plan compliance checklist: 1910.38(a)	1910.38(a)(1)	
1. Is the Plan in writing		
2. Are emergency escape procedures and emergency escape routes designated?	1910.38(a)(2)(i)	
3. Are procedures established to account for all employees after the emergency evacuation has been completed?	1910.38(a)(2)(iii)	
4. Has an employee alarm system which complies with 29 CFR 1910.165 been established?	1910.38(a)(3)(i)	
5. If an employee alarm system is used for other purposes, have distinctive signals for each purpose been developed?	1910.38(a)(3)(ii)	
6. Has the employer designated and trained a sufficient number of persons to assist in the safe and orderly evacuation of employees (generally one per 20 employees)? (See Appendix to 29 CFR 1910 Subpart E -- Means of Egress, 3.)	1910.38(a)(5)(i)	
7. Has the employer reviewed the emergency action plan with each employee covered by the plan initially, and when the plan or the employee's responsibilities under the plan change?	1910.38(a)(5)(ii)	
8. Is the written plan kept at the workplace and made available for employee review?	1910.38(a)(5)(iii)	
9. Has the plan been effectively communicated and implemented by the employer to ensure that employees do not assist in handling emergencies, or does the employer actually intend to have employees respond to emergencies?		
10. Does the employer intend to have employees handle incidental releases? If so, are the training, tools, equipment, and PPE appropriate for handling incidental releases of the hazardous substance available in the work area?		
Does the employer have procedures for notifying both inside and outside parties of incidents?	1910.38(a)(2)	
Comments:		

Checklist Completed By:

_____ _____
Name Title

Site Name:_____ Date:_____

NSWC Crane
Emergency Action
Drill/Incidental Response
Evaluation Form

Site Name:	Date:_____	Time Drill/Response Initiated:_____
Contract Task Order Number:_____		Time Drill/Response Terminated:_____

Description of Drill/Response Event	**Time**
Type of Drill/Response: Fire; Spill Response; Chemical Release; Injury/Illness	N/A
Alarm Activated (Alarm Type – Verbal, Radio, Air Horn)	
Operations secured	
All personnel assembled at evacuation point	
Incidental response measures initiated	
Head Count Conducted	
Outside Emergency Response Notified	

Names of Participants	Roles/Responsibility	Performance Evaluation
	Incidental Response Coordinator	
	Incidental Response Team Member 1	
	Incidental Response Team Member 2	
	Incidental Response Team Member 3	

Outside Response Agencies Participating	Notification Time	Arrival Time	Resources : Adequate number of personnel and Equipment to Support Response measures Required

Equipment Used in the Drill/Response	Readily Available			Function as Intended	Replenishment of Used Supplies Required
	Yes	No	N/A		
Spill Kit					
Fire Extinguishers					
First-Aid Kit/Stretcher					
Self Contained Breathing Apparatus (SCBA)					
Other					

Remarks and/or Suggestions

Evaluator:

_____ Name

_____ Title

APPENDIX B

FIRST AID

First Aid

INTRODUCTION

During any emergency situation, an injury or illness may occur. Therefore, it is important that emergency treatment be conducted in a safe and efficient manner.

MEDICAL EMERGENCIES

First Aid

The field team in many circumstances may be required to perform or assist in handling medical emergencies. The medical emergency may be a result of:

- Chemical itself (toxic effect).
- Physical hazard of the substance (corrosive effect, fire, explosion).
- Equipment failure that resulted in a hazardous material release.
- Employee injury that may have caused the hazardous material incident.

Emergency responders should possess American Red Cross First-Aid and Cardiopulmonary Resuscitation (CPR) Training.

The exact first-aid procedures required in the event of a medical emergency involving hazardous materials will be located on the manufacturer's Material Safety Data Sheet (MSDS) for that substance. Emergency responders should be cautioned that many times the manufacturer adds medical procedures that only a licensed physician may perform.

A few general first-aid procedures are included here for reference.

Assessing the Situation

Use the following steps to assess what emergency problems exist and what actions are needed:

1. Don't panic. You will be able to assess the situation more effectively. Remember, psychological support to the victim is also important.

2. Look for an emergency medical identification tag on the victim's wrist, ankle, or neck. Check his/her wallet for an identification card with further instructions. Another alerting device could be a sticker on the windshield of the victim's car.

3. Remember the ABC's of life support:

   a. Airway open. Open and maintain the victim's airway.

   b. Breathing restored. If the victim is not breathing, begin rescue breathing techniques immediately.

   c. Circulation maintained. If there is no pulse, start external cardiac compression immediately.

4. Check for bleeding. If bleeding is found, apply direct pressure, elevate the injured limb, only if it does not cause further pain or injury, and apply pressure on the blood-supplying artery. Only use a tourniquet for severe, life-threatening hemorrhage as a last resort when all other measures fail.

5. Look for signs of shock and broken bones.

6. Get professional help quickly. Know other emergency numbers, such as 911 or the local emergency agencies' numbers. Telephone appropriate authorities (rescue squad, ambulance, police, poison control center, or fire department) and describe the problem. Be sure to give your name and location, as well as the number of persons involved.

7. Loosen any clothing that may restrict the victim's breathing or interfere with circulation.

8. Never give an unconscious person anything by mouth.

9. Do not move injured persons unless the situation is life threatening. Keep the victim still, quiet, and warm (except in cases of heat exhaustion and sunstroke). A victim with broken bones should not be moved until a splint has been properly applied.

Vital Signs

Once the situation is stabilized, the victim's breathing and heartbeat must be checked. Pulmonary resuscitation techniques are used to restore breathing, and cardiac compression is used to restore the heartbeat.

Cardiopulmonary Resuscitation

Pulmonary Resuscitation

Symptoms of breathing difficulties include shortness of breath, dizziness, chest pain, rapid pulse, bluish-purple skin color, dilated pupils, and unconsciousness. The following procedures should be used for persons who have stopped breathing:

1. Lay the victim on his back. Place one hand under the victim's neck and lift, tilting the head back as far as possible with other hand to open the airway. Avoid exaggerated head tilt in infants, small children, and victims with neck and back injuries.

2. Look, listen, and feel for respiratory movement. If breathing is absent, pinch the victim's nostrils closed, take a deep breath, and completely cover the victim's mouth. Give two quick full breaths. If the chest does not rise, check for airway obstruction.

3. Clear the airway using your fingers in a hooked fashion to remove any solid or liquid obstructions. If the victim has a tracheotomy (permanent opening in neck), start rescue breathing by placing your mouth over the neck opening (stoma) rather than the mouth.

4. If a pulse is present, continue rescue breathing at a rate of one strong breath every 5 seconds (i.e., 12 per minute) for adults or one shallow breath every 3 seconds (i.e., 20 per minute) for small children.

5. If a pulse is not present, start external cardiopulmonary resuscitation (CPR).

Cardiac Compression

Symptoms of heartbeat problems include those for breathing difficulty. Heartbeat can be checked by feeling for a pulse.

The normal adult heart rate is 60 to 80 beats per minute. Children are slightly faster, and excitement, exercise, or fever may increase the heartbeat. Pulse rates can be determined as follows:

1. Place the tips of your index and middle fingers on the side of the victim's neck next to the airway to feel for a pulse. Do not use your thumb, as you will confuse the victim's pulse with your own.

2. Once a pulse has been located, count the number of beats in 15 seconds and multiply by four, or, if the pulse is very slow or irregular, count for an entire 60 seconds.

   A pulse rate may vary, depending on the victim's condition. The normal adult male pulse is 54 to 70 beats per minute; for a female it is 75 to 80. A young child's pulse ranges between 80 and 180 beats per minute. In addition to the number of beats, be sure to note whether the pulse is full, weak, bounding, or irregular.

Lack of heartbeat or pulse requires starting CPR. There are two methods of giving CPR, depending on whether one or two people are available. Only information on the one-rescuer CPR is provided here.

One-Rescuer CPR

Apply 80 compressions per minute. Every 15 compressions should be followed by two very quick breaths. For adults, one must exert enough pressure to depress the breastplate 1-1/2 to 2 inches. Continue compressions at a rate of 80-100 per minute (15 per 9-11 seconds). Call for professional medical help as soon as possible. Keep the victim warm and still. Signs of recovery include a return to normal breathing, an improvement in skin color, and the movement of arms and legs.

Children require the heel of only one hand to depress the breastplate 3/4 to 1-1/2 inch. Continue compressions at a rate of 80-100 per minute (5 per 3-4 seconds). Every five compressions should be followed without a pause by one shallow rescue breath. Note: A child's lungs will require less air to inflate. Take care so as not to burst lungs by over inflation.

Wound Care

When possible, wash hands thoroughly with soap and water before administering first aid. Even minor cuts and scrapes can become contaminated and infected. Using the following good wound management techniques can prevent or reduce the possibility of infection. Prepare a clean, uncluttered place to put articles required to provide care. Under emergency conditions when this is not possible, try not to touch the wound unnecessarily, breathe on the wound, or cough over the wound. Keep the wound and all first-aid materials as clean as possible. When using packages of sterile pads or dressings, handle on the edges. Do not touch the area that comes in contact with the wound.

Surface Wounds

Cleanse the wound and the surrounding area gently with mild soap and water and rinse. Blot the wound dry with a sterile pad or clean dressing. Treat the wound to protect against contamination and cover it to soak up fluids and prevent further contamination. Handle only the edges of sterile pads or dressings.

The following bandage types may be used:

1. Adhesive pads for large wounds, cuts, or scrapes. These are convenient, one-step bandages to cushion and protect.

2. Sterile pads for cuts, scrapes, or other minor wounds.

3. Nonstick sterile pads for bleeding and draining wounds, burns, and infections. These will not stick to the wound or disrupt the healing process.

4. Rolled gauze for securing sterile pads. This is especially good for joints and hard-to-bandage wounds.

Tape bandage secure with first-aid tape to help keep out dirt and germs.

Deep Wounds and Serious Burns

These types of wounds should be cleansed only by professional medical personnel. The patient should be treated for bleeding and shock. One must be alert for signs of infection such as a hot, painful reddening around the wound, swelling, chills, and fever. Consult a physician immediately, and check for immunization against tetanus within the past 5 years.

Bandaging

Emergency bandages can be devised from clean handkerchiefs, sheets, belts, socks, or stockings. Bandages should be snug but not tight enough to interfere with circulation. Always leave the victim's fingertips or toes exposed when a splint or bandage is applied to the arms or legs. Loosen the bandage if swelling, discoloration, or a cold, numb, or tingling sensation occurs in the fingers or toes. Never apply a tight bandage to the victim's neck, as the circulation of blood to the brain may be restricted or stopped.

Heat Related Illnesses

Working in Personal Protective Equipment can easily lead to heat stress. All site personnel wearing PPE should be constantly monitored for indications of heat related illness.

There are three disorders which should be recognized and treated as soon as possible.

Heat Cramps

Heat cramps are painful muscle spasms that occur after vigorous exercise. They can occur in cold as well as warm environments. Heat cramps usually occur in the leg or abdominal muscles. When in the abdomen, the pain may be severe enough to double someone over. To treat heat cramps use the following steps.

- Remove the person from the hot environment. Remove PPE and loosen any tight clothing.
- Rest the affected muscles. Have the person sit or lie down until the cramps subside.
- Replace fluids by mouth. Use water or a balanced electrolyte solution (such as a sports drink). Do not give salt.

After the cramps go away, the person may resume their work. However, if they resume heavy sweating, the cramps may reoccur. If the cramps do not go away, the person should be transported to the hospital.

Heat Exhaustion

Heat exhaustion is the most common serious illness caused by heat. It occurs when the body is depleted of vital fluid through sweating. Sweating is supposed to cool they body by evaporation. When evaporation does not occur, the body continues to sweat. Persons wearing PPE may sweat profusely but experience little body cooling and are particularly prone to heat exhaustion. High humidity will also hinder the cooling process.

The persons skin will be cold and clammy and the face gray. They may also feel dizzy, weak or faint with nausea or headache. Their pulse is often rapid with body temperature normal or slightly elevated.

To treat heat exhaustion, use the following steps:

- Remove them from the hot environment. Remove PPE and loosen any tight clothing.

- Encourage the person to lie down.

- If they are fully alert, encourage them to drink up to 1 liter of water or sports drink.

Most of the time these measures will reverse the symptoms and the person will feel better within 30 minutes. However, if they don't feel better, they should be immediately transported to the hospital for additional treatment and close monitoring.

Heat Stroke

Heat stroke is the least common but most serious heat related illness. It occurs when the body is overwhelmed and cannot get rid of excess heat. The body temperature will rise to the level where tissue is destroyed. Untreated heat stroke will kill a person. The symptoms of heat exhaustion often come before heat stroke. Heat exhaustion can develop into heat stroke if not treated.

Many with heat stroke have hot, dry, flushed skin because their ability to sweat has failed. However, in the early stages the person can still be sweating. The persons body temperature rises rapidly, up to 106ºF. The first sign is a change of behavior and then unresponsiveness. The pulse is unusually rapid and strong but start to fall as they become weaker.

Heat stroke is a life threatening emergency which left untreated will result in death. To treat heat stroke use the following steps.

- Get person out of hot environment.
- Remove all of their clothes.
- Cover with wet towels or sheets or soak with cold water.
- Transport immediately to hospital.

Remember to get the body temperature down by any means possible. Failure to do so will result in DEATH!

<u>Triage</u>

In the event of a hazardous materials emergency, emergency responders must be able to handle a large number of injuries. One method, known as triage, is used to sort the victims of such an incident so that those who are most severely injured, but who can still be saved, will be treated first. Triage was developed by military doctors and has been adopted for natural and man-made emergencies involving civilians. The triage system uses four categories.

- **Priority 1:** (Red tag) Immediate care; life threatening; seriously injured persons needing major medical attention. This requires the presence of medical and paramedical personnel and all other resources or involved agencies that are available. The hospital's role comes into play here. The hospital disaster plans must be implemented. Their arrangements with specialty institutions for specific injuries (burns, head injuries, toxicity cases, etc.) and transfer agreements, if necessary, must be utilized.

- **Priority 2:** (Yellow tag) Urgent care; can delay transport up to one hour. Minor medical attention is needed. Basic wound care, dressings, tetanus immunizations, etc., are provided. This care can easily be handled by paramedics.

- **Priority 3:** (Green tag) Delayed care; can delay transport and treatment up to three hours. This covers victims at the incident scene who sustained only minor injuries and can seek medical attention for themselves and for one another.

- **Priority 4:** (Black tag) No care required. Victims who will die. Though no one wants to accept this fact, there are those who will not survive. Again, we must be realistic, no matter how difficult it is. These victims will need comfort for their impending demise. This service, too, must be pre-planned.

There are a variety of triage systems used across the country. You must be familiar with the system used in your locale. All systems are based on the four basic categories discussed here.

RESCUE CARRIES

The possibility of moving an injured victim during an emergency requires the rescuer to properly carry the victim without injury to the rescuer or the victim. The drawings on the next page illustrate three proper rescue carries.

RESCUE CARRIES

Pack Strap Carry

Extremities Carry

Firefighters drag enables rescuers to move people who are heavier than they. Tie the victims wrists together. Get on hands and knees and straddle the victim put the victims tied hands around your neck, straighten your arms and drag across the floor by crawling on your hands and knees.

The clothes or blanket drag. The rescuer must pull the victim along the long axis of the victims body. Use legs and back muscles and keep your arms straight.

CONCLUSION

Hopefully, rescue and medical emergency procedures will not have to be used at our facility. But we must be prepared for every eventuality that may occur. Only with sufficient planning and regular training will emergency medical procedures be successful.

APPENDIX C

BLOODBORNE PATHOGEN EXPOSURE CONTROL PLAN

BLOODBORNE PATHOGEN – EXPOSURE CONTROL PROGRAM
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TETRA TECH NUS
BLOODBORNE PATHOGEN – EXPOSURE CONTROL PROGRAM

1.0 PURPOSE

To establish a uniform procedure specifying the minimum health and safety requirements for activities which may predispose Tetra Tech NUS personnel or subcontractor under their charge to Bloodborne Pathogens (BBP) or Other Potentially Infectious Materials (OPIM) during operations (specifically first-aid) performed by (or managed by) Tetra Tech NUS, Inc.

2.0 SCOPE

For the purpose of clarification, this program applies to

- All operations in which Tetra Tech NUS, Inc. or subcontractors working under their charge may be exposed to BBP or OPIM while engaged in the collateral duty of rendering first-aid to an injured person.

- All operations as defined through the specified scope of work where through historical evidence or through discovery medical waste, BBP, or OPIM may be encountered.

- This program has been developed on the basis of two principle requirements. These are as follows:

That this program will be implemented on a **SITE SPECIFIC** basis, establishing flexibility to provide for the protection of the health and safety of Tetra Tech NUS and subcontractor personnel, as well as for internal and regulatory compliance. This concept recognizes that Tetra Tech NUS personnel work on many different sites, often with only brief field operations tasks, as opposed to longer term project sites. Therefore, this performance-based program has been developed to establish the minimum requirements for BBP and OPIM protection as per 29 CFR 1910.1030 at any individual Tetra Tech NUS office location or project site.

That all first aid incidents will be treated using Universal Precautions/Body Substance Isolation (UP/BSI). These methods of approach during first-aid application establishes a common theme – **ALL BLOOD AND BODILY SUBSTANCES ARE INFECTIOUS**. This program has been structure after the Model Exposure program created by OSHA. This program also recognizes that OSHA standards are minimum requirements.

This Bloodborne Pathogen-Exposure Control Program has been has been divided into two distinct sections. The first section delineates the program elements and administrative guidelines. The second section reflect the site specific portion of this program the actual exposure control plan.

3.0 RESPONSIBILITIES

Tetra Tech NUS President: Has the overall responsibility for the health and safety of all personnel and operations in Tetra Tech NUS, including those involving collateral duty providing first aid to injured persons or conducting operations where there is potential to BBP and/or OPIM. This responsibility is principally satisfied through delegating the necessary authority and accountability to the Tetra Tech NUS Office Management level. Successful accomplishment and maintenance of this and other health and safety programs will be achieved through such means as ensuring that health and safety is a principal component of personnel annual performance reviews ranging from Tetra Tech NUS top management through to each employee.

Tetra Tech NUS Office Management: Provide labor and equipment resources necessary to comply with the requirements of this program. Other responsibilities include:

- Establish office policy on first-aid provision and this Bloodborne Pathogen protection and Exposure Control Program. No personnel at their location will participate in the delivery of first-aid as a collateral duty unless they are identified participants of this program as qualified through training proficiency and medical qualification.

- Supporting the office health and safety Point of Contact, where applicable, in the implementation and maintenance of this program for that office.

Tetra Tech NUS Health and Safety Manager (HSM): Provide technical management and oversight of this program, and to aid all Tetra Tech NUS locations in effectively implementing these requirements. The Tetra Tech NUS HSM will serve as the Program Administrator for this Bloodborne Pathogen Exposure Control Program. The Tetra Tech NUS HSM will also be responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Reviewing all completed First-aid incident reports and potential BBP-OPIM incidents as they may occur. Review and evaluation of first-aid incidents and Post Exposure Incidents will be completed within 24 hours of the occurrence. This critical time line is necessary if vaccinations are to be administered.

- Will maintain, review, and update the Bloodborne Pathogen Exposure Control Program at least annually, and whenever necessary to include new or modified tasks and/or procedures.

- Will provide necessary personnel to investigate exposure incidents.

- Will review all Post Exposure Follow-up Evaluations to ensure the necessary corrective actions have been accomplished by assigned responsible parties.

- Will coordinate medical surveillance requirements with our current program elements.

- Will provide designee(s) as records custodians for medical evaluations, Post Exposure Follow-up, and training in accordance with 29 CFR 1910.1030 and 1910.1020.

- Will ensure that all medical actions required are performed and that appropriate employee health and OSHA records are maintained. Coordination of this activity will occur between the Program and Plan Administrator(s) and the Medical Surveillance/Training Custodian.

- Will insure through training monitoring and enforcement that those employees who are determined to have occupational exposure to blood or other potentially infectious materials (OPIM) must comply with the procedures and work practices outlined in this program.

- Eliciting feedback from Tetra Tech NUS office health and safety Points of Contact.

- Maintaining proficiency in regulatory requirements on Bloodborne pathogens and OPIM as they may impact Tetra Tech NUS, Inc. operations.

- Modifying elements of this program, when or as appropriate.

Other specific responsibilities of the Tetra Tech NUS HSM include:

- Establishing minimum components of Bloodborne Pathogen Exposure Control Program training course material, both for in-house and subcontractor-provided training courses.

- Maintaining appropriate record-keeping for this program.

- Regularly communicating with Tetra Tech, Inc. Corporate Health and Safety, to satisfy overall company requirements.

Office Health and Safety Points of Contact (POCs): Ensure that the requirements of this program are satisfied for all operations in which through collateral duties of providing first aid or the potential exists to encounter bloodborne pathogens or OPIM through the course of their duties. Other responsibilities include ensuring that:

- If training is provided by subcontractors, that an appropriate organization is selected, and that the training course material satisfies the Tetra Tech NUS requirements.

- No individual participates in first aid or site operations in which bloodborne pathogens or OPIM may be encountered unless they are fully compliant with all program requirements.

- The HSM is alerted when first aid is administered and there is potential for exposure to bloodborne pathogens or OPIM exists.

- A properly completed written program is present at every site where first aid will be administered by Tetra Tech NUS, Inc. personnel as part of their collateral duties or the potential for bloodborne pathogens or OPIM exists.

- Appropriate documentation is maintained for that office, and that completed training and incident reports and Post incident Evaluation follow-ups are submitted to the HSM at the conclusion of project activities to facilitate the annual review and record keeping requirement.

Note: In situations where an Office Health and Safety Point of Contact is filled by an administrative person not qualified in issues regarding this program, the Tetra Tech NUS HSM will be responsible for those items listed above.

Site Health and Safety Officers (SSO): The SSO and/or the FOL will serve as Bloodborne Pathogen Exposure Control Plan (BBP-ECP) Administrators. Within this capacity they will be responsible to insure all elements of the site BBP-ECP plan are completed as applicable. Other responsibilities include ensuring that:

- All first aid incidents and potential BBP and OPIM exposures are investigated. This investigation will determine plan applicability and corrective measures and actions as appropriate.

- All personnel to participate who will participate in collateral duty activities such as providing first aid or site operations where potential exposure to BBP or OPIM exists are trained to the appropriate level

for the tasks to be performed and documentation certifying this training is obtained and maintained on site.

- All personnel meet the necessary medical qualifications for this type of activity. Where applicable site personnel have declined or accepted vaccinations as it has been determined to be necessary by the Tetra Tech NUS Occupational Health Care Provider. All records pertaining to this medical surveillance are available on-site or under the custody of the Medical/Training record Custodian.

- Provide the intended emergency services, the necessary information concerning the hazards associated with site operations when as part of the scope of work BBP or OPIM may encountered.

- The elements of the BBP-ECP are completed in their entirety, where applicable.

Project Health and Safety Officer (PHSO) – Responsibilities are as follows:

- The PHSO shall ensure that where through collateral duties or project scope may expose personnel to BBP or OPIM that these activities are adequately addressed in the Site Specific Health and Safety Plan for assigned projects.

- The PHSO through constructing the HASP shall ensure the level of collateral duties for first aid are well defined. This is especially critical when it has been determined that emergency services response times or capabilities are limited.

- In addition, it is the PHSO's responsibility to provide technical assistance to the SSO and/or the Field Operations Leader.

Field Operations Leader (FOL) – The FOL may share responsibility with the SSO or in the absence of an SSO ensure the implementation of this program for all operations conducted under their direction. Substitution for the SSO will depend on the nature of the operations and the anticipated severity of the hazards. Substitution shall proceed based on the PHSO recommendation.

Project Manager (PM)/Task Order Manager(TOM) - The PM/TOM is also ultimately responsible for the effective compliance with these requirements. The PM/TOM will ensure that sufficient information has been provided to the PHSO to develop a comprehensive site-specific Health and Safety Plan (HASP).

Tetra Tech NUS Employees - The employees are responsible for following the tenets of this Bloodborne Pathogen Exposure Control Program. In addition the employees are responsible for reporting any deficiencies or inadequacies of this program or site-specific elements to the SSO and/or the FOL.

4.0 UNIVERSAL PRECAUTIONS/BODY SUBSTANCE ISOLATION

In 1987, the Centers for Disease Control and Prevention (CDC) published a document recommending that precautions be consistently used for all patients whenever contact with blood and body fluid is possible, regardless of their bloodborne infection status. This recommendation is referred to as universal precautions; it is an approach to infection control. Universal precautions are intended to prevent parenteral, mucous membrane, and nonintact skin exposures of healthcare providers to bloodborne pathogens. According to the concept of universal precautions, all human blood and certain body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), Hepatitis B (HBV), and other bloodborne pathogens.

The proactive use of universal precautions shall be implemented during all first aid activities whenever contact with blood or OPIM may be reasonably anticipated. All blood or OPIM shall be considered infectious regardless of the perceived status of the source individual. In addition to Universal Precautions a working practice of Body Substance Isolation (BSI) establishes the same practice. Universal precautions or BSI should be attained by using engineering controls, work practice controls, and PPE.

5.0 ENGINEERING AND WORK PRACTICE CONTROLS

Whenever possible, engineering and work practice controls shall be implemented to eliminate or minimize employee exposures. Such controls may include, but are not limited to, the following:

- Hand-washing supplies should be available at all field project sites. At a minimum, antiseptic hand cleaner with clean paper towels or antiseptic towellettes will be provided.

- Employees shall be instructed to wash hands and skin with soap and water or flush mucous membranes immediately or as soon as feasible after contact with blood or OPIM.

- No eating, drinking, smoking, cosmetics or lip balm application, or handling of contact lenses is allowed in areas with reasonable likelihood of occupational exposure to blood or OPIM.

- In rare cases where employees may come across waste items contaminated with blood or OPIM, care shall be taken to avoid potential contact.

- Any needles or sharp objects shall be placed in a puncture-resistant, labeled, leak-proof container. Under no conditions shall needles or contaminated sharp objects be bent, sheared, broken, or recapped.

- All waste created during first aid administration, including PPE, shall be disposed of in a sealable waste bag for disposal. All sanitary napkin and tampon disposal receptacles in restroom facilities shall be lined with plastic bags that are removed and replaced daily. Because these items do not meet the definition of regulated waste under the bloodborne pathogens standard and pose minimal risk of exposure, they can be disposed of in the sealed plastic bags in regular waste containers.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Tetra Tech NUS shall provide occupationally exposed employees with appropriate PPE at no cost. PPE may include the following items:

- Gloves (Surgeons Style)
- Surgeons Mask
- Safety Glasses
- Protective clothing
- Ventilation devices such as mouthpieces, resuscitation bags, or pocket masks

PPE shall be selected based on the potential exposure to blood or other OPIM. PPE is considered appropriate only if it does not permit blood or OPIM to pass through to or reach the employee's work clothes, street clothes, skin, eyes, mouth, or mucous membranes under normal conditions and for the duration of time it will be used. PPE shall be worn during any first aid response involving blood or OPIM.

Disposable gloves, pocket masks, will be included in the standard first aid kit required at all field sites and offices. Gloves shall be worn whenever it is reasonably anticipated that employees will have hand contact with blood, non-intact skin, mucous membranes, or OPIM, and when handling or touching contaminated items or surfaces. Safety Glasses and surgeons mask will be worn whenever there is a potential for splash or spray of bodily fluids during first aid or clean up procedures.

Disposable gloves and mouthpieces will not be washed or decontaminated for reuse and must be replaced when they become contaminated, torn, or punctured, or when their ability to function as a barrier is compromised.

7.0 HOUSEKEEPING

In general, work areas are not expected to be contaminated with blood or OPIM unless in the event of a severe injury or the project background indicates disposal of medical byproducts or wastes. In that case, all surfaces and equipment shall be cleaned and disinfected after contact with blood or OPIM as soon as possible with a diluted bleach solution (5% Household Bleach) or other appropriate disinfectant.

If contaminated sharp objects or broken glassware are encountered, these items shall not be picked up by hand. Mechanical means of retrieval (such as use of a broom and dust pan, tongs, or forceps) shall be used. Any reusable bin, pail, can, and similar receptacles that could become contaminated must be inspected and decontaminated with a bleach solution as soon as possible when contamination is visible.

Clothing contaminated with blood or OPIM shall be laundered. Clothing excessively soiled shall be bagged, labeled, and discarded as regulated waste.

8.0 REGULATED WASTE DISPOSAL

The handling, storage, treatment, and disposal of all regulated waste shall be conducted in accordance with all applicable federal, state, and local regulations. Proper handling of regulated waste is essential to prevent unnecessary exposure to blood and OPIM. Regulated waste includes wastes in which blood or OPIM could be released from pouring, dripping, squeezing, or flaking. Regulated waste must be placed in a red biohazard bag labeled “Biohazardous Waste” or with the international symbol and the word “Biohazard.” Bags must be tied shut and placed in closable, leak-resistant and labeled containers that can prevent leakage during all handling, storage, transport, shipping, and other activities. If the outside of the container becomes contaminated, it must be placed in a secondary container meeting the same specifications.

8.1 Nonregulated Wastes

Nonregulated waste can be disposed of along with normal refuse. This waste shall be placed in a sealable bag, closed tightly, and promptly placed into a garbage receptacle. All sharp items (glass reagent ampoules, broken glass shall be placed in a puncture-resistant, leak-proof container as to not pose a threat to Tetra Tech NUS personnel or outside personnel charged with handling refuse.

9.0 HEPATITIS B VACCINATION AND POST-EXPOSURE EVALUATION AND FOLLOW-UP

Tetra Tech NUS shall make available to employees the HBV vaccination series and a post-exposure evaluation and follow-up following an exposure incident. An exposure incident includes a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or OPIM resulting from the performance of an employee's duties or collateral duties such as first aid. Bloodborne pathogen health hazard information for HBV is presented in the training module Attachment C-II of this program document. The HBV vaccination and post-exposure evaluation and follow-up are discussed below and are also provided in the site-specific portion of this program Attachment C-I.

Hepatitis B Vaccination

In accordance with the OSHA Directive "Change to OSHA Instruction CPL 3-2.44C" dated July 1, 1992, a pre-exposure HBV vaccination does not have to be offered to employees who are designated only as first aid providers and those whose primary job assignment is not rendering first aid but administering first aid only as a collateral duty to their routine work assignments. However, the HBV vaccination series will be made available to any unvaccinated first aid provider who has rendered assistance in any situation involving the presence of blood or OPIM, regardless of whether an actual exposure incident occurred.

If the employee initially declines the vaccination but decides later to accept, Tetra Tech will provide the vaccination series at that time. If an employee eligible for the vaccination series declines to participate, he or she must sign the "Hepatitis B Vaccine Declination" [See Attachment C-I Bloodborne Pathogen-Exposure Control Plan (BBP-ECP), Figure C-I-1].

Post-Exposure Evaluation and Follow-up

A confidential medical evaluation and follow-up shall be immediately provided to exposed employees following the report of an exposure incident. The post-exposure evaluation and follow-up shall include the following:

- Documentation of the exposure route and exposure incident circumstances (See Attachment C-I BBP-ECP for Post Exposure Evaluation Form, Figure C-I-2)
- Identification and documentation of the source individual (unless identification is not feasible or prohibited by law)
- Collection and testing of blood for HBV and HIV serological status

- Post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service or Tetra Tech NUS Occupational health Care Provider.

- Counseling

- Evaluation of reported illness

The source individual's blood shall be tested as soon as feasible after consent is obtained to determine and document HBV and HIV infection status. If the source individual is already known to be infected with HBV or HIV, the blood testing need not take place. The test results shall be made available to the exposed employee, and any applicable laws and regulations regarding disclosure of identity and infection status of the source individual will be complied with. Details of the exposure incident investigation shall be documented on the using the Tetra Tech NUS Post Exposure Evaluation Form (See Attachment C-I BBP-ECP for Post Exposure Evaluation Form, Figure C-I-2).

Copies of the completed form shall be forwarded to the Tetra Tech NUS, Inc. HSM and designated healthcare professional.
Information provided to the healthcare professional and the healthcare professional's written opinion for follow-up are discussed below.

9.1 Information Provided to the Healthcare Professional

Prior to an event of an exposure incident, Tetra Tech NUS shall provide the following information to the healthcare professional responsible for the employee's HBV vaccination:

- A copy of 29 CFR 1910.1030
- A description of the exposed employee's duties as they relate to the exposure incident
- Documentation of the routes of exposure and exposure incident circumstances
- Results of source individual's blood testing, if available
- All medical records relevant to the appropriate medical treatment, including vaccination status

A copy of the "Post-Exposure Evaluation Form (See Attachment C-I BBP-ECP for Post Exposure Evaluation Form, Figure C-I-2).

9.1.1 Exposure Protocol

The time line for responding to a potential exposure incident is critical. In order meet that time line the following sequence of events will apply

The FOL and/or the SSO will notify the HSM immediately in the event of a potential BBP or OPIM exposure incident. As part the notification the following documentation must be completed

- Incident report
- Post Exposure Evaluation Form (See Attachment C-I BBP-ECP for Post Exposure Evaluation Form, Figure C-I-2).
- Work Care Emergency Response Protocol (See Attachment C-I BBP-ECP for Emergency Response Protocol Form, Figure C-I-3).

Upon completion of these reports, they shall be faxed to the HSM and Tetra Tech NUS Occupational Health care provider –Work Care.

Work Care will provide instruction as to how to proceed and shall establish communication with the facility providing care to the victim and should it be necessary to the first aid provider should a potential exposure be determined to be likely. It will be necessary to initiate any vaccination within 24 hours of potential exposure incident.

Tetra Tech NUS employees shall receive a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation. The opinion for HBV vaccination shall be limited to whether the vaccination was indicated and if the employee has received such vaccination. The employee will be informed of the results of the examination. During the evaluation, the employee will also be told about any medical conditions that may result from exposure to blood or OPIM and that may require further evaluation or treatment. All other findings or diagnoses shall remain confidential and shall not be included in the healthcare professional's written opinion.

10.0 INFORMATION AND TRAINING

All Tetra Tech NUS employees with the potential for occupational exposure to blood and OPIM will receive training at the time of initial assignment to tasks during which occupational exposure might occur and at least annually thereafter. The training may be included with other health and safety training. Additional training will be provided when changes in tasks or procedures affect employee exposure potential. The training program shall contain or address the following elements:

- A copy of the 29 CFR 1910.1030 bloodborne pathogens standard, along with an explanation of its contents.
- The contents of this program with emphasis on the site-specific portion to be completed by the field crews.
- Epidemiology and symptoms of bloodborne diseases
- Modes of transmission of bloodborne pathogens
- Methods for recognizing tasks and other activities that may involve exposure to blood and OPIM
- Use and limitations of exposure prevention or reduction methods, including engineering controls, work practices, and PPE
- PPE types and their proper use, location, removal, handling, decontamination, disposal, and basis for selection.
- HBV vaccination efficacy, safety, method of administration, benefits, and that the vaccine and vaccination will be offered free to eligible employees
- Appropriate actions in the event of an emergency involving blood or OPIM
- Procedures to follow in the event of an exposure incident, including method of reporting and medical follow-up.
- Details of the post-exposure evaluation and follow-up
- Signs and labels and/or color coding regulated waste containers or other containers of blood or OPIM

All training conducted shall be documented and the training records kept for 3 years. An example of a suitable training record is provided in the BBP-ECP. Training documentation shall include the dates of the training, the contents or summary of the training session, names and qualifications of persons conducting the training, and the names of those attending.

Attachment C-I

Site-specific
Bloodborne Pathogen-Exposure Control Plan (BBP-ECP)

NSWC CRANE
BLOODBORNE PATHOGEN
EXPOSURE CONTROL PLAN

POLICY

The Tetra Tech NUS NSWC Crane Project (CTO 0131) is committed to providing a safe and healthful work environment for our entire staff. In pursuit of this endeavor, the following exposure control plan (ECP) is provided to eliminate or minimize occupational exposure to bloodborne pathogens in accordance with OSHA standard 29 CFR 1910.1030, "Occupational Exposure to Bloodborne Pathogens."

The ECP is a key document to assist our firm in implementing and ensuring compliance with the standard, thereby protecting our employees. This ECP includes:

- Determination of employee exposure
- Implementation of various methods of exposure control, including:
  - Universal precautions
  - Engineering and work practice controls
  - Personal protective equipment
  - Housekeeping
  - Hepatitis B vaccination
  - Post-exposure evaluation and follow-up
  - Communication of hazards to employees and training
  - Record-keeping of exposure incidents and training
  - Procedures for evaluating circumstances surrounding an exposure incident

The methods of implementation of these elements of the standard are discussed in the subsequent pages of this ECP.

PROGRAM ADMINISTRATION

The FOL and/or the SSO will serve as on-site Program Administrators and are responsible for the implementation of this site specific ECP.

Field Operations Leader (FOL)- _____
Phone Number (Site/Project Trailer): (___)_____Phone Number (Home Office): (___)_____
Fax Number (Home Office): (___)_____E-mail Address (Home Office): _____

Site Safety Officer (SSO) - _____

Phone Number (Site/Project Trailer): (___)_____ Phone Number (Home Office): (___)_____

Fax Number (Home Office): (___)_____ E-mail Address (Home Office): _____

Health and Safety Manager (HSM) - Mr. Matthew Soltis, CIH, CSP

Phone Number (Home Office): (412) 921-8912 Fax Number (Home Office): (412) 921-8912

E-mail Address (Home Office): soltism@ttnus.com

The HSM will serve as the overall corporate program administrator. The primary duties associated with this responsibility will be as follows:

- Maintain, review, and update the ECP at least annually, and whenever necessary to include new or modified tasks and procedures.

- Provide necessary personnel to investigate exposure incidents.

- Review all Post Exposure Follow-up Evaluations to ensure the necessary corrective actions have been accomplished by assigned responsible parties.

- Coordinate medical surveillance requirements with our current program elements

- Provide designee(s) as records custodians for medical evaluations, Post Exposure Follow-up, and training in accordance with 29 CFR 1910.1030 and 1910.1020.

- Eensure that all medical actions required are performed and that appropriate employee health and OSHA records are maintained. Coordination of this activity will occur between the program Coordinator and the Medical Surveillance/Training Custodian.

- Ensure through training monitoring and enforcement that those employees who are determined to have occupational exposure to blood or other potentially infectious materials (OPIM) must comply with the procedures and work practices outlined in this ECP.

Medical Surveillance/Training Custodian: Ms. Linda Diano
Phone Number (Home Office): (412) 921-8438 Fax Number (Home Office): (412) 921-4040
E-mail Address (Home Office): dianol@ttnus.com

All records pertaining to the following will be routed by the FOL to the Medical Surveillance/Training Custodian for filing and maintenance:

Medical

- All first-aid incidents
- All Post Exposure Incident Follow-up Evaluations
- Vaccination Status

Training

- Site-specific training
- Elements of this BBP-ECP
- Review of Incidents as they pertain to the elements associated with or in accordance to this BBP-ECP.
- Changes in procedures due to site-specific elements

Equipment Manager: Tom Patton
Phone Number (Warehouse): (412) 262-4583 Fax Number (Home Office): (412) 262-1132
E-mail Address (Warehouse): pattont@ttnus.com

The Equipment Manager will maintain and provide all necessary personal protective equipment (PPE), engineering controls (e.g., sharps containers), labels, and red bags as required by the standard. These supplies will be provided with the first aid supplies. Minimum recommended content of a First-Aid Kit and supplies necessary to support the BBP-ECP are as follows:

Micro-Shield CPR Mouthpiece	Disposable Surgeons Masks	Ammonia Inhalant
Gauze Bandage (4 inch x 6 yards)	Triangular Bandage (40 inch)	Cold Pack
Gauze Pads (3 inch x 3inch)	Adhesive Bandage	Adhesive Tape
Wound Towelettes	PVP Iodine Wipes	Antibiotic Cream
Burn Cream	Compression Bandage (4 inch)	Alcohol Prep Pads
(3) Red Bags (Biohazard Bags)	Biohazard Labels	Anti-bacterial soap
500ml Household Bleach	Sharps Container	Bandage scissors
Vital Signs Note Book		

In addition to the above First-Aid Kit components

(1) Stretcher

(2) Eye Wash

The FOL and/or the SSO or their designee will be responsible for ensuring adequate stocks and supplies of the aforementioned equipment is maintained on-site.

EMPLOYEE EXPOSURE DETERMINATION

The following is a list of all job classifications at our project site in which designated employees who through collateral duty to provide first aid have potential occupational exposure:

Name/Signature	Job Title	First-Aid Training Status	BBP-ECP Training Status
		Date of Training: Date of Expiration:	Date of Training: Date of Expiration:
		Date of Training: Date of Expiration:	Date of Training: Date of Expiration:
		Date of Training: Date of Expiration:	Date of Training: Date of Expiration:
		Date of Training: Date of Expiration:	Date of Training: Date of Expiration:

The individuals presented in this table represent Tetra Tech NUS, Inc. and subcontractor personnel who by way of qualifications and training will participate and support this project specific program as First-Aid providers should the need arise. It is through supporting this collateral duty that they also become potential exposure population.

METHODS OF IMPLEMENTATION AND CONTROL

The following information represents implementation and exposure control methods to be utilized to protect against exposure to blood and Other Potentially Infected Materials (OPIM).

Methods of Implementation

This ECP will be reviewed as part of site-specific training for all projects, that it is determined through collateral duty that employees will provide first-aid assistance. In additional, the ECP will be implemented when the following conditions exist

- Foreseeable emergencies require first aid provisions. Evaluation of the Emergency response providers ability to respond within a reasonable time frame will impact this decision.

- The potential exists as part of the project scope that infectious materials and or medical wastes may be encountered through the site investigation or remediation.

Methods of Control

The following represent methods of control to be employed by personnel who will support this project through the execution of their collateral duties of providing first aid.

<u>Universal Precautions/Body Substance Isolation</u>

(ALL EMPLOYEES)
Both of these concepts Universal Precautions and Body Substance Isolation reflect a common theme. All bodily fluids are considered infectious. All employees shall approach all first aid applications from this standpoint to minimize the potential for infection.

<u>Exposure Control Plan</u>

In order to understand your role as a participant providing first aid or to provide non-participants awareness level training, this ECP will be covered as part of site-specific training. In addition, other mechanisms to be utilized to convey this subject matter are as follows:

- 40-Hour General Site Worker Training
- 8-Hour Management and Supervisory Training

- 8-Hour Refresher Training
- Daily Safety Meetings

All employees who are covered by this program will receive at a minimum, initial and annual refresher training.

The SSO or the FOL will ensure that this program for all project applications will either be posted or maintained in a centralized location (Three Ring Binder) accessible to all employees.

The HSM shall ensure reviewed an updated versions are maintained on the Tetra Tech NUS Web site for all personnel to have access to as necessary.

Engineering Controls and Work Practices

As the application of this program is based primarily on the provision of first aid for work place incidents, typical engineering controls are not feasible (either technologically or economically). However, in review of certain activities, hazards of cutaneous penetration may be minimized by providing Sharps Containers for the following activities:

- Natural Attenuation Sampling – The glass ampoules used in the reagent dispersal provides a threat of percutaneous puncture for on-site personnel when disposed of in plastic bags, as well as providing a threat level to trash collection personnel.

- In addition, based on that hazard, the Puncture Proof container would provide provisions for the disposal of broken glass (damaged sample containers).

The SSO and the FOL will be responsible for the periodic replacement of the Sharps Container as it is deemed necessary.

Work Practices

Prevention

- The FOL and or the SSO will through the course of their duties preview work locations prior to committing personnel or resources. Through this effort potentially hazardous situations can be identified, removed, or physically barricaded.

- Follow the tenets established in the HASP. Within the HASP, detailed hazard analysis of potential hazards as they may be associated with the tasks to be conducted and necessary control measures to isolate/shield, minimize, or eliminate those hazards are provided.

- Employ Universal Precautions/Body Substance Isolation to avoid or minimize contact with blood or OPIM.

- Personal and environmental hygienic measures

To insure, to the extent possible, the minimization of BBP associated hazards the FOL and/or the SSO will enforce the implementation of these work practices.

Personal Protective Equipment (PPE)

The personal protective equipment selected for protection against BBP associated hazards are as follows:

General First-Aid

Safety Glasses – ocular contamination of the first aid provider will be minimized through the use of safety glasses.

Disposable Surgeons Masks – Contamination of the mouth and upper respiratory tract will be minimized through the use of Disposable Surgeons Masks.

Skin penetration – To avoid skin penetration through breaks in intact skin, the first aid providers will wear surgeons gloves (latex or nitrile).

Cardio-Pulmonary Resuscitation (CPR)

Micro-Shield CPR Mouthpiece – The Micro-Shield CPR Mouthpiece will be provided to personnel to offer a shield between the first-aid provider and the victim during CPR.

The PPE provided will be provided to the Tetra Tech NUS, Inc. personnel as part of their on-site First-Aid Kit. The Equipment Manager will be responsible for ensuring that all kits are stocked as indicated earlier in this ECP, before issue.

Training on the use and application of these items will be conducted by the FOL and/or the SSO as part of site-specific training.

Decontamination

All employees using PPE must observe the following precautions:

- Remove PPE after it becomes contaminated, and before leaving the work area. Remove immediately or as soon as feasible any garment contaminated by blood or OPIM, in such a way as to avoid contact with the outer surface.

- Used PPE (Gloves, surgeons mask, Micro-Shield CPR Mask, any gauze, bandages, or other potentially contaminated supplies, contaminated clothing) will be disposed of in the Red Bag provided in your First-Aid Kit. In order to accomplish this the following steps will be required:

- The bag will be labeled as to the content. Care must be taken as to not cover the Biohazard Symbol on the bag when applying the label.

- Contaminated clothing, which has been determined to be salvagable, will be bagged in second Red Bag. The FOL and/or the SSO will be responsible for laundering the clothing at a commercial laundry.

- Equipment contaminated with body fluids will be washed with a soap and water and a 5% bleach solution mixture for purposes of disinfecting. PPE for disinfecting will include

  - Impermeable gloves, outer nitrile or natural rubber gloves
  - Safety Glasses and a splash shield
  - Splash suit shall be used if the method of washing (pressure/steam washer causes splashing)
  - Rubber boots

All decontamination fluids will be collected and staged at the Investigative Derived Waste Satellite location. This material may be stored with the other decontamination fluids.

Wash hands immediately or as soon as feasible after removal of gloves or other PPE. In situations where soap and water is not available, anti-septic wipes will be used until access to soap and water is feasible.

Housekeeping

Regulated waste is placed in containers which are closable, constructed to contain all contents and prevent leakage, appropriately labeled or color-coded (see Labels), and closed prior to removal to prevent spillage or protrusion of contents during handling.

The procedure for handling sharps – A Hard Sided Disposal Container will be available whenever determined that procedures such as Natural Attenuation sampling is conducted in order to dispose of sharp glass ampules. This container must be hard sided to protect on-site personnel and refuse personnel during collection periods. No label will be required as this container will not contain potential BBP or hazardous materials. All ampoules will be rinsed prior to placing in the hard sided container. Broken glassware will also be placed in the hard sided container.

Broken glassware which may be contaminated with BBP or OPIM resulting from an accident will be picked up using mechanical means (Forceps or tweezers provided in the First-Aid Kit) or through means such as a brush and dust pan. This material will covered in a 5% bleach solution, permitted to soak then drained off. This then will be placed in a puncture proof container and follow normal refuse disposal procedures.

A Sharps Container as referenced in BBP literature will not be used through the course and execution of this program. This determination has been made based on the level of first-aid to be provided and the fact that syringes and needles will not be used.

The procedure for handling other regulated waste generated through the first-aid service provided is to take this material which has been collected and bagged to the medical facility which will provide medical treatment to the victim and evaluation of the first aid provider, and request disposal assistance.

HEPATITIS B VACCINATION

The SSO and or the FOL will provide training to employees on hepatitis B vaccinations, addressing the safety, benefits, efficacy, methods of administration, and availability.

The hepatitis B vaccination series is available at no cost to the employee. Pre-vaccinations will be administered 30 days prior to field assignment where there is a potential for BBP or OPIM to be encountered through the course and execution of the scope of work. The necessity of the vaccinations will be based on a thorough review of the last physical and anticipated duties by Tetra Tech NUS occupational health care provider (WorkCare).

Vaccination is encouraged unless:

1) Documentation exists that the employee has previously received the series
2) Antibody testing reveals that the employee is immune
3) Medical evaluation shows that vaccination is contraindicated.

However, if an employee chooses to decline vaccination, the employee must sign a declination form. Employees who decline may request and obtain the vaccination at a later date at no cost.

Documentation of refusal of the vaccination is kept with the employees medical surveillance files by the Medical/Training Custodian.

Vaccination will be provided by the current occupational health care provider.

Following hepatitis B vaccinations, the health care professional's written opinion will be limited to whether the employee requires the hepatitis vaccine, and whether the vaccine was administered.

POST-EXPOSURE EVALUATION AND FOLLOW-UP

Should an exposure incident occur, contact the

- HSM – Mr. Matt Soltis at 1(800) 245-2730 or (412) 921-8912
- Work Care at 1(800) 455-6155 extension 109. Complete the Work Care Protocol as specified in Section 2.0 Emergency Action of the HASP and as Figure C-I-3 of this BBP-ECP.

The occupational health care provider will require information as it pertains to their protocol and will direct the efforts of the medical provider identified in Section 2.9 of this HASP and as Figure C-I-3 of this BBP-ECP. The FOL and/or the SSO will serve as interface between field crews and Work Care.

Following the initial first aid the following activities will be performed:

- Document the routes of exposure and how the exposure occurred.

- Identify and document the source individual (unless the employer can establish that identification is infeasible or prohibited by state or local law).

- Obtain consent and make arrangements to have the source individual tested as soon as possible to determine HIV, HCV, and HBV infectivity; document that the source individual's test results were conveyed to the employee's health care provider. If the source individual is already known to be HIV, HCV and/or HBV positive, new testing need not be performed.

- Assure that the exposed employee is provided with the source individual's test results and with information about applicable disclosure laws and regulations concerning the identity and infectious status of the source individual (e.g., laws protecting confidentiality).

- After obtaining consent, collect exposed employee's blood as soon as feasible after exposure incident, and test blood for HBV and HIV serological status.

  If the employee does not give consent for HIV serological testing during collection of blood for baseline testing, preserve the baseline blood sample for at least 90 days; if the exposed employee elects to have the baseline sample tested during this waiting period, perform testing as soon as feasible.

ADMINISTRATION OF POST-EXPOSURE EVALUATION AND FOLLOW-UP

The HSM shall insure that the occupational health care provider is provided with

- OSHA's Bloodborne Pathogens Standard, 29 CFR 1910.1030.
- A copy of this BBP-ECP

The FOL and/or the SSO shall ensures that the health care professional evaluating an employee after an exposure incident receives the following:

- A description of the employee's job duties relevant to the exposure incident
- Route(s) of exposure
- Circumstances of exposure
- If possible, results of the source individual's blood test
- Relevant employee medical records, including vaccination status

The occupational health care provider shall provide the employee with a copy of the evaluating health care professional's written opinion within 15 days after completion of the evaluation. A copy of this shall also be provided to the HSM for inclusion into the employees medical file.

PROCEDURES FOR EVALUATING THE CIRCUMSTANCES SURROUNDING AN EXPOSURE INCIDENT

The FOL and/or the SSO will review the circumstances of all exposure incidents to determine:

- Engineering controls in use at the time
- Work practices followed
- A description of the incident (Who, what, where, and how). This narrative should be constructed for the incident and the first aid response provided.
- Protective equipment or clothing that was used at the time of the exposure incident (gloves, eye shields, etc.)
- Employee providing the first aid training

Based on an evaluation of the incident the HSM and the PHSO will determined whether revisions need to be made to the BBP-ECP and the HASP. The PHSO shall ensure that appropriate changes are made as determined to be necessary.

EMPLOYEE TRAINING

All employees who have potential for occupational exposure to bloodborne pathogens receive training conducted by Tetra Tech NUS Health Sciences Department or qualified designees. The HSM will determine qualification of outside vendors. Qualifications for acceptable course content shall mirror that provided by Tetra Tech NUS, Inc. which is as follows:

- Course content

  - Review of the OSHA 29 CFR 1910.1030

  - Review of this BBP-ECP for instruction to our personnel

  - An explanation of methods to recognize tasks and other activities that may involve exposure to blood and OPIM, including what constitutes an exposure incident

  - An explanation of the use and limitations of engineering controls, work practices, and PPE

  - An explanation of the types, uses, location, removal, handling, decontamination, and disposal of PPE

  - An explanation of the basis for PPE selection

- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine will be offered free of charge

- Information on the appropriate actions to take and persons to contact in an emergency involving blood or OPIM

- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available

- Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident

- An explanation of the signs and labels and/or color coding required by the standard and used at this facility

- All employees who have occupational exposure to bloodborne pathogens receive training on the epidemiology, symptoms, and transmission of bloodborne pathogen diseases. In addition, the training program covers, at a minimum, the following elements:

- An opportunity for interactive questions and answers with the person conducting the training session.

- Qualification of the Course Instructors

Training materials for Tetra Tech NUS will be maintained on-site and at the Tetra Tech NUS, Inc. Web site http://webmail.nus.tetratech.com.

RECORDKEEPING

Training Records

Training records are completed for each employee upon completion of training. These documents will be kept for at least **three years** at Tetra Tech NUS regional office for the employee. In addition, acopy of the training certification will be provided to the Pittsburgh Office in care of the Medical/Training Custodian

The training records include:

- The dates of the training sessions
- The contents or a summary of the training sessions
- The names and qualifications of persons conducting the training
- The names and job titles of all persons attending the training sessions

Copies of the employee training certification will be maintained at the job site.

Employee training records are provided upon request to the employee or the employee's authorized representative within 15 working days. Such requests should be addressed to Ms. Linda Diano, Medical/Training Records Custodian, Health Sciences, Pittsburgh Office.

Medical records are maintained for each employee with occupational exposure in accordance with 29 CFR 1910.20, "Access to Employee Exposure and Medical Records."

These confidential records are kept at the Pittsburgh Office during active employment. Upon termination of employment the records are archived at the Business Record Management facility, Pittsburgh, Pennsylvania.

The medical and exposure records for at least the duration of employment plus 30 years. Employee medical records are provided upon request of the employee or to anyone having written consent of the employee within 15 working days. Such requests should be sent to Ms. Linda Diano, Medical/Training Records Custodian, Health Sciences, Pittsburgh Office.

An exposure incident is evaluated to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904). This determination and the recording activities are done by the Mr. Matt Soltis, CLEAN Health and Safety Manager, Health Sciences, Pittsburgh Office.

Figure C-I-1

HEPATITIS B VACCINE DECLINATION (MANDATORY)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Print Name:_____

Signature:_____

Date:_____

Witness:

SSO (Print Name):_____

Signature:_____

Date:_____

FIGURE C-I-2

TETRA TECH NUS, INC.

POST-EXPOSURE EVALUATION

I. Exposed Person		**II. Exposure Source** (if legally obtainable)	
Name:	Date of Birth:	Name:	Date of Birth:
Street Address:		Street Address:	
City, State, Zip Code:		City, State, Zip Code:	
Telephone No.: Work: ( ) Home: ( )		Employer:	
Employer (and office location):		Employer's Street Address:	
Personal Physician or Clinic:		City, State, Zip Code:	

III. Description of Incident Resulting in Exposure	
Date of Incident (month/day/year):	Time of Incident: ☐ a.m. ☐ p.m.
Specific Description of Incident (include estimate of volume of fluid involved):	

Type of Incident and Body Fluid Exchanged (check all that apply):

Body Fluid	Action	Route of Entry of Exposed Person
☐ Blood	☐ Needle puncture	☐ Eye
☐ Sputum or saliva	☐ Bite that breaks skin	☐ Nose
☐ Urine	☐ Impalement	☐ Mouth
☐ Feces	☐ Splash or splatter	☐ Open wound or break in skin
☐ Semen	☐ Mouth-to-mouth CPR	
☐ Vaginal secretions	☐ Cut or wound	
☐ Vomitus	☐ Other	

FIGURE C-I-2 (Continued)

TETRA TECH NUS, INC.

POST-EXPOSURE EVALUATION

Have you been vaccinated against Hepatitis B virus? ☐ No ☐ Yes If yes, what year?		
The above information accurately describes the exposure. I request disclosure of the source person's body fluid/bloodborne pathogen(s) test results.		
Exposed Person's Signature:		Date Signed:
IV. Significant Exposure Certification by Physician		
I certify that the incident described above had the potential for the exposed person to have a significant exposure to blood or other body fluids. I have informed the exposed person about medical conditions that may require further evaluation or treatment as a result of this exposure.		
A Hepatitis B vaccination is recommended for the exposed person: ☐ Yes ☐ No		
The exposed person has received the Hepatitis B vaccination: ☐ Yes ☐ No		
Physician's Name (print):	Physician's Signature:	Date Signed:
Business Telephone No.: ( )	Physician's License No.:	
Physician's Business Address (street, city, state, zip code):		

FIGURE C-I-3

EMERGENCY RESPONSE PROTOCOL

The purpose of this protocol is to provide guidance for the medical management of injury situations. In the event of a personnel injury or accident:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, and shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the injured person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the WorkCare physician. WorkCare will contact the medical facility and request specific testing which may be appropriate. WorkCare physicians will monitor the care of the victim. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
- Call WorkCare at 1-800-455-6155 and enter Extension 109, or follow the voice prompt for after hours and weekend notification being prepared to provide:
  - Any known information about the nature of the injury.
  - As much of the exposure history as was feasible to determine in the time allowed.
  - Name and phone number of the medical facility to which the victim(s) has/have been taken.
  - Name(s) of the involved Tetra Tech NUS, Inc. employee(s).
  - Name and phone number of an informed site officer who will be responsible for further investigations.
  - Fax appropriate information to WorkCare at (714) 456-2154.
- Contact Corporate Health and Safety Department (Matt Soltis) at 1-800-245-2730.
- As data is gathered and the scenario becomes more clearly defined, this information should be forwarded to WorkCare.
- WorkCare will compile the results of all data and provide a summary report of the incident. A copy of this report will be placed in each victim's medical file in addition to being distributed to appropriately designated company officials.

Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. A personalized letter describing the individual findings/results will accompany this generalized summary. A copy of the personal letter will be filed in the continuing medical file maintained by WorkCare.

FIGURE C-I-3 (continued)
WORKCARE
POTENTIAL EXPOSURE REPORT

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

Client Contact: _____ Phone No.: _____

Company Name: _____

I. Exposing Agent

Name of Product or Chemicals (if known):_____

_____

Characteristics (if the name is not known)

Solid Liquid Gas Fume Mist Vapor

II. Dose Determinants

What was individual doing?_____

How long did individual work in area before signs/symptoms developed? _____

Was protective gear being used? If yes, what was the PPE? _____

Was their skin contact? _____

Was the exposing agent inhaled?_____

Were other persons exposed? If yes, did they experience symptoms? _____

III. Signs and Symptoms (check off appropriate symptoms)

Immediately With Exposure:

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Nausea / Vomiting
Dizziness
Weakness

Delayed Symptoms:

Weakness
Nausea / Vomiting
Shortness of Breath
Cough
Loss of Appetite
Abdominal Pain
Headache
Numbness / Tingling

IV. Present Status of Symptoms (check off appropriate symptoms)

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Cyanosis
Nausea / Vomiting
Dizziness
Weakness
Loss of Appetite
Abdominal Pain
Numbness / Tingling

Have symptoms: (please check off appropriate response and give duration of symptoms)

Improved: _____ Worsened: _____ Remained Unchanged: _____

V. Treatment of Symptoms (check off appropriate response)

None: _____ Self-Medicated: _____ Physician Treated: _____

FIGURE C-I-4

BLOODBORNE PATHOGEN – EXPOSURE CONTROL PLAN
SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature associated with Bloodborne Pathogens and OPIM through the performance of my collateral duties of providing first aid or historical information of performing to the possible presence of these materials. My signature further indicates that I have received site-specific training for activities to be conducted at_____which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Review of the OSHA 29 CFR 1910.1030
- Review of this BBP-ECP for instruction to our personnel
- An explanation of methods to recognize tasks and other activities that may involve exposure to blood and OPIM, including what constitutes an exposure incident
- An explanation of the use and limitations of engineering controls, work practices, and PPE
- An explanation of the types, uses, location, removal, handling, decontamination, and disposal of PPE
- An explanation of the basis for PPE selection
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine will be offered free of charge
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or OPIM
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available
- Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident
- An explanation of the signs and labels and/or color coding required by the standard and used at this project
- Epidemiology, symptoms, and transmission of bloodborne pathogen diseases.

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.
I further state, by the presence of my signature below, that the date of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name/Signature	First-Aid/CPR Training	BBP-ECP Training
	Date of Training: Date of Expiration:	
	Date of Training: Date of Expiration:	
	Date of Training: Date of Expiration:	
	Date of Training: Date of Expiration:	
	Date of Training: Date of Expiration:	
	Date of Training: Date of Expiration:	
Instructor(s):		

Attachment C-II

Bloodborne Pathogen Training

Bloodborne Pathogens

OBJECTIVES

At the end of this unit, participants will be able to:

- Explain the importance of bloodborne pathogen protection and education.
- Describe the elements of the Bloodborne Pathogen Regulation OSHA 29 CFR 1910.1030.
- Describe the components of the facility-specific bloodborne pathogen program.
- List the protective equipment available for bloodborne pathogens in your workplace.

INTRODUCTION

The bloodborne pathogen regulation legislated by OSHA was designed to protect workers from exposure to bloodborne pathogens, such as the hepatitis B virus (HBV), the human immunodeficiency virus (HIV), or any disease carried by human blood and body fluids. In today's world many diseases are spread or transported by contact with blood or body fluids. Some of these diseases can cause permanent illness or death. Exposure to bloodborne pathogens can be prevented through the use of engineering controls, personal protective equipment (PPE), and workplace practices designed to avoid exposure to human blood and body fluids. In this section we will discuss the procedures and the requirements that must be followed by employees who could be exposed to human blood and body fluids.

SCOPE OF OSHA 29 CFR 1910.1030

The bloodborne pathogens standard requires employers to develop a written exposure control plan, designed to reduce or eliminate employee exposure. By reducing the chance of exposure, employers will limit the risk to employees.

Exposure Control

Exposure Control Plan

To properly protect employees who have, or may have, an occupational exposure to bloodborne pathogens, employers must develop an exposure control plan (ECP) for the workplace. The ECP must be written and must include the following:

- The exposure determination procedure that the employer will use to determine all work areas where exposure could occur.

- The schedule and method of compliance to ensure employee safety. This will include:

  - The method for communicating hazards to employees.
  - A post-exposure evaluation and follow-up.
  - The facility evaluation procedure for determining circumstances surrounding exposure incidents.
  - Accessibility of the exposure plan to employees upon request.
  - Updating of the exposure plan annually or as needed.

Exposure Determination

Employers having employee(s) with occupational exposure to bloodborne pathogens, as defined in a previous section, shall prepare an exposure determination. The exposure determination should contain:

- A list of all job classifications in which all employees have occupational exposure.
- A list of job classifications in which some employees have occupational exposure.
- A list of all tasks and procedures in which occupational exposure occurs and which are performed by employees in job classifications listed above.

The exposure determination is made without regard to the use of personal protection; in other words, if an employee is wearing protective clothing against blood or body fluids, the hazard is considered an occupational exposure. The use of protective clothing does not nullify the hazard.

Methods of Compliance

The plan must include the method and procedure the employer will use to achieve compliance. This includes observing universal precautions, using engineering and work practice controls, using PPE, and instituting housekeeping procedures.

Universal Precautions

Universal precautions are those precautions adopted to prevent exposure to suspect blood and body fluids. This includes exposure to body fluids that may be suspect.

Engineering and Work Practice Controls

Engineering and work practice controls shall be used to eliminate or minimize employee exposure. In cases where an employee exposure remains after institution of these controls, personal protective equipment shall also be used.

Engineering controls must be inspected or examined and maintained on a regular basis to ensure their effectiveness.

Handwashing

As part of this program, employers must provide handwashing facilities that are readily accessible to employees.

When handwashing stations are not feasible, the employer must provide alternatives, such as antiseptic hand cleaner with clean cloth/paper towels, or antiseptic towelettes. The employee must then wash his/her hands (using soap and water) as soon as feasible.

Once protective gloves are removed, an employee is required to immediately wash his/her hands with soap and water. When an employee comes in contact with blood or body fluids or potentially infected

material, the employer must immediately wash the body area with soap and water and flush affected mucous membranes with water. It is the responsibility of the employer to enforce this procedure.

Sharps

Contaminated needles or sharps (objects that can penetrate the skin) will be placed in containers that are puncture resistant, color coded, labeled (in accordance with the standard), and leakproof on the sides and bottom. Contaminated needles or sharps cannot be recapped, bent, or removed unless no alternative is feasible or unless required by specific medical or dental procedure and must be accomplished using a mechanical device or a one-handed technique.

Note: Reusable needles cannot be stored in a container that requires employees to reach into the container to reprocess the needles.

Prohibited Activities

In work areas where there is a reasonable likelihood of occupational exposure to bloodborne pathogens, eating, drinking, smoking, applying cosmetics, and inserting contact lenses is prohibited.

Food or drinks are not permitted in areas where blood or potentially infectious materials are present; this includes refrigerators.

Procedures involving blood or potentially infectious materials will be performed in a manner that minimizes splashing, spraying, spattering, and generation of droplets of the material.

Mouth suctioning of blood with a pipette is prohibited.

Packaging

Specimens of blood or other potentially infectious materials must be packaged to prevent leakage during the handling process, which includes collection and transporting. If the primary package is contaminated by an outside source or leaks during processing, the package is placed in a secondary leakproof container, then labeled, and the processing resumed.

Decontamination

Contaminated equipment will be examined and decontaminated unless the employer can prove that decontamination is not feasible.

All contaminated or potentially contaminated materials must be labeled in accordance with the standard. Labeling will be discussed in later in this module.

Personal Protective Equipment (PPE)

A third work practice control to minimize employee exposure to bloodborne pathogens is the use of PPE.

When there is a risk of occupational exposure, the employer must provide appropriate protective equipment to the employee at no cost. PPE will only be considered appropriate if it does not permit blood or other potentially infectious materials to pass through to or reach the employee's work or street clothes or undergarments, skin, eyes, mouth, or other mucous membranes. This equipment includes but is not limited to:

- Gloves
- Laboratory coats
- Masks
- Mouthpieces
- Pocket masks
- Gowns
- Face shields
- Eye protection
- Resuscitation bags
- Ventilation devices

Employer Responsibilities

- The employer will ensure that the employee uses the appropriate PPE unless:
  - The employee temporarily and briefly declines to use PPE when, if in his/her professional opinion, this extraordinary circumstance would prevent the delivery of healthcare or public safety services or would pose an increased hazard to the employee. This situation will be investigated and documented to change future procedures that would preclude this circumstance from occurring in the future.
- The employer will ensure that the PPE is readily accessible at the workplace in the appropriate sizes, including hypoallergenic gloves, gloveliners, powderless gloves, or similar alternatives.
- The employer will clean, launder, or dispose of PPE at no cost to the employee.
- The employer will repair or replace PPE as needed to maintain effectiveness at no cost to the employee.
- Garments that are penetrated by blood or other potentially infectious materials shall be removed immediately or as soon as feasible.
- PPE must be removed prior to leaving the work area.

- PPE, when removed, must be placed in an appropriate container for storage, washing, decontamination, or disposal.

- Gloves will be worn when it is reasonably anticipated that the employee may come into contact with blood or other potentially infectious materials.

  - Disposable gloves will be replaced when practical or when their ability to function as a barrier is compromised.

  - Disposable gloves cannot be washed or decontaminated for re-use.

  - Utility gloves can be decontaminated for re-use if they maintain their integrity; however, if punctured or deteriorated in any way, they must be discarded.

  - Volunteers taking blood for samples in a blood donation center may not be required to wear gloves if the employer deems that it is not necessary. But the employer must:

    -- Periodically reevaluate the policy.
    -- Make gloves available to those who wish to use them.
    -- Not discourage the use of gloves.
    -- Require that gloves be worn when an employee has cuts or breaks in the skin, when contamination may occur, or during training.

- Masks, eye protection, and face shields must be worn whenever splashes, sprays, splatters or droplets of blood or other infectious materials may be generated.

- Body-protective clothing may be required if exposure is anticipated.

<u>Housekeeping</u>

Employers must ensure that the workplace is maintained in a clean and sanitary condition. The employer will develop a program specifying when the facility will be cleaned and the procedures necessary to clean it. Specific procedures include the following:

- Equipment and work surfaces will be decontaminated after contact with blood or other potentially infected material.

  - This includes the use of disinfectants to properly decontaminate working surfaces.

  - Protective coverings, such as plastic wraps, aluminum foil, etc., if contaminated or potentially contaminated, will be removed as soon as possible or at the end of the workshift.

- All containers or receptacles will be decontaminated on a regular basis or after contamination.

- Broken glassware that is possibly contaminated cannot be picked up directly with the hands but must be picked up using mechanical devices.

Regulated Wastes

All contaminated or potentially contaminated wastes must be properly disposed of to eliminate the possibility of contaminating or infecting employees working with this material.

- Contaminated sharps are discarded in containers that are:

  - Closable
  - Puncture resistant
  - Leakproof on sides and bottom
  - Easily accessible to employees
  - Maintained upright during use
  - Replaced routinely (do not overfill)

- Movement of contaminated sharps. The containers must be:

  - Closed before moving
  - Placed in secondary container if leaking
  - Labeled properly

- Handling of contaminated laundry. Such laundry must be:

  - Bagged and containerized with a minimum of handling
  - If leaking, placed in a secondary container to prevent soaking through
  - If suspect, handled only by employees wearing appropriate PPE
  - Properly labeled

HIV HBV Research Laboratories and Production Facilities

This section of the regulation deals with laboratories that conduct research and manipulate HIV and HBV; it does not apply to clinical and diagnostic laboratories. The requirements are very specific as to how the material is handled, decontaminated, and spills controlled. For the purposes of this class, however, we will not cover these requirements.

Hepatitis B Vaccination/post exposure evaluation

Hepatitis B Vaccination

Employees who have the possibility of occupational exposure to blood or suspect body fluids will be eligible for the hepatitis B vaccine. Employees who have had an exposure incident to hepatitis B will be placed in a post-exposure evaluation and follow-up program. The follow-up must be:

- Made available at no cost to the employee.
- Made available at a reasonable time and place.
- Performed under the direction of a licensed physician.
- Provided according to the current guidelines of the U.S. Public Health Service.

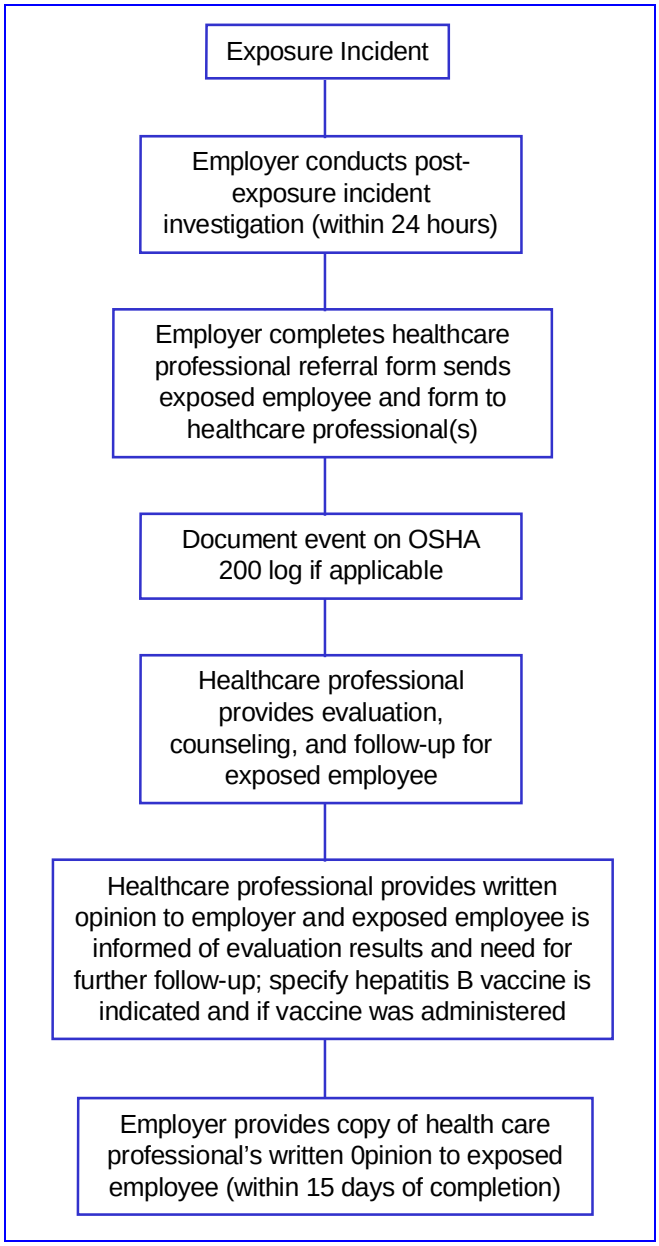
The employer shall ensure that all tests will be conducted by an accredited laboratory at no cost to the employee.

Post-Exposure Evaluation

If an exposure occurs, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up and include at least the following elements (see Figure 1 for a logic chart on exposure):

- Documentation of the route of exposure.
- Identification and documentation of the source individual:
  - Blood testing of exposed individual shall be accomplished as soon as possible.
  - Results will be made available to the exposed individual.

Figure 1. Post-Exposure Evaluation and Follow-up Management



- The exposed individual will be informed of applicable laws concerning disclosure of the identity and infectious status of the exposed individual.

- Baseline blood serological testing procedures and employee consent concerning HIV/HBV testing are further defined in the regulations.

Employer responsibilities to the healthcare professional are as follows:

- Provide a copy of the bloodborne pathogen regulation.
- Employees duties as related to the exposure.
- Route of exposure and circumstances under which the exposure occurred.
- Exposed individuals blood test.
- Medical records related to the exposure

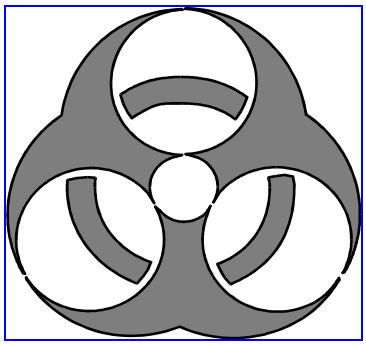
Healthcare professional's written opinion:

- Should be provided to employee within 15 days of completion of the evaluation.
- Is limited to whether the employee should receive the hepatitis B vaccine.
- Should inform the employee of the results and medical conditions.

Hazard Communication to Employees

Labels and Signs (Figure 2)

Figure 2. Biohazard



- Warning labels will be affixed to:

  - Containers of regulated waste.

  - Refrigerators/freezers containing blood or potentially infected material.

  - Any container used to store, collect, or transport potentially infected material.

- Container labels will include:

  - Fluorescent orange or orange red with letters and symbols in a contrasting color.

- Red bags or red containers may be substituted for labels.
- Labels will be affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss.
- Individual containers of blood or infectious materials placed in a labeled container are exempted from the labeling requirements.
- Contaminated equipment must be labeled according to these requirements.
- Decontaminated waste need not be labeled.

Information and Training

Employers are required to train all employees with potential occupational exposure to blood or suspect body fluids. This training must be:

- Provided to the employee at no cost.
- Provided during working hours.
- Conducted at the time of initial assignment to tasks where occupational exposure may exist.
- Conducted annually (within 1 year of initial training).
- Updated with information not presented in original training.
- Used in the language and vocabulary appropriate to the educational level of the employees being trained.

Content of Training Program

The federal regulation requires that certain elements be included in the training program. These elements include:

- An accessible copy of the regulatory text of this standard and an explanation of the content.
- An explanation of the epidemiology and symptoms of bloodborne diseases.
- An explanation of the modes of transmission of bloodborne pathogens.
- An explanation of the employer's exposure control plan and how an employee can obtain a copy.

- Methods for recognizing tasks and activities that may involve exposure to blood and other potentially infectious materials.

- An explanation of:

  - Engineering controls to prevent exposure
  - PPE available to prevent exposure

- Information on the removal and disposal of potentially contaminated PPE.

- Criteria for selection of PPE.

- Information on hepatitis B vaccine.

- Appropriate actions to take for protection during an emergency.

- The procedure to follow when an exposure incident occurs, including reporting procedures, and medical follow-up.

- Information on post-exposure evaluation and follow-up.

- An explanation of the signs and labels required to be used.

Recordkeeping

Medical Records

The employer is required to maintain an accurate record for each employee with occupational exposure. This record includes:

- Name and social security number of the employee.
- Employee's vaccination status and all records.
- A copy of all medical examinations, testing, and follow-up procedures.
- A copy of the healthcare professional's written opinion.
- A copy of the information provided to the healthcare professional.

All records must be retained in confidence, and for the employee's term of employment plus 30 years.

Training Records

Training records are to be maintained for 3 years from the date of training and include:

- The dates of the training session.
- The contents or a summary of the training sessions.
- The names and qualifications of persons conducting the training.
- The names and job titles of all persons attending the training session.

Training records must be available for copying by employees and their representatives.

Medical records must also be available to employees for examination and copying or be available to anyone having written consent from the employee.

Conclusion

The nature of diseases transmitted by the blood or by suspect body fluids requires that parties subject to exposure be trained, use the appropriate PPE, and use engineering controls to prevent exposure and thus infection. It is the responsibility of the employer to provide training and PPE and to enforce the regulation to keep all employees safe.

PRACTICE exercise

1. The bloodborne pathogen regulation was designed to protect employees from bloodborne pathogens such as:

   a. Polio and tuberculosis

   b. HIV and HBV

   c. Flu and hysteria

   d. Horse fever and trichinosis

2. True or False:

   An employer is not required to conduct an exposure determination until an employee is exposed to a bloodborne pathogen.

   a. True

   b. False

3. The method for compliance with the bloodborne pathogen regulation contains four components. They are:

   a. _____

   b. _____

   c. _____

   d. _____

4. The exposure determination (part of the exposure control plan) should contain:

   a. A list of all job classifications having occupational exposure.

   b. A list of job classifications in which some employees may have occupational exposure.

   c. A list of all tasks and procedures in which occupational exposure occurs.

   d. All of the above.

5. The employer must provide PPE to protect employees against exposure. This equipment includes but is not limited to:

   a. Gloves
   b. Protective suits
   c. Eye protection
   d. Hair nets
   e. All of the above
   f. Answers a., b., and c.

APPENDIX D

FIRE EXTINGUISHER

USE AND INSPECTION

FIRE EXTINGUISHER

USE AND INSPECTION

Fire Extinguisher Use and Inspection procedures will be conducted in support of the activities to be conducted at NSWC Crane. The following text is intended to provide general instruction to the field personnel charged with this responsibility.

Fire Extinguisher Use

All personnel trained in incidental response measures may be required to use and operate a fire extinguisher in response to a incipient stage fire. Therefore, the following instruction is provided and will be conveyed to all field personnel as part of site-specific training.

To use a portable fire extinguisher, the user should be familiar with the operation of the specific fire extinguisher located in the workplace. The following procedure will properly extinguish a small fire.

1) Identify the type of fire (Class A, B, C, D).

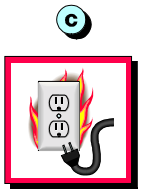
Classes of Fire/Fire Extinguisher Identification

Fire is divided into four classes for easy identification and extinguishment. The type of fuel or ignition source will determine the type of extinguishing medium required.

Class A - Ordinary combustibles (wood, paper, rubber, plastic, and cloth). Extinguishers suitable for Class A fires should be identified by a triangle containing the letter "A." If colored, the triangle is green.

Class B - Flammable liquids, gases, and greases. Extinguishers suitable for Class B fires should be identified by a square containing the letter "B." If colored, the square is red. <u>This type of extinguisher is effective on small petroleum product fires</u>.

Class C - Electrically energized systems. Extinguishers suitable for Class C fires should be identified by a circle containing the letter "C." If colored, the circle is blue.



Class D - Combustible metals (sodium, magnesium, phosphorus). Extinguishers suitable for fires involving metals should be identified by a five-pointed star containing the letter "D." If colored, the star is yellow.

<u>Note: Water and other extinguishing media, such as carbon dioxide and dry chemicals, are ineffective on metal fires.</u>

New NFPA Markings

Class A, B, C

Class B, C

Class A, B

Class A

Mutli-class (ABC) Fire extinguishers will be provided for use on site. If you will buy a Fire Extinguisher, this is the type recommended. Size or rating recommended is 2 1/2 to 5 lbs.

1. Determine whether the extinguisher is adequate for this fire.

Rating number – The rating number assigned to a fire extinguisher is based on the capabilities of that fire class, for example

Class 5 A – Will provide extinguishing capabilities equal to that of 5 gallons of water.

Class 20 B - Will provide extinguishing capabilities equal to 20 square feet of flammable liquid burning.

Class C & D are not rated as to their limitations.

2. If adequate, hold the extinguisher upright and pull the ring pin.
3. Stand back 10 feet and aim at base of fire. Be careful not to spread burning material with pressurized extinguishing material.
4. Squeeze lever; sweep extinguisher in a side-to-side motion.

Portable Fire Extinguisher Placement/Mounting

Portable Fire Extinguishers will be placed/mounted in clear view in the areas where flammable materials are stored and/or dispensed. Mounting and placement of fire extinguishers will follow the following requirements

Fixed Locations (Flammable Storage)

- Extinguisher location will be marked by a red painted post to indicate extinguisher location
- The travel distance to access a fire extinguisher shall be no greater than 50 feet.
- The fire extinguisher will be mounted at a maximum height of four feet.

Mobile Locations (Drill Rigs, Support Vehicles)

All vehicles carrying fuel containers or used in the dispensing of fuel will carry at a minimum a 5 pound rated fire extinguisher.

Portable Fire Extinguisher Inspection

All fire extinguishers used in support of this field effort will be inspected on the following frequencies:

- A certified provider will perform maintenance checks of fire extinguishers at least once a year. A tag attached to the neck of the fire extinguisher will indicate documentation of the maintenance check.

- All fire extinguishers will have a current hydrostatic inspection. For the type of extinguishers selected for use at NSWC Crane hydrostatic inspections are required every 5 years.

- All fire extinguishers will be inspected monthly. The monthly inspection will cover the following
  - Are the fire extinguisher(s) placed in their designated location(s)?
  - Is the location conspicuously marked (Top 18 inches of the mounting pole to be painted red)?
  - Is the access impeding travel to the fire extinguisher blocked or restricted in any way?
  - Has the fire extinguisher been partially or completely discharged?
  - Is there signs of obvious physical damage?
  - Does the fire extinguisher shows sufficient pressure and are all of the tamper indicators are in place?

This inspection shall be documented on the attached tag provided by the maintenance/hydrostatic inspection service.

FIRE EXTINGUISHER CHECKLIST

NSWC CRANE

PROJECT NAME: NSWC CRANE_____	**CTO 0131**	**DATE OF INSPECTION:**_____
FIRE EXTINGUISHER IDENTIFICATION NUMBER:_____		**FIRE EXTINGUISHER LOCATION:** _____

MEASUREMENT CRITERIA	**YES**	**NO**	**N/A**	**NEEDS REPAIRED**
ARE THE FIRE EXTINGUISHER(S) PLACED IN THEIR DESIGNATED LOCATION(S)?				
Is the location conspicuously marked (Top 18 inches of the mounting pole to be painted red)?				
Is the access impeding travel to the fire extinguisher blocked or restricted in any way?				
Has the fire extinguisher been partially or completely discharged?				
Is there signs of obvious physical damage?				
Does the fire extinguisher shows sufficient pressure and are all of the tamper indicators are in place?				

PROJECT NAME: NSWC CRANE_____	**CTO 0131**	**DATE OF INSPECTION:**_____
FIRE EXTINGUISHER IDENTIFICATION NUMBER:_____		**FIRE EXTINGUISHER LOCATION:** _____

MEASUREMENT CRITERIA	**YES**	**NO**	**N/A**	**NEEDS REPAIRED**
Are the fire extinguisher(s) placed in their designated location(s)?				
Is the location conspicuously marked (Top 18 inches of the mounting pole to be painted red)?				
Is the access impeding travel to the fire extinguisher blocked or restricted in any way?				
Has the fire extinguisher been partially or completely discharged?				
Is there signs of obvious physical damage?				
Does the fire extinguisher shows sufficient pressure and are all of the tamper indicators are in place?				

APPENDIX E

HAZARD COMMUNICATION PROGRAM

HAZARD COMMUNICATION PROGRAM
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HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE

To establish general Hazard Communication Program and guidelines for developing site and activity specific Hazard Communication procedures.

2.0 SCOPE

Applies to all onsite activities where exposure to hazardous materials brought to that site may occur.

3.0 RESPONSIBILITIES

Project Health and Safety Officer (PHSO) - The PHSO shall ensure that the hazard communication program is adequately addressed in the Site Specific Health and Safety Plan.

Site Safety Officer (SSO) - The SSO is responsible for enforcing elements of the hazard communication program. The SSO also ensures that adequate hazardous communication procedures are followed to prevent exposure of individuals or contamination to the environment.

Project Manager (PM) - The PM will ensure that sufficient information has been provided to the PHSO to prepare adequate hazard communications procedures for inclusion in the site-specific activity for the Health & Safety Guidance Manual.

4.0 PROCEDURES

4.1 Introduction

Every worker has the right to know what types of chemical hazards are located in the work area. OSHA has established a standard known as 29 CFR 1910.1200, Hazard Communication Standard (HAZCOM), to meet this requirement. This standard affects:

- Manufacturers of hazardous chemicals.
- Nonmanufacturers whose employees can be exposed to hazardous chemicals, through process, handling, transport, disposal, or incidental exposure.

5.0 REQUIREMENTS

5.1 Written Hazard Communication Plan

A Hazard Communication Plan is required of all employers. The employer must develop, place in writing, and implement the plan. The plan must reveal how each of the following requirements will be met.

5.2 Plan Components

1. Chemical Inventory
2. Material Safety Data Sheets
3. Labeling/Product Identification
4. Employee Training
5. Informing Contractors
6. Information Availability

5.2.1 Chemical Inventory

Employers must maintain an up-to-date inventory of all hazardous products/chemicals at the onsite location. The inventory may be compiled for the entire facility or for individual work areas. The chemical inventory must be kept with the Material Safety Data Sheets so employees may access it during work hours. The FOL and the SSO will be responsible for generating and compiling this list utilizing Figure 1.

FIGURE 1

CHEMICAL INVENTORY

Job Title
Job No.

Chemical/Product Name/Synonym	Quantity	Location	Hazards	MSDS Location

Responsible Party _____
Signature

_____
Position

The purpose of the chemical inventory list is to provide a tool for documenting which products/chemicals are present within a facility. The inventory is required by law under the Federal Hazard Communication Standard. The chemical inventory shall:

- Identify all hazardous products/chemicals within the facility by the name of the product/chemical, address of manufacturer, and should include additional information (e.g., quantity of product/chemical).

- Identify which products/chemicals require an MSDS.

- Maintain an up-to-date inventory list and keep it with the MSDS so employees can access it during work hours. This will be accomplished by filling out the pull out inventory list to be placed in the Hazard Communication section.

- Cross-reference the product/chemical name with the name recognized by employees so that employees can find the MSDS.

5.2.2 Material Safety Data Sheets

A Material Safety Data Sheet (MSDS) must be maintained for each hazardous chemical located in a work area and on the chemical inventory list. All MSDS must be in a place accessible to employees during every work shift. MSDS are discussed in greater detail later in the module. The FOL will request for all chemical substances brought onsite that a MSDS sheet will accompany that delivery. For all purchased items once onsite the FOL or SSO will request copies from office support locations.

5.2.3 Labeling/Product Identification

OSHA requires that each container in the workplace must be labeled, tagged, or marked with specific information. This information is covered in detail following this section.

5.2.4 Employee Training

Training must be conducted for existing employees, for all new employees, and whenever new products/chemicals are brought into the workplace. Training must be documented and kept on file. The training must include the following:

- Basic requirements of the Hazard Communication Standard or applicable state regulations.
- Work tasks that expose employees to hazardous chemicals.
- Location and availability of this written hazard communication program, the chemical inventory, and the MSDS.
- Methods for detecting hazardous chemicals, such as by odor and by sight.
- Physical and health hazards of chemicals in the work area.
- Ways for employees to reduce or eliminate exposures.
- How to use the MSDS.
- How employees will be informed of the hazards of nonroutine tasks.
- The location of training materials.

5.2.5 Informing Contractors

The FOL and/or the SSO will inform all contractors and subcontractors of the hazardous products/ chemicals at a facility, necessary precautions, and location and use of the chemical inventory list and MSDS while working at the facility. This will be accomplished as part of the site-specific training.

5.2.6 Employee Information Availability

The written Hazard Communication Plan must inform employees of any operations in the work area where hazardous chemicals are present, and the location and availability of documentation (inventory and MSDS, see Figure 2) under that plan.

FIGURE 2

MSDS LOCATIONS

List all areas at the site where MSDS can be accessed. This may include client locations. This list must be posted along with the OSHA Poster in a conspicuous location.

Location
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

APPENDIX F

HAZARD ASSESSMENT

HAZARD ASSESSMENT
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HAZARD ASSESSMENT

1.0 PURPOSE

This section addresses the chemical and physical hazards that are associated either directly or indirectly with tasks and operations performed during hazardous waste operations. Chemical and physical hazards vary from site to site and are dependent upon numerous factors associated with each site. Given this variation, the site-specific Health and Safety Plan will identify the chemical and physical hazards associated with the individual site and the planned activities that are to be performed at these sites.

2.0 SCOPE

This section applies to all Tetra Tech NUS personnel and subcontractors involved in hazardous waste operations. Site visitors such as client personnel representatives of regulatory agencies (EPA, OSHA) and occasional site visitors such as delivery personnel, truck drivers, and sanitation services are also covered under the provisions of the site HASP.

3.0 CHEMICAL HAZARDS

Chemical hazards associated with hazardous waste operations vary from site to site. The site specific HASP provides detailed information as to the chemicals of concern, potential routes of exposure, toxicological information regarding these chemicals, exposure limit information, symptoms of exposure, air monitoring protocols, and physical characteristics of the chemicals. Generally, this information is provided in a table format that can be easily referenced and used by site personnel.

This information contained in the HASP is generally compiled available information from previous site investigations, historical data pertaining to site operations, and preliminary analytical results. If any additional information regarding site contaminants becomes available, the HASP will be modified accordingly.

4.0 PHYSICAL HAZARDS

Particular emphasis is placed on the physical hazards associated with hazardous waste operations. Often more attention is place on the chemical hazards of a work site since chemical exposures are generally thought of when referring to hazardous waste work. However, physical hazards are often the more predominant hazard which they result in far more injuries and fatalities than chemical exposure to site contaminants.

Physical hazards which may be involved in the execution of hazardous waste activities include the following items:

- Uneven or unstable terrain (Slip, trip, and fall hazards)
- The potential for a worker to be struck by or entangled in heavy machinery
- Lifting heavy objects
- Pinch/Compression points
- Inclement weather
- Contact with energized sources
- Ambient temperature extremes
- Noise in excess of 85 dBA
- Water hazards
- Open excavations
- Natural hazards (e.g. snakes, ticks, mosquitos, poisonous plants, etc.)
- Hazards associated with work performed at active sites (vehicular traffic, facility hazards such as flying projectiles, overhead hazards, etc.)

Control measures to protect site personnel from these physical hazards shall include the use of proper equipment maintenance, guarding, and operation. Additionally, adherence to proper standard work practices and standard operating procedures will aid in the elimination of these hazards. Each of the above mentioned items are further detailed below.

4.1 Uneven/Unstable Terrain (Slips, Trips, and Falls)

Planned activities associated with hazardous waste operations may bring field personnel into areas where this potential hazard exists (dilapidated buildings, river banks, test pits, loose and shifting ground cover of landfill areas, etc.). Additionally, it is possible that steep terrain may be encountered during the course of hazardous waste operations, particularly during sampling exercises. This hazard may exist in various locations. It is the responsibility of the Field Operations Leader (in accordance with Standard Operating Procedures and Safe Work Practices) to inspect and document the areas prior to placing heavy equipment or personnel at risk. As the operation moves from one area to another the hazards associated with that area will be discussed as part of the safety briefing prior to the commencement of activities in that area.

The use of personal protective equipment (safety shoes, hard hats, and safety glasses) will be implemented to protect personnel who may encounter this type of hazard. Additional equipment such as rope ladders, safety lines, harnesses, etc., may also be employed as conditions dictate. Personnel must be aware of their limitations and shall not attempt any exercise that will endanger their health and welfare.

4.2 Heavy Machinery

Activities such as soil borings with drill rigs, soil excavation and disposal operations have the potential to place site personnel at risk. The most predominant physical hazard associated with work around drill rigs is entanglement of safety equipment or clothing into the rotating augers. To address this hazard, a thorough inspection of all equipment will be performed to remove potential snag points. Also, ensure that emergency stop devices operate properly and all members of the field team know the location and operation of these devices. Persons working in close proximity to the drill rig will be required to secure all loose clothing or protective equipment to avoid possible entanglement. The use of a long-handled shovel or the equivalent will be used to remove drill cuttings away from the hole and from rotating tools. In addition, pins that protrude from augers shall not be permitted.

Test pitting operations and other soil excavation activities are accomplished through use of heavy equipment such as backhoes, bulldozers, excavators, and front-end loaders. Workers have the potential to be struck by moving attachments or other equipment during excavation operations. To address this hazard, workers will remain a safe distance (a distance greater than that at which the boom can extend) and will maintain two-way visual contact with the operator. In addition, no sampling activities of the test pits will be permitted while excavating activities are being performed. High visibility visits shall be used if work activities are performed in areas of heavy vehicular traffic.

All mechanized equipment brought on site will be inspected prior to the commencement of onsite activities and then periodically thereafter. These inspections will be performed by the SSO and will include that the following:

- All safety guards are in place.
- All safety-restraints (i.e. seatbelts) are in place and functioning properly as required by federal regulations.
- All vehicles have a backup alarms and emergency stop devices.
- All drivers will be required to have their Commercial Drivers License. All operators must be qualified.
- Traffic Control Measure Routes and regulations will be established and adherence required.

- All maintenance performed on the equipment will employ manufacturers recommended parts, and be inspected prior to returning to services by the SSO.

In addition to the requirements established by these guidelines, all heavy equipment and/or the movement of may also be bound to meet local or site-specific regulations. Control measures for these hazards are presented the "Standard Work Practices" section of this document.

4.3 Lifting Heavy Objects

The potential exists for workers to be injured while lifting or maneuvering heavy objects during the performance of various tasks. During soil boring activities workers have the potential to over-exert themselves while maneuvering the angering device and during sample extraction. In addition, various tasks may require lifting heavy pieces of equipment. If objects are improperly lifted, debilitating back strain and/or other injuries can result. Workers should obtain help from others, employ proper lifting techniques, and use machinery, where possible, to assist them when handling heavy objects.

4.4 Pinch/Compression Points

Pinch and Compression Points associated with drilling, sampling, and other equipment associated with hazardous waste operations may result in injury to site personnel. All equipment must be maintained in proper working order, with machine guarding devices in place. Any equipment found to be lacking in these areas shall be removed from service.

4.5 Inclement Weather

Most work activities related to hazardous waste operations are conducted outdoors. As a result, inclement weather may be encountered. As conditions may vary, it will be at the discretion of the Field Operations Leader and the Site Safety Officer representative to temporarily suspend or terminate activities as conditions dictate. All site activities will be terminated in the advent of electrical storms, tornadoes, and other hazardous weather conditions.

4.6 Contact With Energized Sources

One of the hazards associated with intrusive activities associated with hazardous waste work is the potential for encountering energized sources (pressurized lines, water lines, telephone lines, buried utility lines, high power lines, etc.), primarily while engaged in drilling and/or excavation activities. Due to the obvious ramifications associated with this hazard, extreme caution and strict adherence to procedures to detect, identify, and take evasive action shall be followed during the completion of site activities. Efforts will be made

through local contacts, as built drawings (where available) along with geophysical surveys to identify potential locations. Positive readings will require the relocation of a soil boring point and/or test pit excavation. To further avoid hazards of this type, no drilling mast, boom, or any other such projecting items shall be permitted within a 20-foot radius of any energized source. Also, any areas targeted for subsurface activities shall first be investigated to determine the presence of underground utilities. Any such utilities identified shall be physically marked and avoided.

4.7 Ambient Temperature Extremes

Ambient temperature extremes (hot or cold working environments) may occur during performance of hazardous waste work depending on the project schedule. Work performed when ambient air temperatures are below 50◦F may result in varying levels of cold stress (frost nip, frost bite, and/or hypothermia) depending on environmental factors such as temperature, wind speed, and humidity; physiological factors such as metabolic rate and moisture content of the skin; and other factors such as work load and the protective clothing being worn. Work performed when ambient temperatures exceed 70◦F may result in varying levels of heat stress (heat rash, heat cramps, heat exhaustion, and/or heat stroke) depending on factors similar to those presented above for cold stress.

In either case, these conditions can be debilitating and, when extreme, they can be fatal. An understanding of the importance in preventing heat/cold stress, coupled with the worker's awareness of the signs and symptoms of overexposure, can significantly reduce the potential for adverse health effects. This awareness is typically a part of each employees' 40-hour hazardous waste operations training. If this hazard is present during site operations, each worker will be provided with information necessary to protect themselves and site management will be instructed to permit frequent breaks in mild temperature rest areas having hot/cold fluids available for consumption. In extreme cases, biological monitoring may be performed and data compared to the most recent recommendations of the American Conference of Governmental Industrial Hygienists (ACGIH). Additional information regarding heat/cold stress is provided at the end of this section (Attachment A).

4.8 Noise In Excess Of 85 dba

Noise exposures exceeding the OSHA Permissible Exposure Limit could be encountered during certain phases of drilling or excavation operations. Personnel who are repeatedly overexposed could experience a permanent reduction in their ability to hear normal conversation. Appropriate hearing protectors will be worn when in close proximity to drilling and excavating operations, as determined by the SSO. It shall also be the responsibility of the SSO to ensure the application, use, and maintenance of occupational noise protective measures in accordance with 29 CFR 1910.95.

4.9 Water Hazards

Hazardous waste operations (particularly sampling activities) occasionally take place near waters edge or from boats. To avoid potential hazards associated with working on or over water (drowning) the field team shall employ lifelines, safety harnesses, and U.S. Coast Guard approved personal flotation devices when working within four feet of the waters edge. Due to the obvious hazards associated with working on or near waters edge during inclement weather, all field activities may be temporarily suspended or terminated at the discretion and direction of the Field Operations Leader, or Site Safety Officer representative.

4.10 Open Excavations

During the performance hazardous waste operations, the potential exists for open excavations (test pits, trenches, USTs, etc.) to be created. Under no circumstances will workers be permitted to enter excavations with depths greater than 4 feet. In addition to cave-in concerns, the potential exists for oxygen deficient and/or toxic atmospheres to be present within open excavations. It should be noted that vapor concentrations from potential site contaminants may be heavier than air which may result in vapors accumulating in low lying areas such as open excavations. As a result, sufficient air monitoring must be implemented prior to sampling activities near excavations. The use of remote sampling techniques (i.e., core stems, excavating machinery) will be employed to obtain soil samples from excavations with depths greater than 4 feet. Precautions must be taken, however, to eliminate the potential for soil, equipment, and/or personnel around the excavation from collapsing into the excavation. A minimum distance of 3 feet should be maintained between equipment and personnel from the edge of any excavation. All excavations will be performed in compliance with Subpart P of the OSHA Construction Industry Safety and Health Standards 29 CFR 1926.

At some hazardous waste sites, the potential exists for personnel to encounter buried unidentified drums during the performance of excavation activities. All drum handling activities will be performed in strict accordance with OSHA Standard 29 CFR 1910.120 (j). All unlabelled drums and containers shall be considered to contain hazardous substances and shall be handled accordingly until the contents are positively identified and labeled. As a result, any work involving unearthing of unidentified drums, overpacking of unidentified drums, or spill control activities for unidentified substances will be performed in Level B Protection (air supplied respirators). Buried drums may be corroded, ruptured or leaking. If drums or other containers are anticipated to be encountered at specific areas of the site, (based on the site's history), a ground-penetrating system or other type of detection system or device will be used to estimate their location and depth. To the maximum extent possible, any drums encountered during excavation activities will be left undisturbed and in place. Markers (flags) will be placed near undisturbed drums to identify the location of unearthed drums. As stated earlier, it should be noted that the potential exists for drums to be damaged as a result of excavating operations. All soil and covering material shall be removed with caution to prevent drum

or container rupture. If product from uncovered drums is leaking, spill control measures will be initiated to minimize contamination of nearby areas. Such procedures will include the use of U.S. Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent material. Drums or containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from the explosive relief of the drum. If drums are to be moved, material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers. Additional information regarding drum handling practices can be found in the drum and container management section of this document.

Continuous air monitoring should be performed during all excavation activities. Detailed records relating to air monitoring readings and task operations should be recorded during all excavation activities, particularly during excavations in which buried drums are discovered.

4.11 Natural Hazards

Natural hazards such as poisonous plants, stings and bites from poisonous or disease carrying animals or insects (e.g. snakes, ticks, mosquitos) cannot be avoided in typical hazardous waste site environments. However, in an effort to offset the impact of this hazard, field personnel will have access to commercially available snake bite kits and insect repellents. Potential nesting areas in and about work areas shall be avoided to the greatest extent possible. Lastly, within recent years a marked increase in Lyme's Disease has been reported. Ticks have been shown to be the primary vector in the transmission of this disease. In an effort to control this hazard, close attention will be given during operations and decontamination with regard to personal hygiene to detect and remove any ticks from personnel. The information provided in Section 6.0 of this module will be reviewed with site personnel to aid in the recognition and control of this threat and other hazards.

Additionally, site personnel who also are allergic to stinging insects such as bees, wasps, and hornets must be particularly cautious since severe illness or death may result in event of an allergic reaction. Site workers should convey such allergies to the SSO and FOL as part of the medical data sheet. The OSC of commercially available "anti-venom" kits are strongly encouraged for people who believe they are allergic to such insects.

5.0 HEAT/COLD STRESS

5.1 Heat Stress

The SSO shall visually monitor personnel to note for signs of heat stress. Field personnel will also be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress:

- Provide adequate liquids to replace lost body fluids. Personnel must replace water and salt lost from sweating. Personnel must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Replacement fluids can be commercial mixes such as Gatorade®.

- Establish a work regime that will provide adequate rest periods for cooling down. This may require additional shifts of workers. Breaks are to be taken in a cool rest area (77◦F is best). Personnel shall not be assigned other tasks during rest periods. Personnel shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.

- Personnel shall remove impermeable protective garments during rest periods.

The heat stress of personnel on-site may be monitored utilizing biological monitoring or the Wet Bulb Globe Temperature Index (WBGT) technique when workers are not wearing protective coveralls (such as Tyvek). This method will require the use of a heat stress monitoring device.

One of the following biological monitoring procedures shall be followed when the workplace temperature is 70◦F or above.

- Heart rate (HR) shall be measured through the pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should again be shortened by 33 percent. The length of the initial work period will be determined by using the table below.

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous	80.0°F	80.0°F	77.0°F
75% Work - 25% Rest, Each Hour	87.0°F	82.4°F	78.6°F
50% Work - 50% Rest, Each Hour	88.5°F	85.0°F	82.2°F
25% Work - 75% Rest, Each Hour	90.0°F	88.0°F	86.0°F

- Body temperature shall be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the oral temperature exceeds 99.7°F at the beginning of the next rest period, the following work cycle shall be further shortened by 33 percent. OT should be measured at the end of the rest period to make sure that it has dropped below 99°F. At no time shall work begin with the oral temperature above 99°F.

NOTE: External temperatures in excess of those stated above shall be regarded as inclement weather. Work continuation, termination, or alteration of the work schedule will be at the discretion of the FTL and on site health and safety representative. The heat and cold stress related sections of this are applicable to the season when work will be completed.

5.2 Cold Stress

The cold stress TLVs are intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury and to describe exposures to cold working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body temperature from falling below 36°C (96.8°F) and to prevent cold injury to body extremities (deep body temperature is the core temperature of the body determined by conventional methods for rectal temperature measurements). For a single, occasional exposure to a cold environment, a drop in core temperature to no lower that 35°C (95°F) should be permitted. In addition to provisions for total body protection, the TLV objective is to protect all parts of the body with emphasis on hands, feet, and head from cold injury.

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The

single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36◦C (96.8◦F); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering occurs when the body temperature has fallen to 35◦C (95◦F). This must be taken as a sign of danger and exposure to cold should be immediately terminated when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia. Whole body protection must be provided.

1. Adequate insulating dry clothing to maintain core temperatures above 36◦C (96.8◦F) must be provided to workers if work is performed in air temperatures below 4◦C (40◦F). Wind chill cooling rate and the cooling power of air are critical factors. [Wind chill cooling rate is defined as heat loss from a body expressed in watts per meter squared which is a function of the air temperature and wind velocity upon the exposed body.] The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2. The equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

TABLE 1

PROGRESSIVE CLINICAL PRESENTATIONS OF HYPOTHERMIA*

Core Temperature		Clinical Signs
°C	°F	
37.6	99.6	"Normal" rectal temperature
37	98.6	"Normal" oral temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss
35	95.0	Maximum shivering
34	93.2	Victim conscious and responsive, with normal blood pressure
33	91.4	Severe hypothermia below this temperature
32	86.0	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
31	87.8	
30	86.0	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases
29	84.2	
28	82.4	Ventricular fibrillation possible with myocardial irritability
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent
26	78.8	Victim seldom conscious
25	77.0	Ventricular fibrillation may occur spontaneously
24	75.2	Pulmonary edema
22	71.6	Maximum risk of ventricular fibrillation
21	69.8	
20	68.0	Cardiac standstill
18	64.4	Lowest accidental hypothermia victim to recover
17	62.6	Isoelectric electroencephalogram
9	48.2	Lowest artificially cooled hypothermia patient to recover

* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.

TABLE 2

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect)	**LITTLE DANGER** In < 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.
	Trenchfoot and immersion foot may occur at any point on this chart.		

5.2.1 Evaluation and Control

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32°C(-25.6°F). Superficial or deep local tissue freezing will occur only at temperatures below -1°C (30.2°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

TLVs recommended for properly clothed workers for periods of work at temperatures below freezing are shown in Table 3.

Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more than 10-20 minutes in an environment below 16°C (60.8°F), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below -1°C (30.2°F).

2. If the air temperature falls below 16°C (60.8°F) for sedentary, 4°C (39.2°F) for light, -7°C (19.4°F) for moderate work and fine manual dexterity is not required, then gloves should be used by the workers.

To prevent contact frostbite, the workers should wear anti-contact gloves.

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

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

TABLE 3

THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C(approx)	°F(approx)	Max.WorkPeriod	No. ofBreaks	Max.Work Period	No. ofBreaks	Max.Work Period	No. ofBreaks	Max.Work Period	No. ofBreaks	Max. WorkPeriod	No. ofBreaks
-26° to -28°	-15° to -19°	(Norm Breaks)	1	(Norm Breaks)	1	75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm Breaks1		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	2	30 min	5	Non-emergency work should cease		Non-emergency work should cease	
-38° to -39°	-35° to -39°	40 min	4	30 min	1	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	
-40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	
-43° & below	-45° & below	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	

NOTES:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) 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: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. 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/M^2; (2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. 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, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labor.

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

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

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

3. If exposed areas of the body cannot be protected sufficiently to prevent sensation of excessive cold or frostbite, protective items should be supplied in auxiliary heated versions.

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

5. Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 4◦C (39.2◦F) should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point that is just above ambient temperature.

5.2.1.1 Work - Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7◦C (19.4◦F), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers

should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

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

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

2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.

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

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

5. The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.

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

    a. Proper rewarming procedures and appropriate first aid treatment.
    b. Proper clothing practices.
    c. Proper eating and drinking habits.
    d. Recognition of impending frostbite.

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

f. Safe work practices.

5.2.1.2 Special Workplace Recommendations

Special design requirements for refrigerator rooms include:

1. In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter/sec (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.

2. Special wind protective clothing should be provided based upon existing air velocities to which workers are exposed.

Special caution should be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temperature loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

1. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16◦C (60.8◦F) so that overall compliance with the requirements of the TLV can be maintained.

2. Whenever the air temperature at a workplace falls below -1◦C (30.2◦F), the dry bulb temperature should be measured and recorded at least every 4 hours.

3. In indoor workplaces, the wind speed should also be recorded at least every 4 hours whenever the rate of air movement exceeds 2 meters per second (5 mph).

4. In outdoor work situations, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below -1°C (30.2°F)

5. The equivalent chill temperature should be obtained from Table 2 in all cases where air movement measurements are required; it should be recorded with the other data whenever the equivalent chill temperature is below -7°C (19.4°F).

Employees should be excluded from work in cold at -1°C (30.2°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24°C (-11.2°F) with wind speeds less than five miles per hour, or air temperatures below -18°C (0°F) with wind speeds above five miles per hour, should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissues in addition to providing for first aid treatment.

Note: This information has been adopted from the **1992-1993 "Threshold Limit Values** for Chemical Substances and Physical Agents and **Biological Indices"** by the American Conference of Governmental Industrial Hygienists (ACGIH).

6.0 TICK CONTROL AND LYME DISEASE

The occurrence of Lyme disease has become a worldwide problem since its identification in 1976. This disease is characteristically recognized as being transmitted by ticks, which may be encountered by field personnel while working at this site. As a result, this discussion has been included with this Health and Safety Plan to provide for adequate recognition, evaluation, and control efforts to minimize the occurrence and effects of this potential hazard.

The discovery of Lyme disease is credited to Dr. Allen Steere of Yale University Medical School, and is named after the community where it was (reportedly) first encountered, Lyme, Connecticut. This disease can be transmitted to man through the bite of ticks that are infected with a cork screw-shaped microbe (spirochete). The spread of this disease has been so rapid that in 1984 it surpassed Rocky Mountain Spotted fever as the most common tick-borne disease in the United States. In this country, most of the incidents of this disease have been recorded in the Northeast, and the tick species most commonly attributed with its spread is the deer tick.

6.1 Recognition

This hazard potential exists primarily in the spring and summer months, as these are the seasons that tick populations and activity flourish. In fact, 90 percent of the reported cases have occurred from early June through September. Also, this concern exists primarily in heavily vegetated areas. Therefore, recognition of these factors can aid in the awareness and control of this threat.

To aid in the recognition and identification of these insects, an example illustration of the tick species common to the region where this site is located has been included with this discussion. This species (the American Dog tick) is common in the eastern half of the United States, and typically exists in areas covered with grass or underbrush. These insects will attach themselves to animals (including man) that pass through the area and rub against them. After finding a host, the tick inserts its mouthparts and sucks blood until it is fully engorged. This requires a time period of three to twelve days, then the tick will drop off. In addition to Lyme disease concerns, this tick has also been identified as a transmitter of Rocky Mountain Spotted Fever, and the organisms of tularemia and possibly relapsing fever. The wounds left by tick bites can be painful, and can also have a paralyzing effect commonly referred to as tick paralysis.

The earliest symptom of the onset of this disease is the occurrence of an unusual red skin rash. This is commonly the first indication since it has been evidenced that many persons who have contracted this disease were, in fact, unaware that they had been bitten. This rash can appear at the site of the bite anywhere from several days to a few weeks after the bite. It typically starts as a small red spot, and then expands as the spirochetes expand from the bite location. Rash sizes can vary, but have been most commonly associated in a 2 to 3 inch diameter size range. This rash will fade (with or without treatment) after a few weeks. Close inspection is necessary to detect this symptom as the rashes are easy to miss because they're often very faint. Body sites where rashes frequently occur include the thigh areas, groin, and armpits. Also, it is not uncommon for a rash to develop in more than one place.

Other early symptoms include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Recognition of the onset of any of these symptoms is important since tick bites do not always produce a rash. If left untreated, the disease will progress to its second stage within weeks or months after the infection. This stage involves affects to the heart and nervous system. A common second stage symptom is a paralysis on one or both sides of the face. Others include severe headache, encephalitis, or meningitis. The third and final stage involves the development of chronic inflammatory arthritis, which can occur up to a year or more after the bite.

6.2 Evaluation

Evaluation of this hazard potential principally involves field personnel performing close self-inspections for the presence of ticks each time they leave the site. This should involve careful examination, especially of the individuals' heads. Personnel should be aware that when a tick attaches itself to its host, it inserts its entire head under the surface of the skin.

6.3 Control

Control of this threat involves several components. First, field personnel must be aware of the climate and area conditions which are commonly associated with being conducive to tick infestation. Second, when working in or walking through potential infested areas, personnel must ensure that they do not have exposed body parts (i.e. at least long sleeved shirts and long pants, particularly when protective coveralls are not worn). In heavily vegetated areas where infestation is likely, Tyvek coveralls will be required to minimize this hazard potential. Also, several commercial products have been demonstrated as being effective in repelling ticks. Examples include Permanone, Off!, and Cutter. These types of repellents will be used at the direction and discretion of the Tetra Tech NUS Health and Safety Officer, and only in accordance and observation of manufacturer's recommendations. In most instances, however, such repellents are typically applied to the outside surfaces of clothing (and not directly onto the skin), and should be applied also to shoe tops, socks, pants cuffs, and other areas most susceptible to ticks.

6.4 Tick Removal

In the event that a tick is discovered to be attached to a member of the field team, timely removal of the insect is critical to reducing the potential for contracting the disease. According to available information and research, there is apparently a grace period of at least a few hours from the time of the bite before the tick transmits the microbe (the spirochetes are not present in the mouth parts of the tick). However, the incident of a tick bite is frequently unnoticed, and the discovery of the tick may not occur until after this suspected grace period has already elapsed. Therefore, timely removal is very important. The preferred method of tick removal is to pull it out using tweezers or small forceps. In this method, the tick should be grasped as close to the mouth as possible, and then pulled steadily upward. Care must be exercised so as not to pull in a jerking motion as this can result in the head becoming detached. After the tick has been removed, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). The tick must not be handled as the microbes can enter the body through any breaks in intact skin. The bite should be checked occasionally for at least a two-week period to see if a rash forms. If it does, medical attention must be promptly sought.

In order to provide for proper and timely response to the occurrence of a tick bite, the Health and Safety Officer will ensure that the site First Aid kit is properly equipped with medical forceps and rubbing alcohol, in addition to the standard kit contents. Also, an adequate supply of commercial insect (tick) repellents will be maintained on site, and all personnel will be trained in its proper application and will be required to use it, at the direction of the Health and Safety Officer.

APPENDIX G

SAFE WORK PERMITS

SAFE WORK PERMIT
EXCAVATION OPERATIONS
NSWC CRANE, CRANE, INDIANA

Revision 1
June 2001

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Excavation of two unidentified anomalies estimated to be 2-4 feet below ground surface (bgs). The method of excavation will proceed by removing the over burden, either manually or using a back-hoe, to within about 12-inches of the anomaly. The remaining soils will be excavated by hand using shovels

II. Required Monitoring Instruments: Radiation Survey Meter; MSA/Auer CWA Detector Tube (Sensitivity 0.1 mg/m^3; go-no-go response) or AP2C Chemical Agent Detector Kit (Sensitivity 0.006 mg/m^3 quantifiable result). (See Section 7.0 of this HASP for more information

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ _____
TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☐
Level C ☒ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☒	Escape Pack	☐
Half face APR	☐	SCBA	☐
SAR	☐	Bottle Trailer	☐
Skid Rig	☐	None	☒

Modifications/Exceptions: This activity will be initiated in Level C Protection Full face APR with CBA-RCA Canister. Based on the scope of work it is not anticipated that this function will be greater than two days in duration. Change out schedule for the canisters are at the beginning of each day. Initiation in Level C Protection is based on the absence of positive information confirming that neither Thorium Nitrate or Mustard Gas will be encountered.

V. Chemicals of Concern

Chemicals of Concern	Action Level(s)	Response Measures
Thorium Nitrate	>2 µCi (250cpm) above background	See Table 5-1 for Response Measures
Mustard Gas	>0.1 mg/m^3 (0.015 ppm)	See Table 5-1 for Response Measures

VI. Additional Safety Equipment/Procedures

Hard-hat	☒ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☒ Yes	☐ No	Safety belt/harness(Seat Belts)	☒ Yes	☐ No
Chemical/splash goggles	☐ Yes	☒ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☐ No
Splash suits/coveralls	☒ Yes	☐ No	Gloves (Type - Nitrile)	☒ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☐ Yes	☒ No
Chemical Resistant Boot Covers	☒ Yes	☐ No			

Modifications/Exceptions: Reflective vests for high traffic areas (Ground Spotters or operators who will leave their cab). Tyvek for incidental dust. All operators and truck drivers will employ seat belts when operating designated equipment. Based on ambient conditions the SSO may conduct heat stress monitoring. If monitoring is to be conducted it will proceed in accordance with the provisions specified on Table 5-1 .

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☐	☐

VIII. Site Preparation

	Yes	No	NA
Utility Locating and Excavation Clearance completed	☐	☐	☐
Vehicle and Foot Traffic Routes Cleared and Established	☐	☐	☐
Physical Hazards Barricaded and Isolated	☐	☐	☐
Emergency Equipment Inspected and Staged (Fire Extinguishers, etc.)	☐	☐	☐

IX. Additional Permits required (Utility Locating and Excavation Clearance – Attachment II). ☒ Yes ☐ No
If yes, complete permit required or contact Health Sciences, Pittsburgh Office

X. Special instructions, precautions: Excavation will proceed in the following manner – ❶The boundaries will be defined using maps and magnetic detection devices, ❷A sweep of the dig area will be conducted using a radiation survey meter, ❸he first 12-inches will be probed using geophysical survey equipment, ❹once clear the first cut will be made. This general procedure will be followed for the depth of the excavation until the anomalies are uncovered and removed from the excavation. To prevent the spread of contaminants the top 1-2-feet of material will be placed on plastic sheeting to be used as clean cover. The material extracted will be used for fill unless during the excavation there is a positive detection from the instruments employed. At this point those materials will be collected and containerized. Of primary concern is the potential for UXO/CWM/Radiological hazards. The anomalies will be examined by UXO personnel prior to moving or relocating to the decontamination station. All items including soils and anomalies will be scanned for the presence of radiological contamination and/or CWM. If the anomalies are ordnance materials NSWC Crane will be notified. Follow the safe work practices for excavation specified in Section 5.3 of this HASP. Use proper lifting techniques defined in Table 5-1 for mobilization/demobilization. Complete an Equipment Inspection Checklist for the heavy equipment used in the excavation upon arrival to the site, and then every 10 day shift thereafter or after major repairs. The Ground Spotter will exercise complete control over the area in which the excavation activities are being conducted. No one will enter those areas without the express permission of the ground spotter. Traffic patterns will be constructed to facilitate one-way travel to minimize backing where possible.

Permit Issued by: _____ Permit Accepted by: _____

APPENDIX H

PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT (PPE)
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PERSONAL PROTECTIVE EQUIPMENT (PPE)

1.0 PURPOSE

This section presents requirements for the use of personal protective equipment for each of the activities being conducted as part of hazardous waste operations. This section includes the types and levels of personal protective equipment, the criteria used for selecting various levels of protection, and criteria for modifying levels of protection based on monitoring instrument readings and personal observations.

2.0 SCOPE

This section applies to all Tetra Tech NUS personnel and subcontractors participating in hazardous waste operations.

3.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) OBJECTIVES

Hazardous waste operations require the use of personal protective equipment to adequately protect personnel from exposure to site contaminants that cannot be controlled through engineering or administrative controls. Many of the physical hazards associated with hazardous waste operations can be controlled or minimized with the use of PPE. Most hazardous waste operations in which Tetra Tech NUS is involved requires the use of level B, C, and D protection. Levels of protection are defined in Appendix B of OSHA Standard 29 CFR 1910.120 - "Hazardous Waste Operations and Emergency Response." and are provided in this document. The site specific HASP addresses specific PPE requirements for each task associated with the scope of work. In addition, criteria for upgrading and downgrading levels of protection based on air monitoring results are discussed in the site specific HASP.

3.1 Levels of Protection

The type and amount of protection required are usually expressed in levels. These levels are based on the hazard present, and the chemical concentration encountered on site. The four levels of protection, as defined by OSHA, range from Level A, the highest level to Level D, the lowest.

This information is presented as a guide to choosing personal protective equipment. The selection of PPE is a complicated process which should take into consideration a variety of factors. These factors are:

- Identification of the hazards
- Potential route(s) of exposure (inhalation and/or dermal)

- Performances
- Work requirements
- Durability of PPE material
- Physical and heat stress
- Knowledge of the hazard

In some circumstances, equipment from the various levels may be combined to provide the most appropriate protection against the hazards encountered.

3.1.1 Level D

This level is normal work attire and provides only minimal protection. Level D is not sufficient if chemical hazards are present.

- Coveralls or work clothes
- Steel-toed/shank boots
- Safety glasses with side shields or goggles
- Hard hat
- Work gloves
- Escape respirator[1]

3.1.2 Level C

Can be worn when the type(s) of airborne substance(s) is known, the concentration(s) is measured, and other criteria for using air-purifying respirators are met. Level C equipment includes:

- Full-face, air-purifying respirator such as our chin canister (MSHA/NIOSH approved).
- Chemical-resistant clothing (one-piece coverall; hooded, two-piece, chemical splash suit; chemical-resistant hood and apron, disposable, chemical-resistant coveralls).
- Boots, steel toe and shank, chemical resistant.
- Boots, outer, chemical resistant (disposable).*
- Gloves, outer, chemical resistant.
- Gloves, inner, chemical resistant.
- Hard hat.
- Cloth coveralls (inside chemical protective clothing).[1]

---

1 Optional

- Depending on the job, there may be a need for two-way radio communications (intrinsically safe).[1]
- Escape respirator.[1]

Level C protection should only be used when the following criteria are met:

- Oxygen concentration is greater than 19.5 percent.
- Contaminants have adequate warning properties such as odor (alerting wearer to the presence of the contaminant).
- Canisters are available to remove the contaminants.
- The IDLH (immediately dangerous to life or health) concentrations are not exceeded.
- Contaminant and concentration are identified.
- No excessive fire/explosion hazard exists.

3.1.3 Level B

Can be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. OSHA requires that the minimum level for entry into an unknown situation is Level B protection. Level B protection is the minimum level required on initial site entries until the hazards have been further defined by onsite studies. The Incident Commander may then downgrade or upgrade the level of protection, depending upon the results. Level B PPE equipment includes:

- Positive-pressure (pressure demand), self contained breathing apparatus (MSHA/NIOSH approved), or airline-supplied respirator with an escape SCBA.
- Chemical-resistant clothing, coveralls; hooded, two-piece, chemical splash suit; disposable chemical-resistant coveralls).
- Coveralls (under chemical resistant clothing).[1]
- Gloves, outer, chemical resistant.
- Gloves, inner, chemical resistant.
- Boots, chemical resistant, steel-toed and shank.
- Boot covers disposable.[1]
- Hard hat.

[1]Optional

Level B protection should only be selected when the following criteria are met:

- The environment identified presents a higher respiratory hazard (above the IDLH or the oxygen concentration is below 19.5 percent) but not a severe skin hazard.
- A fire/explosion hazard exists or is possible.
- The airborne contaminant concentrations or conditions exceed the criteria for wearing an air-purifying respirator (APR).
- The contaminant is incompletely identified.
- OSHA-recommended minimum level for entry into an unknown situation.

3.1.4 Level A

Must be worn when the highest level of respiratory, skin, and eye protection is needed. This includes the following:

- Positive-pressure (pressure demand), self contained breathing apparatus (MSHA/NIOSH approved).
- Fully encapsulating, chemical-resistant suit.
- Gloves, inner, chemical resistant.
- Gloves, outer, chemical resistant.
- Boots, chemical resistant, steel toe and shank; (depending on suit boot construction, worn over or under suit boot).
- Underwear, cotton, long-john type.[1]
- Hard hat (under suit).[1]
- Cooling unit.
- Coveralls (under suit).[1]
- Disposal boot cover.
- Two-way radio communications (intrinsically safe).

Level A protection will be used when:

- The hazardous substance has been identified and requires the highest level of protection.
- There are confined areas with poor ventilation which also present dermal exposure potentials.
- Existence or potential for high atmospheric concentration of gases, vapors, or particulates.
- The work function requires it.
- There is an unidentified, suspicious risk requiring Level A protection.

[1]Optional

In addition to specifying the level of protection, OSHA 29 CFR 1910.120 also addresses the testing procedure that totally encapsulating suits must pass before being used. The type of material used is also important, since there are no universal materials resistant against all chemicals. Protective clothing must be chosen using compatibility charts supplied by the manufacturer.

Note: Optional equipment may be required based on the hazard founds and the site characterization.

3.2 Styles of Protective Clothing

Three types of protective clothing are used to protect the skin surface from hazardous materials.

3.2.1 Fully Encapsulating Suit

- One-piece garment.
- Completely encloses the wearer.
- Vapor-proof (sealed so as to preclude the admission of harmful vapors or liquids into the suit).
- SCBA or airline respirator is used.
- Air must maintain a positive pressure within the suit.

3.2.2 Nonencapsulating Suit

- Two types:
  - One-piece coverall.
  - Two-piece pants and coat.
- Optional hood and other accessories.
- No face shield (does not encapsulate).
- Used when dermal threat is less hazardous.

3.2.3 Single-Use Garment

- Disposable.
- Decontamination is made easier (garment is disposed).
- Garment will withstand the demands of rigorous use.
- Use is dependent on type of contaminant and the concentration.

3.3 Protective Clothing Materials

In addition to the types of suits available, protective clothing is made of various materials. These materials are classified as either elastomers or nonelastomers.

3.3.1 Elastomers

Are defined as materials with the ability to be stretched to twice their original length and to retract (rapidly) to their original length. Examples include the following:

- Natural Rubber - Polyisoprene obtained from rubber plants. A highly flexible and conforming material used principally for gloves. High elasticity. Used for bases, alcohols, dilute acids. Poor for hydrocarbons.

- Butyl Rubber - Copolymer of isobutylene and a small amount of isoprene. Material has good resistance to weathering and a wide variety of chemicals. Both supported and unsupported forms of butyl rubber are used as protective clothing. Poor for halogenated hydrocarbons.

- Polyethylene - A fairly chemically resistant material that is used as a freestanding film (e.g., apron) or a fabric coating. Low-density polyethylene is the most common form used in protective clothing. Good for acids and bases. Poor for organic solvents, halogenated chemicals, hydrocarbons.

- Polyvinyl Chloride - A staff polymer that is made suitable for protective clothing applications by the addition of plasticizers. Used as a freestanding material for gloves, aprons, etc., as well as coatings for fabrics. Clear forms are also available as flexible face shields. Good for acids, bases, and some organics.

- Neoprene - Polychloroprene. A synthetic rubber having chemical and wear-resistance properties that are generally superior to those of natural rubber.

- Viton - A proprietary fluoroelastomer. Highly chemically resistant, but expensive synthetic elastomer. Good for crude oil, gasoline.

- Nitrile - Available in a wide range of acrylonitrile concentrations. Good for petroleum products and many acids.

- Polyvinyl Alcohol - A water-soluble polymer that, as long as it is dry, exhibits exceptional resistance to many organic solvents that rapidly permeate most rubbers. The material is somewhat stiff; thus dexterity is limited. PVA will break down when it contacts water (H_2O).

- Blends/Mixtures - Many materials are blended or mixed together. This blending increases the clothing's ability to resist the chemical. Check specific clothing available at your site to determine whether it is a blend, and which chemicals it resists.

- Laminated/Multilayer - Offers a wider range of protection to different contaminants. Some gloves are constructed of multiple layers of different materials. This gives them resistance to a wider variety of chemical classes. There is no "universal" material good for all compounds, but this type of PPE comes the closest.

3.3.2 Nonelastomers

Defined as materials without the ability to stretch and retract to their original shape. Examples include the following:

- Leather - Used for firefighting; cannot be cleaned and is readily penetrated.

- Nomex - Used for firefighting and as a filler for chemical-resistant suits. It is readily penetrated and is flame retardant.

- Gortex - A Teflon material which allows air and moisture to move through material but not water. (This reduces heat buildup.)

- Tyvek - A Du Pont product which is an excellent barrier to many dry particulates. This fabric is inexpensive, durable, and disposable; but offers poor protection against liquid chemicals. Coated Tyveks offers protection for a wide range of chemicals such as acids, and other liquid chemicals.

- Saranex - Is also a Du Pont product. It is a saran-coated Tyvek (as in Saran Wrap) and offers good protection for many substances.

There are many brands and types of protective clothing for the specific chemical that will be encountered.

3.4 Performance Requirements for Chemical Protective Clothing (CPC)

3.4.1 Primary Performance Requirements

When choosing chemical protective clothing, check the material's chemical resistance which will determine the garment's integrity.

Chemical Resistance

Chemical Resistance is defined as: "The ability of a material to withstand chemical and physical change to a chemical and block exposure caused by penetration, degradation, and permeation." A material's chemical resistance is the most important performance requirement. The suit must maintain its structural integrity and protective qualities upon contact with a hazardous substance. Chemical resistance is determined by the following factors:

- Penetration

  - Process of chemical transport through openings in a garment.
  - May be due to design or garment imperfections.
  - May be due to rips, tears, punctures, or abrasions to the garment.

- Degradation

  - Chemical action involving molecular breakdown of the material due to chemical contact.
  - Causes physical changes to the material.

- Permeation

  Permeation of a liquid or vapor through a rubber or plastic material is a three-step process involving:

  (1) The sorption of the chemical at the outside surface of the Chemical Protective Clothing (CPC).

  (2) The diffusion of the chemical through the CPC material.

(3) The desorption of the chemical from the inside surface (i.e., toward the wearer) of the CPC.

- Permeation Occurrence

  -- Permeation rate

  Permeation rate is expressed in terms of the amount of a chemical which passes through a given area of clothing per unit of time. (Common units are micrograms per square centimeter per minute.) Thus, obviously, the total amount of chemical permeating an article of clothing increases as the area exposed to the chemical is increased and also as the duration of exposure is lengthened. For a given chemical/ material pair, the permeation rate decreases as the material's thickness is increased.

  -- Permeation influences

  Permeation is influenced by:

  --- Construction of the material.
  --- Thickness of the material.
  --- Chemical substance the garment is exposed to.
  --- Concentration of chemical.
  --- Temperature.
  --- Contact time.

Included at the end of this section is a permeation chart to show you how PPE is selected.

- Work Function

The choice of protective clothing will be greatly influenced by the type of work that is being performed.

3.4.2 Additional Performance Requirements for Chemical Protective Clothing

Durability

The ability to withstand wear; the ability to resist punctures, abrasions, and tears; the material's inherent strength.

Flexibility

The ease to move and work in protective clothing. This has a direct impact on the worker's mobility and agility.

Temperature Resistance

The ability of a material to maintain its chemical resistance during temperature extremes and to remain flexible in cold weather.

Service Life

The ability of a material to resist aging and deterioration.

Cleanability

The ability of a material to be effectively decontaminated.

Design

The way the suit is constructed.

Size

The physical dimensions or proportions of clothing, which are directly related to comfort and which influence the number of unnecessary accidents.

Color

Brightly colored suit materials make it easier to maintain visual contact between personnel.

3.4.3 Physical Limitations

Wearing chemical protective clothing can cause severe problems. These involve heat stress, accidents, and physical exertion. Physical limitations can include:

- Heat stress - Caused by protective clothing interfering with the body's ability to cool itself. Clothing that provides a barrier against chemicals contacting the skin, unfortunately, also

prevents the efficient dissipation of body heat. Evaporation, the body's primary cooling mechanism, is reduced, since ambient air is not in contact with the skin's surface.

- Accidents - Increases when wearing chemical-protective clothing. Suits are heavy, cumbersome, decrease mobility and dexterity, lessen visual and audio keenness, and increase physical exertion. The severity of the problems depends on the style of clothing worn. These negative qualities increase the risk of common accidental injury; for example, slips, falls, or being struck.

- Physical exertion - Working in protective clothing can in itself cause problems. Worker performance may decrease due to increased fatigue levels. Other more serious illnesses, such as stroke or heart attack, could occur.

3.5 Communications in Chemical Protective Clothing

Communications may be difficult when wearing PPE. In certain instances, radio, voice, or written communications cannot be used. Such instances may require the use of hand signals to solicit needed help or equipment. The following hand signals are universally recognized.

Signal	Meaning
Hand gripping throat:	Out of air, can't breathe.
Grip partner's wrist or place both hands around your waist:	Leave area immediately, no debate!
Both hands on top of head:	Need assistance.
Thumbs up:	Okay, I'm all right, I understand.
Thumbs down:	No, negative.
Forefinger and middle finger:	Need a wrench.

3.6 Conclusion

Wearing chemical protective clothing will protect us from the effects of hazardous materials. Certain items must be considered in the selection and use of protective clothing. They are:

- Type of contaminant and concentration
- Physical stress on wearer
- Work function of wearer

PERSONAL PROTECTIVE CLOTHING CHECKLIST

1. Site Contaminants:

_____

_____

_____

2. Protective Equipment Employed*:

Type	Limitations
Dermal	
Gloves	
Boots	

*Respiratory Protection is addressed in a separate topic.

3. Materials resistance to Heat

4. Materials resistance to Cold

5. Color of dermal protection

APPENDIX I

UNEXPLODED ORDNANCE STANDARD OPERATING PROCEDURE

Tetra Tech NUS, Inc.

Memo

To: CTO 131 Project Personnel

From: Tom Johnston, CTO 131 Task Order Manager TEJ 7-16-00

CC: Not Applicable

Date: 07/17/00

Re: Notice of Variance to CTO 131 Health and Safety Plan Standard Operating Procedure, "Unexploded Ordnance and Chemical Warfare Agents," number HS-2.0, revision 0 (Appendix I of the Health and Safety Plan).

The subject procedure requires path clearance into an area for unexploded ordnance prior to intrusive activities. However, the Mustard Gas Burial Ground being investigated under CTO 131 has been demonstrated to be free of unexploded ordnance through past geophysical surveys identified in the CTO 131 Quality Assurance Project Plan. Furthermore, numerous personnel have walked over that site in the intervening years with no detriment. Therefore, no path clearance will be required for CTO 131. Sections 15.2, 15.5 and 15.6 have been altered to reflect this relaxation of the path clearance requirement and the indicated sections have been initialed and dated by me to validate the changes.

Concurrence with these changes is indicated below by the project Health and Safety Officer:

Concurrence Signature: Thomas M. Dickson CSP Date: 07/18/00

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1.0 GENERAL

This Standard Operating Procedure (SOP) was prepared as outlined in references (a) and (b) above, for conducting field activities requiring unexploded ordnance (UXO) and chemical warfare agent (CWA) support under the Comprehensive Long-term Environmental Action Navy (CLEAN) contract. All personnel conducting operations under this SOP must read and understand applicable parts of references (a) through (j) prior to commencing any work described within this SOP. The work plan, health and safety plan, and other referenced SOPs submitted for the purpose of accomplishing work covered by this SOP are to be considered supporting documents to this SOP.

2.0 PURPOSE

This SOP is generic in nature and applies to all operations involving UXOs and/or CWAs support during field operations at various U.S. Navy installations throughout the United States under the CLEAN contract. It provides procedural requirements for any activity involving UXO and CWA. It provides detailed procedures for the location, identification, documentation, and emergency actions on UXO/CWA activities.

3.0 APPLICABILITY

This SOP applies to all personnel performing activities associated with UXOs and CWAs. This includes personnel of the prime contractor as well as personnel of any subcontractor. This SOP also applies to persons who may visit the site during the conduct of UXO/CWA activities. Compliance is mandatory for all Tetra Tech NUS, Inc. (TtNUS) personnel, subcontractors, and visitors to the site where UXO/CWA activities are in progress.

4.0 RESPONSIBILITIES

The TtNUS Project Manager is directly responsible for seeing that all applicable rules and regulations are complied with, and that all necessary safety precautions are taken to conduct operations in accordance with this SOP.

It is the responsibility of the Project Manager to ensure that all personnel conducting field activities in accordance with this SOP have the proper training (including hazard control briefings) and, if required, the proper certifications for the job being performed. The onsite TtNUS Health and Safety Officer will assume these responsibilities in the absence of the Project Manager.

5.0 LOCATIONS OF OPERATIONS

The field activities to be conducted during support of the CLEAN contracts can be performed at a variety of locations throughout the United States. Wherever the installation is located, a detailed site description, discussions of known and/or suspected contamination sources, and results of previous studies will be provided to field personnel.

If available, the initial evaluation, consisting of preliminary risk assessments (including discussions of probable contaminants, transport pathways, identification of potential receptors, and preliminary evaluation of human health and environmental concerns), preliminary identification and evaluation of remedial action alternatives, and preliminary identification of applicable or relevant and appropriate requirements (ARARs) will also be made available to field personnel conducting activities at the installation.

6.0 PERSONNEL QUALIFICATIONS AND REQUIREMENTS

6.1 Personnel Qualifications: Qualifications for those personnel actively involved in UXO/CWA operations shall be as follows:

a. UXO personnel shall be graduates of the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indian Head, Maryland.

b. The lead UXO Supervisor for the operation will have been awarded the Master EOD Badge and have served at least 15 years in military EOD assignments, of which more than 10 years were in a supervisory position.

c. UXO personnel must meet the requirements as stated in the Site Health and Safety Plan, consistent with OSHA 29 CFR 1910.120, paragraph (e).

6.2 Personnel Requirements: During any activity where the possibility that UXOs and/or CWAs may be encountered (no matter how remote), the following requirements will be met:

a. One EOD-qualified technician will be required to support each field team engaged in operations in areas that might contain UXOs/CWAs.

b. One EOD-qualified person will be present at the site during all activities to provide UXO/CWA support in the event their services are required.

7.0 PERSONNEL LIMITS

The activities to be conducted under the CLEAN contract will not normally be conducted in areas requiring maximum personnel limitations. Work will not be permitted unless at least two persons are present in the work area. The provisions of 29 CFR 1910.120 concerning personnel qualifications and requirements will be followed while working on site. Any personnel limitation requirements that may be in force by the Installation Safety office will be adhered to at all times.

During all hazardous operations related to searching or screening for UXO or any hazardous UXO/explosive related service, the "buddy system" (29 CFR 1910.120, paragraph (d) (3)) must be used, with one of these persons being a qualified and approved TtNUS EOD technician.

8.0 MATERIAL LIMITS

Explosive materials will not be used during the operations covered by this SOP. Bulk liquids to be used for the decontamination of equipment will be in 2-gallon containers or less. Material Safety Data Sheets (MSDSs) will be kept on file in the Installation Fire Department and at the TtNUS Command Post.

9.0 SAFETY REQUIREMENTS

9.1 Reference Safety Requirements: The safety requirements that apply to the UXO/CWA operations covered under this SOP are:

a. NAVSWCINST 5100.6; Subj: Occupational Safety and Health Program.

b. NSWCDDINST 5104.1; Subj: Control of Emissions (EMCON) Causing Hazards of Electromagnetic Radiation to Ordnance (HERO).

c. OSHA 29 CFR 1910-120 and 1910.134.

d. NRC 10 CFR, Part 19, 20, and 40.

e. NAVSEA SO420-AA-RAD-010, dated 01 October 1991.

9.2 Specific Safety Requirements: The specific safety requirements for UXO/CWA operations are as follows:

a. All operations will be suspended if so ordered by the Installations Range Control.

b. If UXO/CWA or suspected UXO/CWA is encountered, all operations in the affected area will cease, the affected area will be evaluated, and notification will be made in accordance with Section 11.0 of this SOP.

c. TtNUS UXO technicians (EOD-qualified) will be present during UXO-related activities.

d. Installation approved communications equipment (two-way radios) will be onsite during any operation. HERO restrictions will comply with Reference 9.1 b. above.

e. Standard work practices as outlined in the site work plan will apply.

10.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The following PPE will be worn by personnel on site. Items marked with an asterisk (*) will be available and will be used, if necessary, as determined by the TtNUS Site Safety Officer.

a. Safety glasses

b. Safety shoes (and protective overboots/or steel-toe rubber boots*)

c. Cotton clothing (with protective coveralls*)

d. Gloves (type to be determined by TtNUS Site Safety Officer)

e. Respiratory protection equipment* (29 CFR 1910.134)

f. Hearing protection*

g. Hard hats*

Additional equipment may be required on a site-specific basis. Equipment will be selected by the Site Safety Officer (SSO) and the Project Manager in accordance with the Work Plan and appendices.

11.0 EMERGENCY RESPONSE AND CONTINGENCY PLANS

11.1 Emergency Contacts: In the event of an emergency, notification will be made to the following in the order presented or in the order dictated by the installation:

a. Emergency Fire and Medical Assistance

b. Installation Safety Office

c. Installation EOD Office

d. Installation Environmental Office

e. TtNUS Site Supervisor (Field Operations Leader)

f. TtNUS Project Manager

Most activities to be performed during field work should not be conducted within buildings. In the event of an emergency, all site personnel will be evacuated to a predetermined location away from the work place. Emergency Response Planning will follow in accordance with 29 CFR 1910.38(a). TtNUS will utilize the Installations Base Fire Protection and Emergency Services in emergencies or potential emergencies.

11.2 Contingency Plans: The following contingency plans will be implemented:

a. Pre-Planning - Upon arrival at the base, the TtNUS Field Operations Leader and/or Site Safety Officer will meet with the Base Fire Protection Department, Base Security Personnel, and Emergency Services to notify them what activities are to be undertaken and where. All site personnel will be required to follow base emergency procedures and will rely on base services to handle emergency calls when needed. Medical services will be provided by the base if available or off site by local medical services.

Hand-held radios will be available at the work site for communications between field teams and Range Control.

b. Emergency Escape Procedures and Assignments - Upon notification of a site emergency that requires evacuation, all site personnel will proceed to predetermined locations based on emergency location and wind directions. If personnel cannot reach these locations without danger to their lives or health, and alternate meeting place will be designated during the daily hazard control briefing. Personnel will be trained to remain at the refuge location until directed to resume work, or leave the site.

c. Procedure to Account for Site Personnel - The site work force will be small enough that accounting for personnel will not be a problem. Accounting for personnel will be the Field Operations Leader's responsibility. This will be accomplished by taking a roll call using the site log book.

d. Rescue and Medical Duties - A physician-approved first aid kit, an ANSI-approved eye wash station, and a Class ABC fire extinguisher will be readily available on site. Site personnel will not be authorized to participate in emergency rescue operations.

e. Activation of Emergency Response Procedures - Should any emergency occur which requires the support of outside services, the appropriate contacts will be made by the Field Operations Leader. A list of the appropriate contacts will be posted at the Command Post. Hand-held radios will be the primary means of communications.

f. Airborne Chemical Release Contingency Plan -

(1) Chemical Release Monitoring - every member of the site team will be responsible for observing and reporting any gross chemical releases or conditions that could lead to releases. Air monitoring will be performed as described in the site work plans and the site health and safety plan.

(2) Response to Measured Airborne Chemical Releases - the readings on monitoring instrumentation will be compared to the action levels specified in the work plans and the site health and safety plan for the purpose of protecting the health and safety of onsite personnel. If the concentrations shown on the instruments suggest that the hazardous materials can exceed the following levels at the perimeter of neighboring residential or commercial property, the TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fire department.

Parameter	Action Level	Note:
Total Organic Vapors	50 ppm	SUGGESTED LEVELS ONLY
Flammable Vapors	10% of the Lower Explosive Limit (LEL)	

(3) Response to Sudden Airborne Chemical Releases - if a field operation onsite results in a release of a concentrated vapor from a pressurized container (which will normally result in a visible plume), personnel will leave the area for the predetermined-upwind assembly point quickly, but without panic. TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fire department as soon as possible. The potential for such an event to occur during planned activities is not considered to be significant.

g. Liquid Release Monitoring - Every member of the site team will be responsible for observing and reporting any liquid chemical releases or conditions that could lead to a release. If field operations on site result in a release of liquid chemicals in the absence of vapors, field personnel will attempt to contain the liquid by means of berms constructed with available equipment. If the work team cannot control the spill, they will leave the area for the assembly point quickly, but without panic. The TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fir department. This is not considered to be a significant event during operations, however, in the unlikely instance that it should occur, field personnel may effect defensive efforts, providing that such a response does not appear to present a chemical overexposure or other personal health or safety concern.

12.0 SAFETY POINTS OF CONTACT

a. Installation Safety Management Branch

b. Installation Ordnance Officer and/or EOD Officer

c. Installation Radiation Officer

d. Installation Environmental Office

13.0 TOOLS AND EQUIPMENT

Major items of equipment and instrumentation that may be required for UXO/CWA operations covered by this SOP are presented below by category:

13.1 Protective Equipment

a. Respiratory Protective Equipment (APR or SCBA)

b. Dermal (chemical resistant) protective equipment

c. Other items (hard hats, safety glasses, etc.)

13.2 Air Monitoring Equipment

a. Explosive/O_2 Meter (Combustible Gas Indicator)

b. Direct reading Organic Vapor Analyzer (PID or FID)

c. Radiation Survey Meters and TLD Badges

13.3 Geophysical/hydrology/Survey Instrumentation

a. Magnetometer (G-856 AG)

b. Electromagnetic Terrain Conductivity Meter (EM-31)

c. Water Level Indicator/Recorder

d. Survey equipment (transit, tripod, etc.) as required

e. pH/Temperature/Conductivity Meter for water samples

13.4 UXO Support Equipment

a. GA-72CV Magnetic Locator (passive instrument) will be used for UXO surface survey during UXO activities. The GA-72CV detects the magnetic field of any ferromagnetic object.

b. MG-220 Magnetic Gradiometer (Down-Hole Magnetometer) will be used to conduct downhole UXO checks. The MG-220 detects the magnetic field of any ferromagnetic object as it is lowered into a borehole.

c. Marking tape, pin flags, stakes

13.5 CWA Support Equipment

a. Chemical Agent Identification Kits (M18A2 Kit)

b. ICADs (Individual Chemical Agent Detector)

13.6 Decontamination Equipment

As required by the level of protection for each site. See Site Health and Safety Plan.

13.7 Hand Tools

As may be required.

13.8 Miscellaneous

As may be required.

14.0 ENVIRONMENTAL CONCERNS

The field operations covered by this SOP will be performed in such a manner as to minimize the effects of pollution of air, water, or land and to control noise and dust within reasonable limits.

Every effort will be made to:

a. Protect the land areas and to preserve them in their existing condition.

b. Protect water resources, including measures for run-off or run-off controls if applicable.

c. Implement sediment control measures, where warranted. These measures will also be implemented to control erosion.

Usually, field operations will generate solid and liquid waste requiring onsite handling and possible offsite disposal. The major types of waste to be generated, their environmental concerns, and their handling and disposition are summarized below:

a. Personnel and equipment decontamination fluid containers will be disposed off site following a thorough decontamination. Liquid waste will be included with the well purging and development fluids.

b. PPE will be double-bagged and will be the responsibility of TtNUS to dispose of according to applicable regulations. Disposal will be off site.

It is not anticipated that any chemical releases will occur during the field activities.

The MSDSs for chemicals being brought onto the installation for use in field operations will be located at the Fire Department and at the TtNUS Field Command Post.

15.0 UXO/CWA PROCEDURES FOR FIELD OPERATIONS

15.1 General - field procedure for work on the CLEAN contract can include any or all of the following tasks:

a. Initial entry into suspect areas for

b. Surface and subsurface sampling,

c. Monitoring well installation,

d. Exploratory trenching,

e. Geophysical surveys, and

f. Other miscellaneous operations.

15.2 Initial entry - initial entry into suspect areas will not require an EOD-qualified technician with a magnetometer (GA-72CV) to screen a path into the area. See Step 15.3 ~~The screened area is marked with lanes using either pin flags or marking tape. Suspect items on the surface and subsurface magnetic anomalies will be marked, usually with a different color tape or pin flag, and will be avoided by team members.~~ The site where the work is to be conducted will be thoroughly screened for UXO/CWA contamination prior to any work commencing. ~~All personnel will stay within the cleared areas and not venture out into areas not screened. If an area that has magnetic anomalies cannot be avoided, the EOD-qualified technician will hand excavate down to the anomaly to check to see if a hazard exists. If the excavation reveals a hazard, the emergency notification procedures in paragraph 11.0 will apply.~~ However, TEJ 7-16-00

15.3 Sampling - sampling will be conducted in accordance with established protocols and methodologies. Site specific sampling requirements will be presented in the work plans and in the Fieldwork Standard Operating Procedure.

Sites potentially contaminated with UXO/CWA will be screened by EOD-qualified technicians prior to sampling. A magnetometer (GA-72CV) will be used to screen entry into a suspect area as in paragraph 15.2 above. Lanes will be marked and suspect items and subsurface anomalies will be identified and avoided. The immediate sampling area will be surface screened for the sampling team.

Prior to any subsurface intrusive sampling, another check with a magnetometer needs to be accomplished. The GA-72CV Magnetic Locator can be used for collecting subsurface samples not greater than 0.5 feet. If excavation of a bore hole or hand auguring hole is to exceed this depth than the MG-220 Magnetic Gradiometer (downhole magnetometer) should be utilized and a reading taken at every two feet of depth.

If an anomaly is detected then the location will be marked and avoided and the sampling location relocated to a clean area. If the sampling location cannot be relocated then the EOD-qualified technician will hand excavate down to the anomaly to determine if it is hazardous. If it is not hazardous, the object will be set aside and the sampling event will continue. If the object has been determined to be hazardous or suspect, the sampling team will move out of the area and the emergency procedures listed in paragraph 11.0 will be implemented.

15.4 Monitoring Well Installation - the area within a 50-foot radius of the borehole and the off-road access path will be screened with the GA-72CV magnetometer and be cleared of all metal objects found. Once this is accomplished, the area should be clear of all UXO and the area around the borehole site will be marked using colored marking tape and/or pin flags. Heavy equipment such as front-end loaders, backhoes, and bulldozers will not be used to develop or establish drill sites. The following action will be followed:

a. The GA-72CV magnetometer will be used directly over the borehole site to check for

buried items down to 0.5 feet. After a surface check, the EOD-qualified technician will hand auger down to a depth of two feet and check down the hole using the MG-220 magnetometer.

b. Once the hand auguring hole has been cleared,the drill rig will be positioned over the proposed borehole. Drilling will commence to a depth four feet, the drill auger will be removed from the borehole, the drill crew chief and UXO personnel will make observations of the soil from the core barrel and the soil removed from the hole by hand auger (if needed). The drilling log and lithologic log will be maintained in accordance with standard practices, noting any metal objects that may be found.

c. The drilling derrick will be secured and the drill rig moved to a position at least 20 feet from the borehole.

d. The borehole will be checked again with the MG-220 magnetometer.

e. If UXO or magnetic anomaly is present, the borehole will be abandoned and another location selected. The new borehole should be at least six feet from the original borehole. If an UXO or anomaly is not detected and the clearance is given, the drill rig shall be positioned back over the borehole, and drilling will proceed to the next depth (6 feet).

f. Repeat above steps, at intervals of 2 feet, until a depth of 10 feet is reached. At the 10 foot interval, a magnetometer reading shall be taken with the MG-220 set on the maximum sensitivity. The instrument will detect larger objects, approximately 100 lbs., that would be expected at this depth depending on density from 4 to 8 feet.

g. After reaching the depth of 10 feet, the above steps will be repeated at intervals of 4 feet, until the desired depth is reached.

15.5 Exploratory Trenching and Excavation - at times, exploratory trenching ~~will~~ may be utilized at the discretion of the FOL and Navy to determine the lateral extent of a landfill, burial pit, or subsurface geophysical anomaly. Trenching and excavation to uncover a subsurface area will be conducted using a backhoe, an excavator, or sometimes a front-end loader. The following procedures will be utilized to conduct these operations: TEP 7-16-00

a. The surface of the area to be trenched or excavated will first be swept with the GA-72CV magnetometer. Anomalies will be hand excavated to determine if hazardous.

b. No more than 0.5 feet of surface soil will then be removed from the area of concern.

c. The heavy equipment will be removed at least 20 feet away from the area, and the area will be checked with the MG-220 magnetometer. If the area is a trench, the entire length of the trench will be checked with the MG-220 and the excavation can continue two feet at a time. If the area is a wide open area, it can once again be checked with the GA-72CV, but only 0.5 feet of soil removal can be excavated at a time.

d. Anomalies will continue to be uncovered by hand excavation until the desired results are obtained and the trench/area is abandoned and refilled.

e. Excavation will continue another 2 feet if using the MG-220 or 0.5 feet if using the GA-

72CV magnetometer. Once again after the proper depth of soil is excavated the heavy equipment is removed from the area (>20 feet) and the area is rechecked with the magnetometer.

f. The above procedures are followed until the desired depth is reached and/or the desired results are obtained.

Once the area or trench has been cleared, excavation can continue to the proper depth before the equipment is again moved away (at least 20 feet) and the area/trench

15.6 Geophysical Surveys - two instruments will be used to conduct geophysical surveys at sampling locations under the CLEAN contract. The EG & G Geometrics magnetometer (G-856 AG) and a Geonics Terrain Conductivity Meter (EM-31). The magnetometer is a passive instrument, and the EM-31 is a active instrument and is commonly used to measure subsurface terrain conductivity. This information can be used for geophysical surveys, as well as for locating voids, discontinuities in soil structures such as boundaries of disposal pits and buried conducting objects.. An Ordnance Safety Analysis of the Geonics Model EM-31-D, Non-Contacting Terrain Conductivity Meter was conducted by the Naval Surface Warfare Center at the request of TtNUS in April 1993. The analysis concluded, in summary, that the "Geonics EM-31-D poses no ordnance safety hazard when operated in the normal survey mode, where the device is held at hip height." However, the Geonics EM-31-D should not be used with the boom on the ground if ordnance is "present".

When using the magnetometer or the EM-31-D, an EOD-qualified technician will conduct a surface sweep of the area to be surveyed to ensure that no surface ordnance or other hazards exist. The magnetometer is a passive instrument, therefore, no special ordnance safety precautions are required.

The following procedure will be used to ensure the safe operation of the EM-31-D during the geophysical survey:

a. The instrument will be turned on and calibrated off site.

b. Background readings will be taken off site and recorded in the field logbook.

c. The instrument will be turned off and taken to the first survey point.

d. The instrument will be placed on a stand or held at waist height (at least 1 meter off ground), turned on, and readings taken and recorded.

e. After all readings have been taken at the survey point, the instrument will be turned off, removed from the stand, and taken to the next survey point.

f. Steps c. and d. above will be repeated until all points have been surveyed.

g. The instrument will be turned off and taken off site, turned on, and background readings again taken.

h. The geophysical survey is now complete.

15.7 Miscellaneous Operations - due to the potential of UXO/CWA material being encountered during field activities, UXO support will be provided at all site locations. UXO support will be provided for

any and all field activities that are in areas suspected to contain UXO and/or CWA. These areas also include those areas covered with water and creeks, canals, etc..

16.0 HAZARD CONTROL BRIEF

A Health and Safety Hazard Control Briefing will be conducted prior to the start of onsite activities. The briefing will be detailed and will cover the information contained in the SOP and the Health and Safety Plan. Refresher briefings will be conducted as necessary for specific or unique activities. New personnel assigned to the project will receive an in-depth briefing prior to starting work. The following information will be given during the briefing:

a. Overview of Task to be Performed

b. Overview of Hazards

- Unexploded Ordnance Hazards
- Chemical Warfare Agents
- Physical Hazards

c. Overview of Standard Work Practices

d. Overview of Training Requirements

e. Overview of Emergency Response Actions

f. Location of MSDSs

17.0 SECURITY

There are no special security requirements. Field activities under the CLEAN contract are unclassified and normal security measures apply in accordance with references (e) and (i). TtNUS personnel and their subcontractors will check in with the installation's security office and be badged for entry into the work areas.

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1.0 GENERAL

This Standard Operating Procedure (SOP) was prepared as outlined in references (a) and (b) above, for conducting field activities requiring unexploded ordnance (UXO) and chemical warfare agent (CWA) support under the Comprehensive Long-term Environmental Action Navy (CLEAN) contract. All personnel conducting operations under this SOP must read and understand applicable parts of references (a) through (j) prior to commencing any work described within this SOP. The work plan, health and safety plan, and other referenced SOPs submitted for the purpose of accomplishing work covered by this SOP are to be considered supporting documents to this SOP.

2.0 PURPOSE

This SOP is generic in nature and applies to all operations involving UXOs and/or CWAs support during field operations at various U.S. Navy installations throughout the United States under the CLEAN contract. It provides procedural requirements for any activity involving UXO and CWA. It provides detailed procedures for the location, identification, documentation, and emergency actions on UXO/CWA activities.

3.0 APPLICABILITY

This SOP applies to all personnel performing activities associated with UXOs and CWAs. This includes personnel of the prime contractor as well as personnel of any subcontractor. This SOP also applies to persons who may visit the site during the conduct of UXO/CWA activities. Compliance is mandatory for all Tetra Tech NUS, Inc. (TtNUS) personnel, subcontractors, and visitors to the site where UXO/CWA activities are in progress.

4.0 RESPONSIBILITIES

The TtNUS Project Manager is directly responsible for seeing that all applicable rules and regulations are complied with, and that all necessary safety precautions are taken to conduct operations in accordance with this SOP.

It is the responsibility of the Project Manager to ensure that all personnel conducting field activities in accordance with this SOP have the proper training (including hazard control briefings) and, if required, the proper certifications for the job being performed. The onsite TtNUS Health and Safety Officer will assume these responsibilities in the absence of the Project Manager.

5.0 LOCATIONS OF OPERATIONS

The field activities to be conducted during support of the CLEAN contracts can be performed at a variety of locations throughout the United States. Wherever the installation is located, a detailed site description, discussions of known and/or suspected contamination sources, and results of previous studies will be provided to field personnel.

If available, the initial evaluation, consisting of preliminary risk assessments (including discussions of probable contaminants, transport pathways, identification of potential receptors, and preliminary evaluation of human health and environmental concerns), preliminary identification and evaluation of remedial action alternatives, and preliminary identification of applicable or relevant and appropriate requirements (ARARs) will also be made available to field personnel conducting activities at the installation.

6.0 PERSONNEL QUALIFICATIONS AND REQUIREMENTS

6.1 Personnel Qualifications: Qualifications for those personnel actively involved in UXO/CWA operations shall be as follows:

a. UXO personnel shall be graduates of the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indian Head, Maryland.

b. The lead UXO Supervisor for the operation will have been awarded the Master EOD Badge and have served at least 15 years in military EOD assignments, of which more than 10 years were in a supervisory position.

c. UXO personnel must meet the requirements as stated in the Site Health and Safety Plan, consistent with OSHA 29 CFR 1910.120, paragraph (e).

6.2 Personnel Requirements: During any activity where the possibility that UXOs and/or CWAs may be encountered (no matter how remote), the following requirements will be met:

a. One EOD-qualified technician will be required to support each field team engaged in operations in areas that might contain UXOs/CWAs.

b. One EOD-qualified person will be present at the site during all activities to provide UXO/CWA support in the event their services are required.

7.0 PERSONNEL LIMITS

The activities to be conducted under the CLEAN contract will not normally be conducted in areas requiring maximum personnel limitations. Work will not be permitted unless at least two persons are present in the work area. The provisions of 29 CFR 1910.120 concerning personnel qualifications and requirements will be followed while working on site. Any personnel limitation requirements that may be in force by the Installation Safety office will be adhered to at all times.

During all hazardous operations related to searching or screening for UXO or any hazardous UXO/explosive related service, the "buddy system" (29 CFR 1910.120, paragraph (d) (3)) must be used, with one of these persons being a qualified and approved TtNUS EOD technician.

8.0 MATERIAL LIMITS

Explosive materials will not be used during the operations covered by this SOP. Bulk liquids to be used for the decontamination of equipment will be in 2-gallon containers or less. Material Safety Data Sheets (MSDSs) will be kept on file in the Installation Fire Department and at the TtNUS Command Post.

9.0 SAFETY REQUIREMENTS

9.1 Reference Safety Requirements: The safety requirements that apply to the UXO/CWA operations covered under this SOP are:

a. NAVSWCINST 5100.6; Subj: Occupational Safety and Health Program.

b. NSWCDDINST 5104.1; Subj: Control of Emissions (EMCON) Causing Hazards of Electromagnetic Radiation to Ordnance (HERO).

c. OSHA 29 CFR 1910-120 and 1910.134.

d. NRC 10 CFR, Part 19, 20, and 40.

e. NAVSEA SO420-AA-RAD-010, dated 01 October 1991.

9.2 Specific Safety Requirements: The specific safety requirements for UXO/CWA operations are as follows:

a. All operations will be suspended if so ordered by the Installations Range Control.

b. If UXO/CWA or suspected UXO/CWA is encountered, all operations in the affected area will cease, the affected area will be evaluated, and notification will be made in accordance with Section 11.0 of this SOP.

c. TtNUS UXO technicians (EOD-qualified) will be present during UXO-related activities.

d. Installation approved communications equipment (two-way radios) will be onsite during any operation. HERO restrictions will comply with Reference 9.1 b. above.

e. Standard work practices as outlined in the site work plan will apply.

10.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The following PPE will be worn by personnel on site. Items marked with an asterisk (*) will be available and will be used, if necessary, as determined by the TtNUS Site Safety Officer.

a. Safety glasses

b. Safety shoes (and protective overboots/or steel-toe rubber boots*)

c. Cotton clothing (with protective coveralls*)

d. Gloves (type to be determined by TtNUS Site Safety Officer)

e. Respiratory protection equipment* (29 CFR 1910.134)

f. Hearing protection*

g. Hard hats*

Additional equipment may be required on a site-specific basis. Equipment will be selected by the Site Safety Officer (SSO) and the Project Manager in accordance with the Work Plan and appendices.

11.0 EMERGENCY RESPONSE AND CONTINGENCY PLANS

11.1 Emergency Contacts: In the event of an emergency, notification will be made to the following in the order presented or in the order dictated by the installation:

a. Emergency Fire and Medical Assistance

b. Installation Safety Office

c. Installation EOD Office

d. Installation Environmental Office

e. TtNUS Site Supervisor (Field Operations Leader)

f. TtNUS Project Manager

Most activities to be performed during field work should not be conducted within buildings. In the event of an emergency, all site personnel will be evacuated to a predetermined location away from the work place. Emergency Response Planning will follow in accordance with 29 CFR 1910.38(a). TtNUS will utilize the Installations Base Fire Protection and Emergency Services in emergencies or potential emergencies.

11.2 Contingency Plans: The following contingency plans will be implemented:

a. Pre-Planning - Upon arrival at the base, the TtNUS Field Operations Leader and/or Site Safety Officer will meet with the Base Fire Protection Department, Base Security Personnel, and Emergency Services to notify them what activities are to be undertaken and where. All site personnel will be required to follow base emergency procedures and will rely on base services to handle emergency calls when needed. Medical services will be provided by the base if available or off site by local medical services.

   Hand-held radios will be available at the work site for communications between field teams and Range Control.

b. Emergency Escape Procedures and Assignments - Upon notification of a site emergency that requires evacuation, all site personnel will proceed to predetermined locations based on emergency location and wind directions. If personnel cannot reach these locations without danger to their lives or health, and alternate meeting place will be designated during the daily hazard control briefing. Personnel will be trained to remain at the refuge location until directed to resume work, or leave the site.

c. Procedure to Account for Site Personnel - The site work force will be small enough that accounting for personnel will not be a problem. Accounting for personnel will be the Field Operations Leader's responsibility. This will be accomplished by taking a roll call using the site log book.

d. Rescue and Medical Duties - A physician-approved first aid kit, an ANSI-approved eye wash station, and a Class ABC fire extinguisher will be readily available on site. Site personnel will not be authorized to participate in emergency rescue operations.

e. Activation of Emergency Response Procedures - Should any emergency occur which requires the support of outside services, the appropriate contacts will be made by the Field Operations Leader. A list of the appropriate contacts will be posted at the Command Post. Hand-held radios will be the primary means of communications.

f. Airborne Chemical Release Contingency Plan -

(1) Chemical Release Monitoring - every member of the site team will be responsible for observing and reporting any gross chemical releases or conditions that could lead to releases. Air monitoring will be performed as described in the site work plans and the site health and safety plan.

(2) Response to Measured Airborne Chemical Releases - the readings on monitoring instrumentation will be compared to the action levels specified in the work plans and the site health and safety plan for the purpose of protecting the health and safety of onsite personnel. If the concentrations shown on the instruments suggest that the hazardous materials can exceed the following levels at the perimeter of neighboring residential or commercial property, the TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fire department.

Parameter	Action Level	Note:
Total Organic Vapors	50 ppm	SUGGESTED LEVELS ONLY
Flammable Vapors	10% of the Lower Explosive Limit (LEL)	

(3) Response to Sudden Airborne Chemical Releases - if a field operation onsite results in a release of a concentrated vapor from a pressurized container (which will normally result in a visible plume), personnel will leave the area for the predetermined-upwind assembly point quickly, but without panic. TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fire department as soon as possible. The potential for such an event to occur during planned activities is not considered to be significant.

g. Liquid Release Monitoring - Every member of the site team will be responsible for observing and reporting any liquid chemical releases or conditions that could lead to a release. If field operations on site result in a release of liquid chemicals in the absence of vapors, field personnel will attempt to contain the liquid by means of berms constructed with available equipment. If the work team cannot control the spill, they will leave the area for the assembly point quickly, but without panic. The TtNUS Field Operations Leader and/or the Site Safety Officer will notify the base fir department. This is not considered to be a significant event during operations, however, in the unlikely instance that it should occur, field personnel may effect defensive efforts, providing that such a response does not appear to present a chemical overexposure or other personal health or safety concern.

12.0 SAFETY POINTS OF CONTACT

a. Installation Safety Management Branch

b. Installation Ordnance Officer and/or EOD Officer

c. Installation Radiation Officer

d. Installation Environmental Office

13.0 TOOLS AND EQUIPMENT

Major items of equipment and instrumentation that may be required for UXO/CWA operations covered by this SOP are presented below by category:

13.1 Protective Equipment

a. Respiratory Protective Equipment (APR or SCBA)

b. Dermal (chemical resistant) protective equipment

c. Other items (hard hats, safety glasses, etc.)

13.2 Air Monitoring Equipment

a. Explosive/O_2 Meter (Combustible Gas Indicator)

b. Direct reading Organic Vapor Analyzer (PID or FID)

c. Radiation Survey Meters and TLD Badges

13.3 Geophysical/hydrology/Survey Instrumentation

a. Magnetometer (G-856 AG)

b. Electromagnetic Terrain Conductivity Meter (EM-31)

c. Water Level Indicator/Recorder

d. Survey equipment (transit, tripod, etc.) as required

e. pH/Temperature/Conductivity Meter for water samples

13.4 UXO Support Equipment

a. GA-72CV Magnetic Locator (passive instrument) will be used for UXO surface survey during UXO activities. The GA-72CV detects the magnetic field of any ferromagnetic object.

b. MG-220 Magnetic Gradiometer (Down-Hole Magnetometer) will be used to conduct downhole UXO checks. The MG-220 detects the magnetic field of any ferromagnetic object as it is lowered into a borehole.

c. Marking tape, pin flags, stakes

13.5 CWA Support Equipment

a. Chemical Agent Identification Kits (M18A2 Kit)

b. ICADs (Individual Chemical Agent Detector)

13.6 Decontamination Equipment

As required by the level of protection for each site. See Site Health and Safety Plan.

13.7 Hand Tools

As may be required.

13.8 Miscellaneous

As may be required.

14.0 ENVIRONMENTAL CONCERNS

The field operations covered by this SOP will be performed in such a manner as to minimize the effects of pollution of air, water, or land and to control noise and dust within reasonable limits.

Every effort will be made to:

a. Protect the land areas and to preserve them in their existing condition.

b. Protect water resources, including measures for run-off or run-off controls if applicable.

c. Implement sediment control measures, where warranted. These measures will also be implemented to control erosion.

Usually, field operations will generate solid and liquid waste requiring onsite handling and possible offsite disposal. The major types of waste to be generated, their environmental concerns, and their handling and disposition are summarized below:

a. Personnel and equipment decontamination fluid containers will be disposed off site following a thorough decontamination. Liquid waste will be included with the well purging and development fluids.

b. PPE will be double-bagged and will be the responsibility of TtNUS to dispose of according to applicable regulations. Disposal will be off site.

It is not anticipated that any chemical releases will occur during the field activities.

The MSDSs for chemicals being brought onto the installation for use in field operations will be located at the Fire Department and at the TtNUS Field Command Post.

15.0 UXO/CWA PROCEDURES FOR FIELD OPERATIONS

15.1 General - field procedure for work on the CLEAN contract can include any or all of the following tasks:

a. Initial entry into suspect areas for

b. Surface and subsurface sampling,

c. Monitoring well installation,

d. Exploratory trenching,

e. Geophysical surveys, and

f. Other miscellaneous operations.

15.2 Initial entry - initial entry into suspect areas require an EOD-qualified technician with a magnetometer (GA-72CV) to screen a path into the area. The screened area is marked with lanes using either pin flags or marking tape. Suspect items on the surface and subsurface magnetic anomalies will be marked, usually with a different color tape or pin flag, and will be avoided by team members. The site where the work is to be conducted will be thoroughly screened for UXO/CWA contamination prior to any work commencing. All personnel will stay within the cleared areas and not venture out into areas not screened. If an area that has magnetic anomalies cannot be avoided, the EOD-qualified technician will hand excavate down to the anomaly to check to see if a hazard exists. If the excavation reveals a hazard, the emergency notification procedures in paragraph 11.0 will apply.

15.3 Sampling - sampling will be conducted in accordance with established protocols and methodologies. Site specific sampling requirements will be presented in the work plans and in the Fieldwork Standard Operating Procedure.

Sites potentially contaminated with UXO/CWA will be screened by EOD-qualified technicians prior to sampling. A magnetometer (GA-72CV) will be used to screen entry into a suspect area as in paragraph 15.2 above. Lanes will be marked and suspect items and subsurface anomalies will be identified and avoided. The immediate sampling area will be surface screened for the sampling team.

Prior to any subsurface intrusive sampling, another check with a magnetometer needs to be accomplished. The GA-72CV Magnetic Locator can be used for collecting subsurface samples not greater than 0.5 feet. If excavation of a bore hole or hand auguring hole is to exceed this depth than the MG-220 Magnetic Gradiometer (downhole magnetometer) should be utilized and a reading taken at every two feet of depth.

If an anomaly is detected then the location will be marked and avoided and the sampling location relocated to a clean area. If the sampling location cannot be relocated then the EOD-qualified technician will hand excavate down to the anomaly to determine if it is hazardous. If it is not hazardous, the object will be set aside and the sampling event will continue. If the object has been determined to be hazardous or suspect, the sampling team will move out of the area and the emergency procedures listed in paragraph 11.0 will be implemented.

15.4 Monitoring Well Installation - the area within a 50-foot radius of the borehole and the off-road access path will be screened with the GA-72CV magnetometer and be cleared of all metal objects found. Once this is accomplished, the area should be clear of all UXO and the area around the borehole site will be marked using colored marking tape and/or pin flags. Heavy equipment such as front-end loaders, backhoes, and bulldozers will not be used to develop or establish drill sites. The following action will be followed:

a. The GA-72CV magnetometer will be used directly over the borehole site to check for

buried items down to 0.5 feet. After a surface check, the EOD-qualified technician will hand auger down to a depth of two feet and check down the hole using the MG-220 magnetometer.

b. Once the hand auguring hole has been cleared,the drill rig will be positioned over the proposed borehole. Drilling will commence to a depth four feet, the drill auger will be removed from the borehole, the drill crew chief and UXO personnel will make observations of the soil from the core barrel and the soil removed from the hole by hand auger (if needed). The drilling log and lithologic log will be maintained in accordance with standard practices, noting any metal objects that may be found.

c. The drilling derrick will be secured and the drill rig moved to a position at least 20 feet from the borehole.

d. The borehole will be checked again with the MG-220 magnetometer.

e. If UXO or magnetic anomaly is present, the borehole will be abandoned and another location selected. The new borehole should be at least six feet from the original borehole. If an UXO or anomaly is not detected and the clearance is given, the drill rig shall be positioned back over the borehole, and drilling will proceed to the next depth (6 feet).

f. Repeat above steps, at intervals of 2 feet, until a depth of 10 feet is reached. At the 10 foot interval, a magnetometer reading shall be taken with the MG-220 set on the maximum sensitivity. The instrument will detect larger objects, approximately 100 lbs., that would be expected at this depth depending on density from 4 to 8 feet.

g. After reaching the depth of 10 feet, the above steps will be repeated at intervals of 4 feet, until the desired depth is reached.

15.5 Exploratory Trenching and Excavation - at times, exploratory trenching will be utilized to determine the lateral extent of a landfill, burial pit, or subsurface geophysical anomaly. Trenching and excavation to uncover a subsurface area will be conducted using a backhoe, an excavator, or sometimes a front-end loader. The following procedures will be utilized to conduct these operations:

a. The surface of the area to be trenched or excavated will first be swept with the GA-72CV magnetometer. Anomalies will be hand excavated to determine if hazardous.

b. No more than 0.5 feet of surface soil will then be removed from the area of concern.

c. The heavy equipment will be removed at least 20 feet away from the area, and the area will be checked with the MG-220 magnetometer. If the area is a trench, the entire length of the trench will be checked with the MG-220 and the excavation can continue two feet at a time. If the area is a wide open area, it can once again be checked with the GA-72CV, but only 0.5 feet of soil removal can be excavated at a time.

d. Anomalies will continue to be uncovered by hand excavation until the desired results are obtained and the trench/area is abandoned and refilled.

e. Excavation will continue another 2 feet if using the MG-220 or 0.5 feet if using the GA-

72CV magnetometer. Once again after the proper depth of soil is excavated the heavy equipment is removed from the area (>20 feet) and the area is rechecked with the magnetometer.

f. The above procedures are followed until the desired depth is reached and/or the desired results are obtained.

Once the area or trench has been cleared, excavation can continue to the proper depth before the equipment is again moved away (at least 20 feet) and the area/trench

15.6 Geophysical Surveys - two instruments will be used to conduct geophysical surveys under the CLEAN contract. The EG & G Geometrics magnetometer (G-856 AG) and a Geonics Terrain Conductivity Meter (EM-31). The magnetometer is a passive instrument, and the EM-31 is a active instrument and is commonly used to measure subsurface terrain conductivity. This information can be used for geophysical surveys, as well as for locating voids, discontinuities in soil structures such as boundaries of disposal pits and buried conducting objects.. An Ordnance Safety Analysis of the Geonics Model EM-31-D, Non-Contacting Terrain Conductivity Meter was conducted by the Naval Surface Warfare Center at the request of TtNUS in April 1993. The analysis concluded, in summary, that the "Geonics EM-31-D poses no ordnance safety hazard when operated in the normal survey mode, where the device is held at hip height." However, the Geonics EM-31-D should not be used with the boom on the ground if ordnance is "present".

When using the magnetometer or the EM-31-D, an EOD-qualified technician will conduct a surface sweep of the area to be surveyed to ensure that no surface ordnance or other hazards exist. The magnetometer is a passive instrument, therefore, no special ordnance safety precautions are required.

The following procedure will be used to ensure the safe operation of the EM-31-D during the geophysical survey:

a. The instrument will be turned on and calibrated off site.

b. Background readings will be taken off site and recorded in the field logbook.

c. The instrument will be turned off and taken to the first survey point.

d. The instrument will be placed on a stand or held at waist height (at least 1 meter off ground), turned on, and readings taken and recorded.

e. After all readings have been taken at the survey point, the instrument will be turned off, removed from the stand, and taken to the next survey point.

f. Steps c. and d. above will be repeated until all points have been surveyed.

g. The instrument will be turned off and taken off site, turned on, and background readings again taken.

h. The geophysical survey is now complete.

15.7 Miscellaneous Operations - due to the potential of UXO/CWA material being encountered during field activities, UXO support will be provided at all site locations. UXO support will be provided for

any and all field activities that are in areas suspected to contain UXO and/or CWA. These areas also include those areas covered with water and creeks, canals, etc..

16.0 HAZARD CONTROL BRIEF

A Health and Safety Hazard Control Briefing will be conducted prior to the start of onsite activities. The briefing will be detailed and will cover the information contained in the SOP and the Health and Safety Plan. Refresher briefings will be conducted as necessary for specific or unique activities. New personnel assigned to the project will receive an in-depth briefing prior to starting work. The following information will be given during the briefing:

a. Overview of Task to be Performed

b. Overview of Hazards

- Unexploded Ordnance Hazards
- Chemical Warfare Agents
- Physical Hazards

c. Overview of Standard Work Practices

d. Overview of Training Requirements

e. Overview of Emergency Response Actions

f. Location of MSDSs

17.0 SECURITY

There are no special security requirements. Field activities under the CLEAN contract are unclassified and normal security measures apply in accordance with references (e) and (i). TtNUS personnel and their subcontractors will check in with the installation's security office and be badged for entry into the work areas.

APPENDIX J

DECONTAMINATION

DECONTAMINATION
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DECONTAMINATION PROGRAM

1.0 PURPOSE

The purpose of this program is to describe and implement a decontamination procedure for a hazardous waste site investigation of the Mustard Gas Burial Ground at the Naval Surface Warfare Center Crane Indiana. This procedure will cover both equipment and personnel decontamination for all site activities and will meet the requirements of OSHA 1910.120 paragraph (k), and 1910.141. Site contaminants, PPE and procedures are explained in Tables 5-1 and 6-1 of the CTO 131 Site Specific Health and Safety Plan (HASP). If site conditions change this procedure will be re-evaluated by the Site Safety Officer (SSO) and modified as appropriate. Any changes will be approved by the Project Health and Safety Officer (PHSO) and the Clean Health and Safety Manager (HSM).

2.0 METHOD OF DECONTAMINATION

Equipment Decontamination

Contaminants of concern for decontamination are Chlorinated Solvents and Poison Gas in the form of Mustard Gas. Information on these contaminants is detailed in Tables 5-1 and 6-1 of the HASP. Site Equipment will be decontaminated either on a containment berm, concrete or asphalt pad that is segregated from the personnel decontamination area. The equipment decontamination will be conducted on a containment pad to preclude the release of potentially contaminated water into the environment. Site equipment will be decontaminated in two ways;

- Heavy Equipment will be steam cleaned after removal of any loose debris, along with cleaning heavy debris from the tires and wheels prior to arrival at the equipment decontamination area.
- Sampling Equipment will be decontaminated with a soap and dionized water/ isoproponal rinse and air dried at a separate section of the equipment decontamination pad.

Personnel Decontamination

Personnel will be decontaminated for chlorinated solvents and Mustard Gas using a 5% bleach and water rinse, followed by a soap/ water wash and rinse. The SSO will determine if the site worker must also shower before exiting the site, and if a change of clothes is required. This will be based on site conditions (ex. detected concentrations of site contaminants, soiling or exposure of underlying clothing, soiling of PPE).

3.0 DECONTAMINATION LOCATION

The Mustard Burial Ground is located to the north northeast of Highway 251 (Hwy 251) between Buildings 1407 and 1409. The decontamination areas for both equipment and personnel will be located up-wind of the site to preclude contamination of the decontamination personnel and equipment. The prevailing wind direction is from the west to the east indicating that the most probable location would be to the southwest of Building 1409. See Figure 1 and 2 for site layout and location.

4.0 PERSONNEL RESPONSIBILITIES

All site personnel will be responsible for the effective performance of decontamination of personnel and equipment. The following personnel will be responsible for the implementation and conduct of the site decontamination procedure.

Field Operations Leader has overall responsibility for all site operations and will assure that decontamination is conducted according to this procedure and is adequate.

Site Safety Officer will have the primary responsibility for the decontamination operation. This responsibility will include:

- Decontamination Program review and site implementation.
- Procurement of all decontamination equipment and facilities.
- Establishment of the decontamination corridor per the decontamination program.
- Implementing and conducting the decontamination procedure for personnel and equipment.
- Determining the effectiveness of the site decontamination procedure while in operation through:
    - visual observation
    - sampling both air monitoring and swipe sampling (if necessary)
    - recommending changes to the Site Decontamination Procedure.
- Decontamination site maintenance which includes:
    - maintaining site cleanliness
    - maintaining decontamination trailer in clean and healthful condition
    - maintaining an adequate water supply, including a schedule for re-filling of the water tank in the decontamination trailer, or the on site potable water tank
- Proper disposal of decontamination fluids, waste and used PPE.
- Decontamination of re-usable site equipment.
- Decontamination, cleaning and repair of respiratory protection
- Demobilization and proper disposal of the decontamination site and equipment.

Site Staff will have the responsibility of assisting the SSO in maintaining the decontamination site and performing decontamination according to the Site Decontamination Procedure.

5.0 DECONTAMINATION EQUIPMENT

The following equipment (Tables 1, 2, and 3) will be required on site. The majority of the equipment is disposable and can be discarded once site operations are completed. What equipment is disposed will be based on determination of the degree of contamination. Disposal methods will be discussed in a separate section of this procedure.

Table 1
Personnel Decontamination Corridor

	EQUIPMENT	QUANTITY
1.	Snap Up Berm 54' x 14' x 12"	1
2.	Inflatable child wading pools 4' by 4'	4 to 6
3.	Garden Sprayer (2 gallon size)	4
4.	Step Ladders 2' for suit and boot removal and glove wash stand	4
5.	Trash Cans minimum size 20 gallon two for disposable items and two for items to be deconed at a later time.	4
6.	Five Gallon Buckets	6
7.	Long Handled Brushes (soft bristles)	1 case of 24
8.	Folding Table 4' x 8' one for medical surveillance one for clean PPE, Eye Wash and auxillary equipment	2
9.	Traffic Cones (3' high)	26
10.	Portable Camping Showers	2
11.	Barrier Tape	4 rolls
12.	Large Plastic Mortar Box (Equipment Drop and boot wash)	3
13.	Eye Wash	1
14.	Portable Stretcher with blanket	1
15.	Swipe Sample Kit	1
16.	100' Garden Hose	3
17.	Drinking Water Container	2
18.	Drinking Cups 8 oz.	1 case
19.	General Absorbent Pillows	96
20.	Large Opaque Trash Bags (40 - 60 gallon)	12 boxes
21.	Large Clear Trash Bags (40-60 gallon)	6 boxes
22.	Small Clear Trash Bags (10-20 gallon)	6 boxes
23.	Assortment of clean PPE including tyvek suits, PE coated Tyvek suits,gloves, boot covers, and temp. shoes	Assortment
24.	Liquinox	4 gallons
25.	Clorox (Bleach)	4 gallons
26.	Stethoscope	2
27.	Oral Thermometers (Disposable)	48
28.	Advanced First Aid Kits that contain life support equipment along with 7 1/2 inch Stainless Steel Shears, and a Vital Stats Notebook	1 kit 3 pairs shears 2 Vital Stats Notebooks
29.	20 lb. A,B, C Fire Extinguishers	3
30.	Duct Tape	5 rolls
31.	Self Contained Breathing Apparatus	2
32.	Porta Johns	2
33.	55 Gallon Drums DOT 17E or H (Removable Lids)	20
34.	Patient Containment Chamber for the transport of contaminated patients	1
35.	Large Reflective Sign identifying the area as follows: "PERSONNEL DECONTAMINATION AUTHORIZED PERSONNEL ONLY"	2
36.	Nitrile Gloves	50 pair
37.	Large plastic dish pan for outer glove wash	2
38.	Sump Pump	1

'

Table 2
Heavy Equipment
Decontamination Corridor

1.	Snap Up Berm 54' x 14' x 12" or 54' x 14' x 8" asphalt pad with curb. Both types should have a sump to collect water.	1
2.	Steam Pressure Cleaning Machine capable of generating hot water greater than 100°F at 1500 lbs. Per sq. inch	1
3.	Side Shields to prevent overspray during equipment cleaning process. 12' high x 20' long covered with sheet plastic	3 walls
4.	Traffic Cones 3' high	30
5.	Barrier Tape	3 rolls
6.	Step Ladder 10' high	2
7.	Clean Water Tank 2,000 gallon	1
8.	Garden Hose 100' long	3
9.	Sump Pump with hose to drain sump	1
10.	Settling Tank for the collection of Decon Water	1
11.	Holding Tank 4,000 gallons	1
12.	Filtration System to filter contaminants from Decon Water	1
13.	20 lb. A,B,C Fire Extinguisher	3
14.	Assortment of clean PPE including tyvek suits, PE coated Tyvek suits,gloves, boot covers, and temp. shoes	Assortment
15.	Water Proof Folding Table 4' x 8'	2
16.	Hard Hat with attached Face Shields	1 per person in decon area
17.	PVC Rain Suits	1 per person in decon area
18.	Thigh High Steel Toe Rubber Boots	1 per person in decon area
19.	Nitrile Gloves	100 pair
20.	Duct Tape	4 rolls
21.	Sump Pump	1
22.	Sign identifying the area "Heavy Decontamination Corridor" "Authorized Personnel Only"	2

Table 3
Sampling Equipment Decon
Annexed to Heavy Equipment Decon Corridor

1.	Folding Table 4' by 8'	2
2.	Roll of Plastic Sheeting 6 ply	2 rolls
3.	Large Plastic Dish Pans	6
4.	Isoproponal Spray Bottles	6
5.	Spray Bottles for Dionized Water	6
6.	Shelf Unit for air drying of equipment	1
7.	Liquinox	1
8.	Nitrile Gloves	30 pairs
9.	Flammable Liquid Storage Cabinet	1
10.	Short Handled Soft Bristle Brushes	6
11.	Garden Hose 100 ' long	1
12.	Wall Shields 1-8' high x 12' long and 1-8' high x 10' long	2

6.0 CONTAMINATION REDUCTION

Avoiding the contamination is the first and best method for preventing the transfer of contamination to personnel or other areas. When the FOL and SSO determine site operations, methods will be employed to prevent the contamination of personnel and equipment. Each person involved in site operations must adhere to the methods, listed below, for contamination reduction.

- Know the limitations of the PPE being used, if liquid contamination or elevated levels of the contaminants are encountered upgrade all protective equipment being used.
- Only enter the exclusion zone when it is necessary to carry out a specific objective or job task.
- When in the exclusion zone, avoid contaminated surfaces.
- Avoid pools of liquids, discolored areas, or any area that shows evidence of possible contamination.
- Stay upwind of ant suspected contamination.
- Do not sit or lean against anything in a contaminated area. In cases where you have to kneel (e.g., to take samples) place a plastic sheet on the ground first.
- Do not set sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth.
- Use the proper tools to safely conduct the job. Only use tools which are designed for the specific job function.

7.0 DECONTAMINATION PROCEDURE

This Decontamination Plan will specify methods and the step by step procedure for conducting decontamination at the Mustard Gas Burial Ground. Our approach to working at this site is to assume that Poison Gas (Mustard Gas) and Chlorinated Solvents are present and will be encountered. Once site work commences it may be discovered that decontamination to this extent is not necessary. In this case decontamination may be downgraded as a temporary measure, but the full decontamination line will be maintained in the event the contaminants of concern are encountered. See Figure 3 for the site description and corridor layout.

7.1 Personnel Decontamination Procedure

This process will be conducted on a containment pad with a 12" berm to prevent the possibility of spreading contamination from the exclusion zone into clean areas. The decontamination corridor will be placed in close proximity to the exclusion zone (no further than 50' away). The pathway between the exclusion zone and the decontamination corridor will be covered with sheet plastic thus preventing contamination spread. The procedure is a sequential process designed to remove heavy contamination first and the least contaminated clothing last. The procedure will include medical monitoring and provisions for sampling to determine the decontamination's effectiveness. At the end of the line, shower and change rooms will be provided in the TtNUS decontamination trailer. The area will be cordoned off with traffic cones and barrier tape. The area will be identified with two signs identifying the area as "Personnel Decontamination Area". See Figure 3 for Site Description.

7.1.1 Equipment Worn

The full decontamination procedure is for workers wearing Level C protection (with taped joints between gloves, boot, and suit). Such protection consists of:

1. One-piece, tyvek, or Poly Ethylene (PE) chemical-resistant splash suit
2. Canister(CAB-RCA) -equipped full-face Advantage mask
3. Hard hat
4. Chemical-resistant boots with steel toe and shank
5. Boot covers
6. Inner (nitrile) and outer (butyl) gloves

7.1.2 Procedure for Level C Decontamination

In this procedure the italicized stations are optional and will be used when a full decontamination is required.

Station 1: Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) in a plastic mortor box or in clear plastic liners or bags. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.*

Station 2: Boot Cover and Glove Wash

Scrub outer boot covers and gloves with 5% bleach water solution followed by detergent wash water rinse.

Station 3: Boot Cover and Glove Rinse

Rinse off decon solution from Station 2 using copious amounts of water using garden hose connected to potable water tank. Repeat as many times as necessary.

Station 4: Tape Removal

Remove tape around boots and gloves and deposit in container with opaque plastic liner.*

Station 5: Suit/Safety Boot Wash

Thoroughly wash splash suit and safety boots. Scrub with long-handled, soft bristle scrub brush and copious amounts of bleach solution and detergent/water solution. Repeat as many times as necessary.

Station 6: Suit/Boot/Glove Rinse

Rinse off bleach solution or detergent/water solution using copious amounts of water. Repeat as many times as necessary. If SSO determines that garden sprayer rinse is adequate this method may be used to diminish the use of water

Station 7: Canister or Mask Change

If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer glove and boot covers donned, and joints taped. Worker returns to duty. Note: A supply of extra cartridges will be kept in the decon supply area.

Station 8: Outer-Glove Removal

Remove outer gloves and deposit in container with opaque plastic liner.*

Station 9: Splash Suit Removal

With assistance of decon personnel, remove splash suit. Deposit in container with opaque plastic liner.*

Station 10: Boot Cover Removal

Remove boot covers and deposit in container with opaque plastic liner.*

Station 11: Safety Boot Removal

Remove safety boots and deposit in container with clear plastic liner.* Help personnel to don temporary shoes or street shoes to leave site.

Station 12: Inner-Glove Wash

Wash inner gloves with decon solution or detergent/water solution that will not harm skin. Repeat as many times as necessary.

Station 13: Inner-Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary.

Station 14: Facepiece Removal

Remove facepiece. Avoid touching face with gloves. Deposit in container with clear plastic liner. Respirators will be washed and decontaminated in the respirator washing machine in the Decontamination Trailer.*

Station 15: Inner-Glove Removal

Remove inner gloves and deposit in container with opaque plastic liner*.

Station 16: Inner-Clothing Removal

Remove clothing soaked with perspiration. Place in container with clear plastic liner. Do not wear inner clothing if there is an off the site possibility that small amounts of contaminants have been transferred in removing the splash suit.

Station 17: Shower

Shower if inner clothing has been compromised, or skin-absorbable materials are suspected to be present. The TtNUS decontamination trailer will be on site, and can provide a shower and change room as the final step in the decontamination process. Once showering is completed personnel can redress.

Station 18 Medical Monitoring

If conditions warrant due to weather or stress, blood pressure and core temperature will be taken in the decon trailer by the SSO, thus determining the physical condition of site workers. Fluid replacement beverages will also be kept readily available in this area.

Clear plastic liners will be used for equipment to be decontaminated at a later time. Opaque plastic liners or bags will be used for items that are to be discarded

7.1.3 Decontamination Trailer

TtNUS will a use fully self-contained decontamination trailer on site. The trailer will be incorporated into the decontamination process and contains the following facilities:

- Change Room
- Lockers
- Showers
- Washing Machine and Dryer
- APR facepiece sanitizing unit
- Toilet facilities
- Generator
- Holding Tanks for potable water and waste water.

7.2 Equipment Decontamination

Equipment decontamination will be conducted in close proximity to the personnel decontamination area. Both decontamination corridors will share equipment and facilities. Once personnel finish decontaminating equipment they will proceed through the personnel decontamination procedure. A separate area will be delineated within the equipment decontamination corridor for small equipment decontamination. Equipment that will be decontaminated in this area is sampling equipment, split spoons, shovels, etc. Due to the nature of this procedure and with the use of isoproponal open flames and smoking and any ignition source will be strictly prohibited.

7.2.1 Heavy Equipment Decontamination Corridor

Heavy equipment will be decontaminated on a bermed and walled area. A sump or depression will be constructed to capture water run-off. The water will be pumped from the sump or depression through a charcoal filtration system (constructed on-site from PVC pipe and standard filter housings) into a waste water holding tank. Before leaving the work site any heavy contamination (ex. mud) will be removed and the wheels cleaned of any debris. Decontamination will be accomplished using a steam pressure washer that heats the water to a minimum of 100°F. Generally this process will only require one decontamination worker and if available a helper. Any heavy equipment entering the site must be decontaminated this includes sampling vehicle, drill rig, direct push rig, hollow stem drill rig, and support vehicles. Once units are clean they will be air dried at the end of the pad. Complete drying is not required. The vehicle will only need to dry long enough to prevent dripping from the vehicle onto the ground. The Equipment Decontamination Corridor will be cordoned off using traffic cones and barrier tape. Two signs will be placed to identify the area as Equipment Decontamination. No- Smoking or open flame signs will be placed around the area. See Figure 4 for site description and corridor layout.

7.2.2 Procedure for Equipment Decontamination

Station 1 Equipment Inspection

Before entering the decontamination area the equipment will be inspected for heavy contamination if found the operator will take steps to remove the heavy contamination from the vehicle before it enters the decontamination corridor.

Station 2 Pressure Washing

Decontamination personnel will move the vehicle into the decontamination area. Steam cleaning will be performed in a walled area to minimize overspray. The walls will be constructed out of 2" x 4" lumber and covered with 6 ply plastic sheeting or plastic tarps. The walled area will be 12' high x 20' long and will be 2-sided to allow drive through access. Personnel will wear PVC splash suits, a hard hat with a face shield, inner nitrile gloves, butyl outer gloves and rubber over boots.

Station 3 Confirmation Inspection

Decontamination personnel will conduct an inspection to determine if the equipment is clean. If the equipment is not satisfactorily cleaned it will be re-done and inspected again until it is clean.

Station 4 Drying

Once decontamination is complete the equipment will be allowed to drip dry. Once water is finished dripping, the vehicle can be moved into the clean area.

Station 5 Auger Cleaning Area

Augers and any other large equipment involved in the drilling or sampling process (e.g. Pumps, generators) will be decontaminated on a rack such as steel horses and a table constructed of pipe. This area will be located directly adjacent to the vehicle decontamination area. The augers will be inspected and be re-done if needed. The equipment will be allowed to drip dry before being removed from the decontamination area.

Items to be located in the Equipment Decontamination Corridor:

- Equipment table covered with plastic
- Strategically placed Fire Extinguishers
- Clean PPE
- Fluid Replacement can be accessed in the Personnel Decontamination Area

7.2.3 Sampling Equipment Decontamination Area

Sampling equipment will be decontaminated in a segregated section of the Equipment Decontamination Corridor. This area will be separated from the main area by 8' 2" x4" walls covered with plastic. Access will be gained through a doorway at the end of one wall. See Figure 4 for site description. Equipment will be scrubbed using short handled brushes in a 5% bleach water solution followed by a soap/water wash and rinse. The final step will be an isopropanol rinse and air dry. If inclement weather is expected the area should covered with a temporary roof (plastic tarp over a 2" x 4" lumber frame that is secured to the walls). Personnel will wear a splash suit and nitrile inner gloves. Contact with the heavy equipment area will not be permitted.

8.0 LAUNDRY SERVICES

Inner clothing or re-usable outer clothing may require laundering. This may be accomplished in one of two ways:

- A washing machine and dryer is located in the decontamination trailer. Site clothing can be laundered as long as the water during the wash cycle is 100°F or higher to break down and wash

away site contaminants. The washing machine will require decontamination after each use to verify that no residual contamination remains. This can be accomplished by running the empty machine through the wash cycle a second time.

- A commercial laundry may be used, as stated above the wash cycle must be 100°F or higher. The commercial laundry will be made aware of the site contaminants and there effect.

9.0 DECONTAMINATION VERIFICATION

The SSO will be responsible for verifying that all personnel and equipment have been properly decontaminated. If questions arise as to the effectiveness of the decontamination process a sampling procedure will be implemented to ascertain the effectiveness of the procedure. This can be accomplished through one of the following procedures:

- Rinsate of decontaminated sampling equipment using deionized water with a quick turn around laboratory analysis.
- Swipe sample of clothing before and after decontamination, analysis will be conducted on a quick turn-around basis. This type of sampling will require the laboratory to establish a sampling protocol which will be communicated to the SSO.

10.0 MEDICAL EMERGENCIES

In the unlikely event that site personnel are injured while working on site. It will be the SSO decision on how extensive a decontamination will be performed. If a life threatening injury occurs the patient will be packaged in a see through contamination containment device and transported to the nearest trauma center with the capabilities to treat and decontaminate injured patients. This may require the SSO to establish a relationship with a medical center and establish a procedure to handle this type of emergency.

11.0 DECONTAMINATION CHECKLIST

The checklist in Figure 5 is designed to assist site personnel in properly establishing the decontamination corridor for both personnel and equipment. This checklist will be completed during establishment of the decontamination corridor, and re-inspected on a weekly basis. The checklist will be maintained in the project file.

FIGURE 5

DECONTAMINATION CHECKLIST
MUSTARD GAS BURIAL GROUND
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

	PROCEDURE	YES	NO	DATE	Comment
1.	Review Tables 1, 2 and 3 has all needed equipment arrived on site. If not provisions should be made to obtain any needed equipment.				
2.	Delineate and mark control zones establish entry control points.				
3.	Has potable water and tank been obtained. Will it be checked and re-filled on a regular basis?				
4.	Has a schedule for potable water tank re-fill been implemented?				
5.	Has a Gray water tank been placed on site and facilities established to safely collect this waste water?				
6.	Has the site been delineated and marked?				
7.	Has Decontamination Corridor been establish per the procedure outlined in this document?				
8.	Has walls been constructed to prevent overspray in Equipment Decontamination Corridor?				
9.	Can vehicles safely navigate through Equipment Decontamination Corridor?				
10.	Has area for Sample Equipment Decontamination been established?				
11.	Has Decontamination Trailer been installed, water connected, is all internal equipment operational?				
12.	Review step by step decontamination procedures. Are all site personnel trained in the process? Have personnel sign site specific training document (Figure 6)?				
13.	Has IDW storage point been established?				
14.	Has DOT 17 E or H drums with removable lids been obtained are they readily accessible?				
15.	Has a sump been constructed to collect run-off water? Has a system been established to pump this water through a filtration system to the waste water storage tank?				
16.	Has medical emergency procedures been relayed to site personnel? Are they aware of notification procedures for obtaining local emergency medical services?				
17.	Has a procedure for laundering inner clothing been established?				

FIGURE 6

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial investigation activities at the Mustard Burial Ground at NSWC Crane, Indiana and that I have received site-specific training on establishing and performing decontamination operations. This includes:

- Names of designated personnel and alternates responsible for decontamination.
- The procedure for personnel and equipment decontamination.
- Location of decontamination corridor
- Emergency medical decontamination of site personnel
- Signs and symptoms of heat stress
- Elements of the site-specific decontamination procedure.
- Emergency response procedures (evacuation and assembly points)

Name (Printed and Signature)	**Decontamination Procedure Training Date**

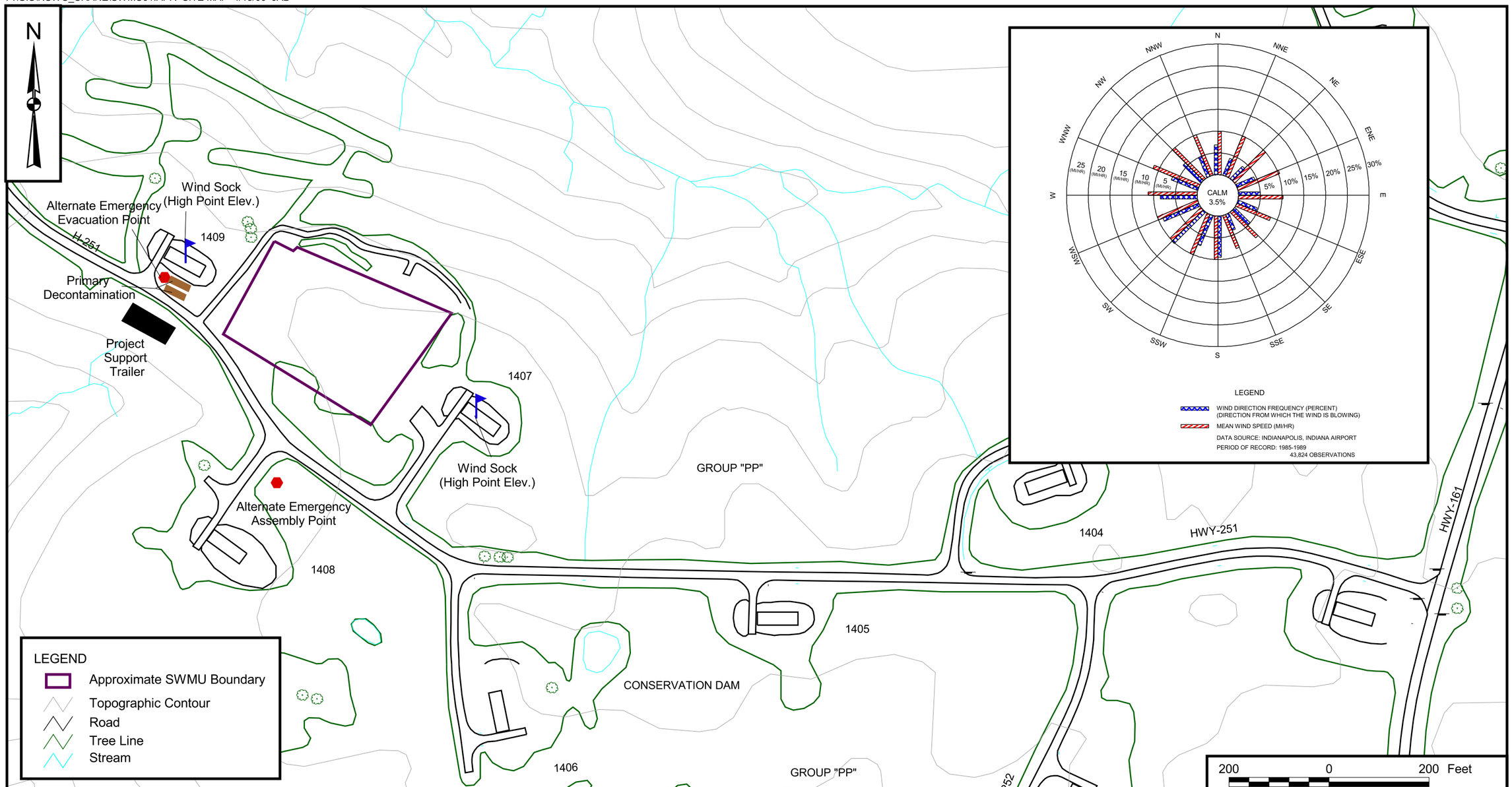
12.0 DECONTAMINATION DEMOBILIZATION

At the conclusion of all activities the field staff will decontaminate both decontamination corridors. Equipment that is non-reusable will be disposed of as hazardous waste if determined to be waste per the FOL/SSO. The remaining site equipment will be cleaned and returned to the appropriate agency Crane Naval Personnel or the TtNUS warehouse. The decontamination trailer will be cleaned and fluids drained and returned to the Pittsburgh warehouse for storage. Port-a-Johns, potable water tank and the waste water tank will be removed. The waste water tank and IDW will be sampled to determine their disposition. Finally the site will be returned to the original condition.

13.0 CONCLUSION

This procedure establishes decontamination practices for operations at the Mustard Gas Burial Ground at NSWC, Crane Indiana. These procedures must be followed in order to safely eliminate the possibility of contaminating personnel and the environment. If changes are needed the SSO and FOL will make a determination and in conjunction with the Clean HSM will institute needed changes.

P:\GIS\NSWC_CRANE\SWMU01.APR SITE MAP 4/18/00 JAL



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

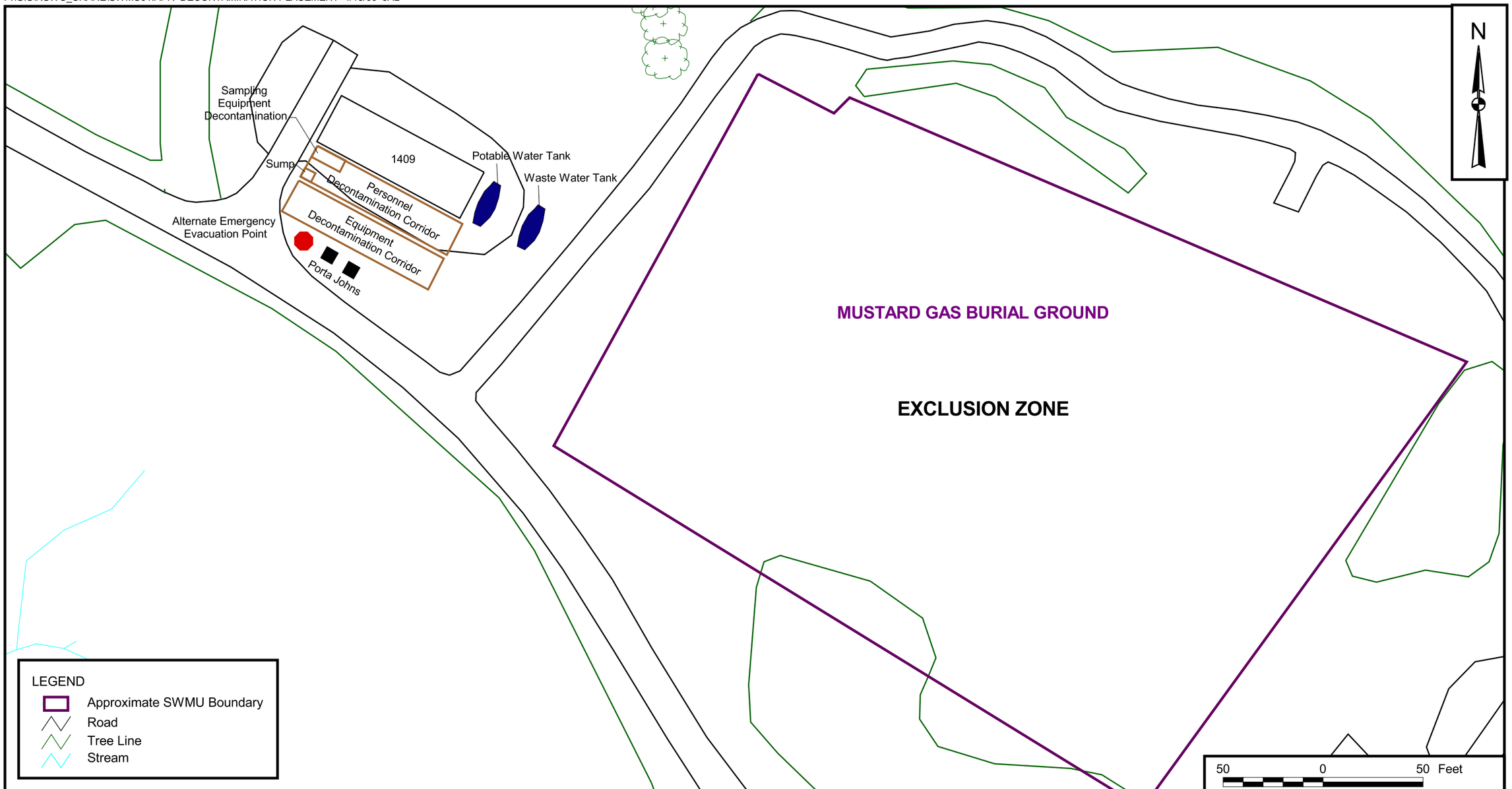
DRAWN BY J. LAMEY DATE 3/23/00
CHECKED BY ____ DATE ____
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE MAP
MUSTARD GAS BURIAL GROUNDS
NSWC CRANE, CRANE, INDIANA

CONTRACT NUMBER N0504
OWNER NUMBER CTO 131
APPROVED BY ____ DATE ____
APPROVED BY ____ DATE ____
DRAWING NO. FIGURE 1
REV 0

P:\GIS\NSWC_CRANE\SWMU01.APR DECONTAMINATION PLACEMENT 4/18/00 JAL



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

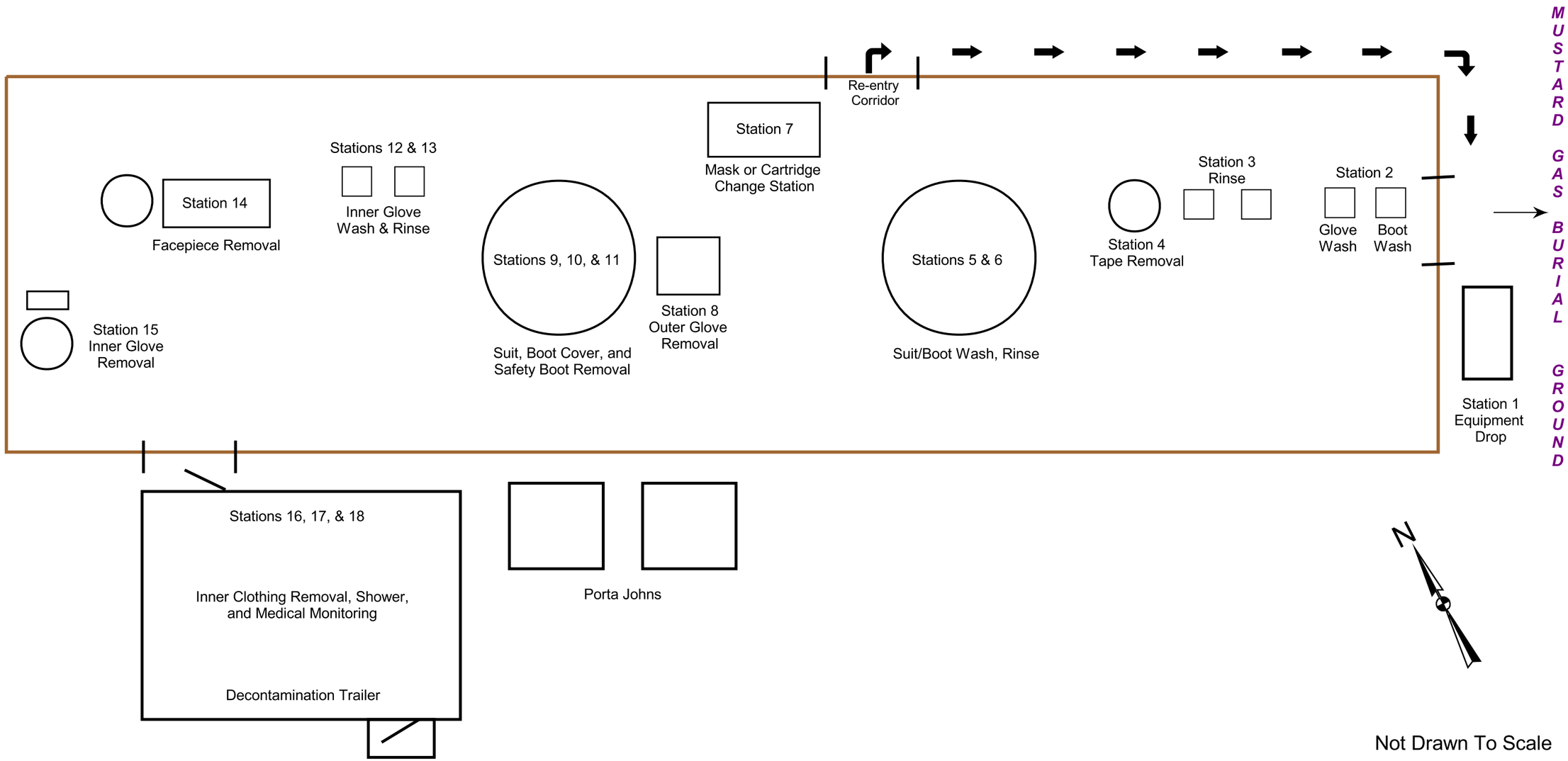
DRAWN BY J. LAMEY DATE 4/18/00
CHECKED BY ____ DATE ____
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

DECONTAMINATION PLACEMENT
MUSTARD GAS BURIAL GROUND
NAVAL SURFACE WARFACE CENTER
CRANE, INDIANA

CONTRACT NUMBER N0504
OWNER NUMBER CTO 0131
APPROVED BY ___ DATE ___
APPROVED BY ___ DATE ___
DRAWING NO. FIGURE 2
REV 0

P:\GIS\NSWC_CRANE\SWMU01.APR DECONTAMINATION PLACEMENT 4/19/00 JAL



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

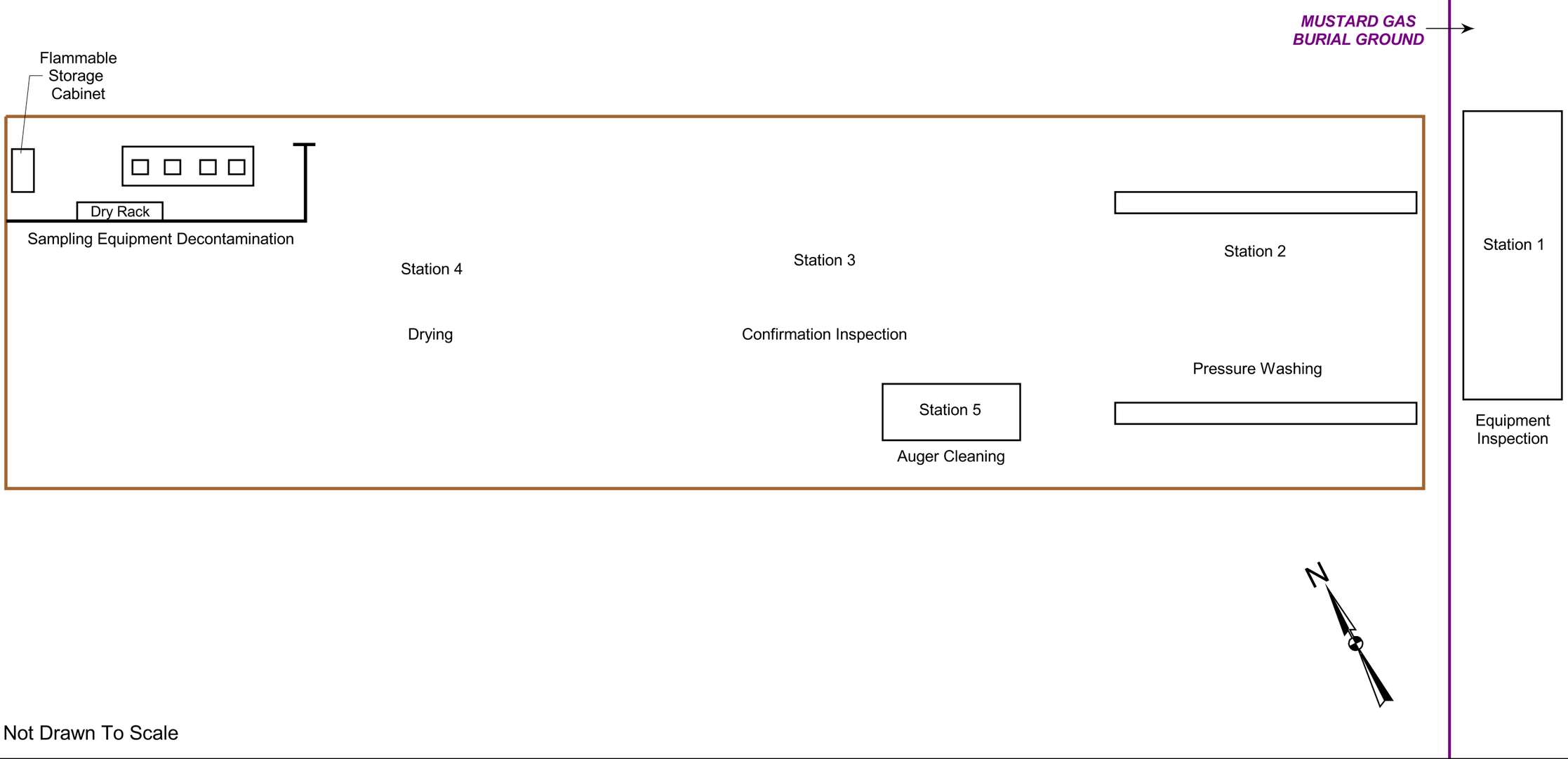
DRAWN BY J. LAMEY DATE 4/18/00
CHECKED BY _____ DATE _____
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

PERSONNEL DECONTAMINATION CORRIDOR
MUSTARD GAS BURIAL GROUND
NAVAL SURFACE WARFACE CENTER
CRANE, INDIANA

CONTRACT NUMBER N0504
OWNER NUMBER CTO 0131
APPROVED BY — DATE —
APPROVED BY — DATE —
DRAWING NO. FIGURE 3
REV 0

P:\GIS\NSWC_CRANE\SWMU01.APR EQUIPMENT DECONTAMINATION CORRIDOR 4/19/00 JAL



Not Drawn To Scale

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY J. LAMEY DATE 4/19/00
CHECKED BY ____ DATE ____
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

EQUIPMENT DECONTAMINATION CORRIDOR
MUSTARD GAS BURIAL GROUND
NAVAL SURFACE WARFACE CENTER
CRANE, INDIANA

CONTRACT NUMBER N0504
OWNER NUMBER CTO 0131
APPROVED BY ___ DATE ___
APPROVED BY ___ DATE ___
DRAWING NO. FIGURE 4
REV 0

APPENDIX K

EQUIPMENT INSPECTION CHECKLIST
FOR
DRILL RIGS

EQUIPMENT INSPECTION FOR DRILL RIGS

COMPANY:_____ **UNIT NO.**_____
FREQUENCY: Inspect at the initiation of the project, after repairs, once every 10-day shift.

Inspection Date: ____/____/____ Time: _____ Equipment Type:_____
(e.g., **Drill Rigs** Hollow Stem, Mud Rotary, Direct Push)

	Good	Need Repair	N/A
Emergency Stop Devices (At points of operation)	❒	❒	❒
Tires (Tread) or tracks	❒	❒	❒
Hoses and belts	❒	❒	❒
Cab, mirrors, safety glass	❒	❒	❒
- Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	❒	❒	❒
- Is the equipment equipped with audible back-up alarms and back-up lights?	❒	❒	❒
Horn and gauges	❒	❒	❒
Brake condition (dynamic, park, etc.)	❒	❒	❒
Fire extinguisher (Type/Rating -_____)	❒	❒	❒
Fluid Levels:			
- Engine oil	❒	❒	❒
- Transmission fluid	❒	❒	❒
- Brake fluid	❒	❒	❒
- Cooling system fluid	❒	❒	❒
- Windshield wipers	❒	❒	❒
- Hydraulic oil	❒	❒	❒
Oil leak/lube	❒	❒	❒
Coupling devices and connectors	❒	❒	❒
Exhaust system	❒	❒	❒
Mast condition (Mast Height_____)	❒	❒	❒
Access-ways: Frame, hand holds, ladders, walkways (non-slip surfaces), guardrails?	❒	❒	❒
Steering (standard and emergency)	❒	❒	❒
Power cable and/or hoist cable	❒	❒	❒
➢ Hooks			
- Safety Latch	❒	❒	❒
- Wear in excess of 10% original dimension	❒	❒	❒
- A bend or twist exceeding 10% from the plane of an unbent hook	❒	❒	❒
- Increase in throat opening exceeding 15% from new condition	❒	❒	❒
- Excessive nicks and/or gouges	❒	❒	❒
➢ Wire Rope (Hoist Mechanism)			
- Reduction in Rope diameter (5/16 wire rope>1/64 reduction nominal size -replace) (3/8 to 1/2 wire rope>1/32 reduction nominal size-replace) (9/16 to 3/4 wire rope>3/64 reduction nominal size-replace)	❒	❒	❒
- Number of broken wires (12 randomly broken wires in one rope lay) (4 broken wires in one strand)	❒	❒	❒
- Number of wire rope wraps left on the Running Drum at nominal use (≥3 required)	❒	❒	❒
- Lead (primary) sheave is centered on the running drum	❒	❒	❒
- Lubrication of wire rope (adequate?)	❒	❒	❒

EQUIPMENT INSPECTION (Continued)

	Good	Needs Repaired	N/A
- Number of U-Type (Crosby) Clips (5/16 – 5/8 = 3 clips minimum) (3/4 – 1 inch = 4 clips minimum) (1 1/8 – 1 3/8 inch = 5 clips minimum)	❒	❒	❒
➢ Kinks, bends – Flattened to > 50% diameter	❒	❒	❒
➢ Hemp/Fiber rope (Cathead/Split Spoon Hammer)			
- Minimum ¾;maximum 1inch rope diameter (Inspect for physical damage)	❒	❒	❒
- Rope to hammer is securely fastened	❒	❒	❒

Safety Guards:

	Yes	No
Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact?_____	❒	❒
Hot pipes and surfaces exposed to accidental contact?_____	❒	❒
All emergency shut offs have been identified and communicated to the field crew?_____	❒	❒
Are any structural members bent, rusted, or otherwise show signs of damage?_____	❒	❒
Are fueling cans used with this equipment approved type safety cans?_____	❒	❒
Have the attachments designed for use (as per manufacturer's recommendation) with this equipment been inspected and are considered suitable for use?_____	❒	❒

Cleanliness:

Overall condition (was the decontamination performed prior to arrival on-site considered acceptable)?_____

Where was this equipment used prior to its arrival on site?_____
Site Contaminants of concern at the previous site?_____
Inside debris (coffee cups, soda cans, tools and equipment) blocking free access to foot controls?_____
Flammable solvents stored in the operators cab?_____

Operator Qualifications (as applicable for all heavy equipment):

Does the operator have proper licensing where applicable, (e.g., CDL)?_____
Does the operator, understand the equipment's operating instructions?_____
Is the operator experienced with this equipment? _____
Is the operator 21 years of age or more?_____

Additional Inspection Required Prior to Use On-Site

	Yes	No
Does equipment emit noise levels above 90 decibels?	❒	❒
If so, has an 8-hour noise dosimetry test been performed?	❒	❒

Results of noise dosimetry:_____
Defects and repairs needed:_____
General Safety Condition: _____
Operator or mechanic signature:_____

Site Safety Officer Signature:_____

Approved for Use: ❒ Yes ❒ No

APPENDIX L

STANDARD OPERATING PROCEDURE FOR UTILITY LOCATING AND EXCAVATION CLEARANCE

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1.0 PURPOSE

Utilities such as electric service lines, natural or propane gas lines, water and sewage lines, telecommunications, and steam lines are very often in the immediate vicinity of work locations. Contact with underground or overhead utilities can have serious consequences including employee injury/fatality, property and equipment damage, substantial financial impacts, and loss of utility service to users.

The purpose of this procedure is to provide minimum requirements and technical guidelines regarding the appropriate procedures to be followed when performing subsurface and overhead utility locating services. It is the policy of Tetra Tech NUS, Inc. (TtNUS) to provide a safe and healthful work environment for the protection of our employees. The purpose of this Standard Operating Procedure (SOP) is to aid in achieving the objectives of the TtNUS Utility Locating and Clearance Policy. The TtNUS Utility Locating and Clearance Policy must be reviewed by anyone potentially involved with underground or overhead utility services.

2.0 SCOPE

This procedure applies to all TtNUS field activities where there may be potential contact with underground or overhead utilities. This procedure provides a description of the principles of operation, instrumentation, applicability, and implementability of typical methods used to determine the presence or absence of utility services. This procedure is intended to assist with work planning and scheduling, resource planning, field implementation, and subcontractor procurement. Utility locating and excavation clearance requires site-specific information prior to the development of detailed operating procedures. This guidance is not intended to provide a detailed description of methodology and instrument operation. Specialized expertise during both planning and execution of several of the geophysical methods may also be required.

3.0 GLOSSARY

Electromagnetic Induction (EMI) Survey - A geophysical exploration method whereby electromagnetic fields are induced in the ground and the resultant secondary electromagnetic fields are detected as a measure of ground conductivity.

Magnetometer – A device used for precise and sensitive measurements of magnetic fields.

Magnetic Survey – A geophysical survey method that depends on detection of magnetic anomalies caused by the presence of buried ferromagnetic objects.

Metal Detection – A geophysical survey method that is based on electromagnetic coupling caused by underground conductive objects.

Vertical Gradiometer – A magnetometer equipped with two sensors that are vertically separated by a fixed distance. It is best suited to map near surface features and is less susceptible to deep geologic features.

Ground Penetrating Radar – Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture.

4.0 RESPONSIBILITIES

Project Manager (PM)/Task Order Manager (TOM) - Responsible for ensuring that all field activities are conducted in accordance with this procedure and the TtNUS Utility Locating and Clearance Policy.

Site Manager (SM)/Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved SOPs or as otherwise directed by the approved project plan(s).

Site Health & Safety Officer (SHSO) – Responsible to provide technical assistance and verify full compliance with this SOP and the TtNUS Utility Locating and Clearance Policy. The SHSO is also responsible for reporting any deficiencies to the Corporate Health and Safety Manager (HSM) and to the PM/TOM.

Health & Safety Manager (HSM) – Responsible for preparing, implementing, and modifying corporate health and safety policy.

Site Personnel – Responsible for understanding and implementing this SOP and the TtNUS Utility Locating and Clearance Policy.

5.0 PROCEDURES

This procedure addresses the requirements and technical procedures that must be performed to minimize the potential for contact with underground and overhead utility services. These procedures are addressed individually from a buried and overhead standpoint.

5.1 Buried Utilities

Buried utilities present a heightened concern because their location is not typically obvious by visual observation, and it is common that their presence and/or location is unknown or incorrectly known on client properties. The following procedure must be followed prior to beginning any excavation that might potentially be in the vicinity of underground utility services. In addition, the Utility Clearance Form (Attachment 3) must be completed for every location or cluster of locations where intrusive activities will occur.

Where the positive identification and de-energizing of underground utilities cannot be obtained and confirmed using the following steps, the PM/TOM is responsible for arranging for the procurement of a qualified, experienced, utility locating subcontractor who will accomplish the utility location and demarcation duties specified herein.

1. A comprehensive review must be made of any available property maps, blue lines, or as-builts prior to site activities. Interviews with local personnel familiar with the area should be performed to provide additional information concerning the location of potential underground utilities. Information regarding utility locations shall be added to project maps upon completion of this exercise.

2., A visual site inspection must be performed to compare the site plan information to actual field conditions. Any findings must be documented and the site plan/maps revised. The area(s) of proposed excavation or other subsurface activities must be marked at the site in white paint or pin flags to identify those locations of the proposed intrusive activities. The site inspection should focus on locating surface indications of potential underground utilities. Items of interest include the presence of nearby area lights, telephone service, drainage grates, fire hydrants, electrical service vaults/panels, asphalt/concrete scares and patches, and topographical depressions. Note the location of any emergency shut off switches. Any additional information regarding utility locations shall be added to project maps upon completion of this exercise and returned to the PM/TOM.

3. If the planned work is to be conducted on private property (e.g., military installations, manufacturing facilities, etc.) the FOL must identify and contact appropriate facility personnel (e.g., public works or facility engineering) before any intrusive work begins to inquire about (and comply with) property owner requirements. It is important to note that private property owners may require several days to several weeks advance notice prior to locating utilities.

4. If the work location is on public property, the state agency that performs utility clearances must be notified (see Attachment 1). State “one-call” services must be notified prior to commencing fieldwork per their requirements. Most one-call services require, by law, 48- to 72-hour advance notice prior to beginning any excavation. Such services typically assign a "ticket" number to the particular site. This ticket number must be recorded for future reference and is valid for a specific period of time, but may be extended by contacting the service again. The utility service will notify utility representatives who then mark their respective lines within the specified time frame. It should be noted that most military installations own their own utilities but may lease service and maintenance from area providers. Given this situation, “one call” systems may still be required to provide location services on military installations.

5. Utilities must be identified and their locations plainly marked using pin flags, spray paint, or other accepted means. The location of all utilities must be noted on a field sketch for future inclusion on project maps. Utility locations are to be identified using the following industry-standard color code scheme, unless the property owner or utility locator service uses a different color code:

white	excavation/subsurface investigation location
red	electrical
yellow	gas, oil, steam
orange	telephone, communications
blue	water, irrigation, slurry
green	sewer, drain

6. Where utility locations are not confirmed with a high degree of confidence through drawings, schematics, location services, etc., the work area must be thoroughly investigated prior to beginning the excavation. In these situations, utilities must be identified using such methods as passive and intrusive surveys, physical probing, or hand augering. Each method has advantages and disadvantages including complexity, applicability, and price. It also should be noted that in many states, initial excavation is required by hand to a specified depth.

7. At each location where trenching or excavating will occur using a backhoe or other heavy equipment, and where utility identifications and locations cannot be confirmed prior to groundbreaking, the soil must be probed with a hand auger or pole (tile probe) made of non-conductive material. If these efforts are not successful in clearing the excavation area of suspect utilities, hand shoveling must be performed for the perimeter of the intended excavation.

8. All utilities uncovered or undermined during excavation must be structurally supported to prevent potential damage. Unless necessary as an emergency corrective measure, TtNUS shall not make any repairs or modifications to existing utility lines without prior permission of the utility owner, property owner, and Corporate HSM. All repairs require that the line be locked-out/tagged-out prior to work.

5.2 Overhead Power Lines

If it is necessary to work within the minimum clearance distance of an overhead power line, the overhead line must be de-energized and grounded, or re-routed by the utility company or a registered electrician. If protective measures such as guarding, isolating, or insulating are provided, these precautions must be adequate to prevent employees from contacting such lines directly with any part of their body or indirectly

though conductive materials, tools, or equipment.

The following table provides the required minimum clearances for working in proximity to overhead power lines.

Nominal Voltage	Minimum Clearance
0 -50 kV	10 feet, or one mast length; whichever is greater
50+ kV	10 feet plus 4 inches for every 10 kV over 50 kV or 1.5 mast lengths; whichever is greater

6.0 UNDERGROUND LOCATING TECHNIQUES

6.1 Geophysical Methods

Geophysical methods include electromagnetic induction, magnetics, and ground penetrating radar. Additional details concerning the design and implementation of electromagnetic induction, magnetics, and ground penetrating radar surveys can be found in one or more of the TtNUS SOPs included in the References (Section 8.0).

Electromagnetic Induction

Electromagnetic Induction (EMI) line locators operate either by locating a background signal or by locating a signal introduced into the utility line using a transmitter. A utility line acts like a radio antenna, producing electrons, which can be picked up with a radiofrequency receiver. Electrical current carrying conductors have a 60HZ signal associated with them. This signal occurs in all power lines regardless of voltage. Utilities in close proximity to power lines or used as grounds may also have a 60HZ signal, which can be picked up with an EM receiver. A typical example of this type of geophysical equipment is an EM-61.

EMI locators specifically designed for utility locating use a special signal that is either indirectly induced onto a utility line by placing the transmitter above the line or directly induced using an induction clamp. The clamp induces a signal on the specific utility and is the preferred method of tracing since there is little chance of the resulting signals being interfered with. A good example of this type of equipment is the Schonstedt® MAC-51B locator. The MAC-51B performs inductively traced surveys, simple magnetic locating, and traced nonmetallic surveys.

When access can be gained inside a conduit to be traced, a flexible insulated trace wire can be used. This is very useful for non-metallic conduits but is limited by the availability of gaining access inside the pipe.

Magnetics

Magnetic locators operate by detecting the relative amounts of buried ferrous metal. They are incapable of locating or identifying nonferrous utility lines but can be very useful for locating underground storage tanks (UST's), steel utility lines, and buried electrical lines. A typical example of this type of equipment is the Schonstedt® GA-52Cx locator. The GA-52Cx is capable of locating 4-inch steel pipe up to 8 feet deep.

Non-ferrous lines are often located by using a typical plumbing tool (snake) fed through the line. A signal is then introduced to the snake that is then traced.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) involves specialized radar equipment whereby a signal is sent into the ground via a transmitter. Some portion of the signal will be reflected from the subsurface material, which is then recorded with a receiver and electronically converted into a graphic picture. In general, an object which is harder than the surrounding soil will reflect a stronger signal. Utilities, tunnels, UST's, and footings will reflect a stronger signal than the surrounding soil. Although this surface detection method may determine the location of a utility, this method does not specifically identify utilities (i.e., water vs. gas, electrical vs. telephone); hence, verification may be necessary using other methods. This method is somewhat limited when used in areas with clay soil types or with a high water table.

6.2 Passive Detection Surveys

Acoustic Surveys

Acoustic location methods are generally most applicable to waterlines or gas lines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. Acoustics may also be applicable to determine the location of plastic gas lines.

Thermal Imaging

Thermal (i.e., infrared) imaging is a passive method for detecting the heat emitted by an object. Electronics in the infrared camera convert subtle heat differentials into a visual image on the viewfinder or a monitor. The operator does not look for an exact temperature; rather they look for heat anomalies (either elevated or suppressed temperatures) characteristic of a potential utility line.

The thermal fingerprint of underground utilities results from differences in temperature between the atmosphere and the fluid present in a pipe or the heat generated by electrical resistance. In addition, infrared scanners may be capable of detecting differences in the compaction, temperature and moisture content of underground utility trenches. High-performance thermal imagery can detect temperature differences to hundredths of a degree.

6.3 Intrusive Detection Surveys

Vacuum Excavation

Vacuum excavation is used to physically expose utility services. The process involves removing the surface material over approximately a 1' x 1' area at the site location. The air-vacuum process proceeds with the simultaneous action of compressed air-jets to loosen soil and vacuum extraction of the resulting debris. This process ensures the integrity of the utility line during the excavation process, as no hammers, blades, or heavy mechanical equipment comes into contact with the utility line, eliminating the risk of damage to utilities. The process continues until the utility is uncovered. Vacuum excavation can be used at the proposed site location to excavate below the "utility window" which is usually 8 feet.

Hand-auger Surveys

When the identification and location of underground utilities cannot be positively confirmed through document reviews and/or other methods, borings must be hand-augered for all locations where there is a potential to impact buried utilities. The minimum hand-auger depth that must be reached is to be determined considering the geographical location of the work site. This approach recognizes that the

placement of buried utilities is influenced by frost line depths that vary by geographical region. Attachment 2 presents frost line depths for the regions of the contiguous United States. At a minimum, hand-auger depths must be at least to the frost line depth plus two (2) feet, but never less than 4 feet below ground surface (bgs). For augering, the hole must be reamed by hand to at least the diameter of the drill rig auger or bit prior to drilling. For soil gas surveys, the survey probe shall be placed as close as possible to the cleared hand-auger. It is important to note that a post-hole digger must not be used in place of a hand-auger.

Tile Probe Surveys

For some soil types, site conditions, and excavation requirements, tile probes may be used instead of or in addition to hand-augers. Tile probes must be performed to the same depth requirements as hand-augers. Depending upon the site conditions and intended probe usage, tile probes should be made of non-conductive material such as fiberglass.

7.0 INTRUSIVE ACTIVITIES SUMMARY

The following list summarizes the activities that must be performed prior to beginning subsurface activities:

1. Map and mark all subsurface locations and excavation boundaries using white paint or markers specified by the client or property owner.

2. Notify the property owner and/or client that the locations are marked. At this point, drawings of locations or excavation boundaries shall be provided to the property owner and/or client so they may initiate (if applicable) utility clearance.

   Note: Drawings with confirmed locations should be provided to the property owner and/or client as soon as possible to reduce potential time delays.

3. Notify “One Call” service. If possible, arrange for an appointment to show the One Call representative the subsurface locations or excavation boundaries in person. This will provide a better location designation to the utilities they represent. You should have additional drawings should you need to provide plot plans to the One Call service.

4. Complete Attachment 3, Utility Clearance Form. This form should be completed for each excavation location. In situations where multiple subsurface locations exist within the close proximity of one another, one form may be used for multiple locations provided those locations are noted on the Utility Clearance Form. Upon completion, the Utility Clearance Form and revised/annotated utility location map becomes part of the project file.

8.0 REFERENCES

TtNUS Utility Locating and Clearance Policy
TtNUS SOP GH-3.1; Resistivity and Electromagnetic Induction
TtNUS SOP GH-3.2; Magnetic and Metal Detection Surveys
TtNUS SOP GH-3.4; Ground-penetrating Radar Surveys

ATTACHMENT 1
LISTING OF UNDERGROUND UTILITY CLEARANCE RESOURCES

ALABAMA
Alabama Line Location (800) 292-8525

Tucson Blue Stake Center (800) 782-5348

Alaska
Locate Call Center of Alaska Inc. (800) 478-3121

Arizona
Arizona Blue Stake Inc. (800) 782-5348

Arkansas
Arkansas One Call System Inc. (800) 482-8998

California
Underground Service Alert North (800) 227-2600

Underground Service Alert South (800) 227-2600

Colorado
Utility Notification Center of Colorado
(800) 922-1987

Connecticut
Call Before You Dig (800) 922-4455

Delaware
Miss Utility of Delmarva
(800) 282-8555

District of Columbia
Miss Utility (800) 257-7777

Florida
Call Sunshine (800) 432-4770

Georgia
Utilities Protection Center Inc.
(800) 282-7411

Idaho
Palouse Empire Underground Coordinating Council
(800) 882-1974

Utilities Underground Location Center
(800) 424-5555

Kootenai Country Utility Coordinating Council
(800) 428-4950

Shoshone County One Call (800) 398-3285

Dig Line (800) 342-1585

One Call Concepts (800) 626-4950

Illinois
Julie Inc. (800) 892-0123

Digger (Chicago Utility Alert Network)
(312) 744-7000

Indiana
Indiana Underground Plant Protection Services
(800) 382-5544

Iowa
Underground Plant Location Service Inc.
(800) 292-8989

Kansas
Kansas One-Call Center (800) 344-7233

Kentucky
Kentucky Underground Protection Inc.
(800) 752-6007

Louisiana
Louisiana One Call (800) 272-3020

Maine
Dig Safe – Maine (800) 225-4977

Maryland
Miss Utility (800) 257-777

Miss Utility of Delmarva (800) 282-8555

Massachusetts
Dig Safe – Massachusetts (800) 322-4844

Michigan
Miss Dig System (800) 482-7171

Minnesota
Gopher State One Call (800) 252-1166

Mississippi
Mississippi One-Call System Inc. (800) 227-6477

Missouri
Missouri One Call System Inc. (800) 344-7483

Montana
Utilities Underground Location Center
(800) 424-5555

Montana One Call Center (800) 551-8344

Nebraska
Diggers Hotline of Nebraska (800) 331-5666

Nevada
Underground Service Alert North (800) 227-2600

New Hampshire
Dig Safe – New Hampshire (800) 225-4977

New Jersey
New Jersey One Call (800) 272-1000

New Mexico
New Mexico One Call System Inc.
(800) 321-ALERT

Las Cruces-Dona Utility Council (505) 526-0400

New York
Underground Facilities Protection Organization
(800) 962-7962

New York City: Long Island One Call Center
(800) 272-4480

North Carolina
The North Carolina One-Call Center Inc.
(800) 632-4949

North Dakota
Utilities Underground Location Center
(800) 795-0555

Ohio
Ohio Utilities Protection Service
(800) 362-2764

Oil & Gas Producers Underground Protection Service
(800) 925-0988

Oklahoma
Call Okie (800) 522-6543

Oregon
Utilities Underground Location Center
(800) 424-5555

Douglas Utilities Coordinating Council
(503) 673-6676

Josephine Utilities Coordinating Council
(503) 476-6676

Rogue Basin Utility Coordinating Council
(503) 779-6676

Utilities Notification Center
(800) 332-2344

Pennsylvania
Pennsylvania One Call System Inc.
(800) 242-1776

Rhode Island
Dig Safe – Rhode Island (800) 225-4977

South Carolina
Palmetto Utility Protection Service Inc.
(800) 922-0983

South Dakota
South Dakota One Call (800) 781-7474

Tennessee
Tennessee One-Call System (800) 351-1111

Texas
Texas One Call System (800) 245-4545

Texas Excavation Safety System (800) 344-8377

Lone Star Notification Center (800) 669-8344

Utah
Blue Stakes Location Center (800) 662-4111

Vermont
Dig Safe – Vermont (800) 225-4977

Virginia
Miss Utility of Virginia (800) 552-7001

Miss Utility (800) 257-7777

Miss Utility of Delmarva (800) 441-8355

Washington
Utilities Underground Location Center
(800) 424-5555

Grays Harbor & Pacific County
Utility Coordinating Council
(206) 535-3550

Utilities County of Cowlitz County
(360) 425-2506

Chelan-Douglas Utilities Coordinating Council
(509) 663-6111

Upper Yakima County
Underground Utilities Council
(800) 553-4344

Inland Empire Utility Coordinating Council
(509) 456-8000

Palouse Empire Utilities Coordinating Council
(800) 822-1974

Utilities Notification Center (800) 332-2344

West Virginia
Miss Utility of West Virginia Inc. (800) 245-4848

Wisconsin
Diggers Hotline Inc. (800) 242-8511

Wyoming
West Park Utility Coordinating Council
(307) 587-4800

Call-In Dig-In Safety Council (800) 300-9811

Fremont County Utility Coordinating Council
(800) 489-8023

Central Wyoming Utilities Coordinating Council
(800) 759-8035

Southwest Wyoming One Call (307) 362-8888

Carbon County Utility
Utility Coordinating Council (307) 324-6666

Albany County Utility Coordinating Council
(307) 742-3615

Southeast Wyoming Utilities Coordinating Council
(307) 638-6666

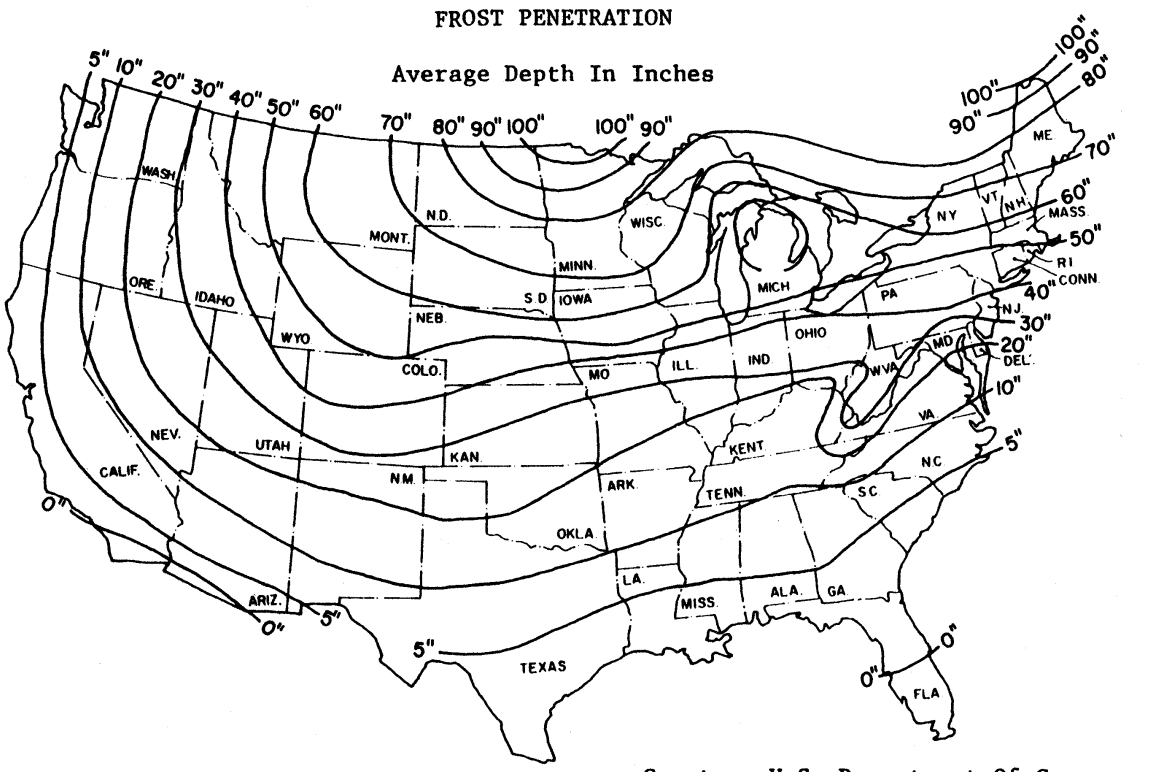
Wyoming One-Call
(800) 348-1030

Utilities Underground Location Center
(800) 454-5555

Converse County Utility Coordination Council
(800) 562-5561

ATTACHMENT 2

FROST LINE PENETRATION DEPTHS BY GEOGRAPHIC LOCATION



ATTACHMENT 3
UTILITY CLEARANCE FORM

Client: _____ Project Name: _____

Project No.: _____ Completed By: _____

Location Name: _____ Work Date: _____

Excavation Method/Overhead Equipment:_____

_____

1. Underground Utilities — Circle One

a)	Review of existing maps?	yes no N/A	
b)	Interview local personnel?	yes no N/A	
c)	Site visit and inspection?	yes no N/A	
d)	Excavation areas marked in the field?	yes no N/A	
e)	Utilities located in the field?	yes no N/A	
f)	Located utilities marked/added to site maps?	yes no N/A	
g)	Client contact notified Name _____ Telephone:_____ Date: _____	yes no N/A	
g)	State One-Call agency called? Caller: _____ Ticket Number: _____ Date: _____	yes no N/A	
h)	Geophysical survey performed? Survey performed by:_____ Method: _____ Date: _____	yes no N/A	
i)	Hand augering performed? Augering completed by:_____ Total depth:_____feet Date: _____	yes no N/A	
j)	Trench/excavation probed? Probing completed by:_____ Depth/frequency: _____ Date: _____	yes no N/A	

2. Overhead Utilities — Present Absent

a)	Determination of nominal voltage	yes no N/A
b)	Marked on site maps	yes no N/A
c)	Necessary to lockout/insulate/re-route	yes no N/A
d)	Document procedures used to lockout/insulate/re-route	yes no N/A
e)	Minimum acceptable clearance (SOP Section 5.2): _____	

3. Notes:

_____

_____

_____

Approval:

_____ _____

Site Manager/Field Operations Leader Date

c: PM/Project File
Program File

APPENDIX M

HEARING CONSERVATION PROGRAM

HEARING CONSERVATION PROGRAM

1.0 PROGRAM OBJECTIVE

To protect Tetra Tech NUS and Subcontractor employees from the harmful effects of exposure to excessive noise levels. Excessive noise in this case will be considered employee noise exposures at or above an 8-hour Time Weighted Average (TWA) of 85 decibels measured on the A-Weighted scale.

This objective will be accomplished through

- Establishing administrative and site-specific hearing conservation procedures and guidelines for employees.
- Audiometric testing of affected employees.
- Site specific monitoring of representative job classifications and operations to determine noise levels and appropriate protective measures.
- Establishment of procedures and guidelines for the selection care and use of hearing protection.
- Warning signs and information.
- Training.

This Hearing Conservation Program (HCP) is divided into two sections. The first section presents the responsibilities of individuals associated with this program and a description of the program's key elements. The second section provides a fill-in the blank tool that is to be used to implement a site-specific HCP on projects where noise exposure is a concern. This second section is presented in Attachment A and must be completed by the Site Safety Officer (SSO) or the Field Operations Leader (FOL) on projects where noise exposure is a recognized potential hazard. The completed fill-in the blank portion, administrative guidelines, and a copy of 29 CFR 1910.95 must be on-site and available to site personnel to ensure regulatory compliance.

2.0 SCOPE

This program applies to all Tetra Tech NUS operations and other support activities where exposure above specified action levels may occur. This program has been developed to comply with OSHA General Industry Standard 29 CFR 1910.95 (Occupational Noise Exposure, retrievable at http://www.osha-slc.gov/OshStd_data/1910_0095.html).

3.0 RESPONSIBILITIES

Corporate Health and Safety Manager (HSM): Serve as HCP Administrator and provide technical management and oversight of this program, as well as technical support to aid all Tetra Tech NUS office locations in effectively implementing these requirements. The HSM is also responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Periodically reviewing random completed Sound Level Measurement and/or Noise Dosimetry Logs.
- Performing field audits of select project sites where the HCP elements are implemented.
- Eliciting feedback from office health and safety Points of Contact.
- Modifying elements of this program, when or as appropriate.
- Establishing minimum components and content of the HCP training course material.
- Maintaining appropriate record-keeping for this program.
- Regularly communicating with Tetra Tech, Inc. Corporate Health and Safety, to satisfy overall company requirements.

Project Health and Safety Officer (PHSO) - The PHSO shall ensure that hearing conservation measures are adequately addressed in the Site Specific Health and Safety Plan for assigned projects. In addition, it is the PHSO's responsibility to provide technical assistance to the Site Safety Officer and/or the Field Operations Leader.

Site Safety Officer (SSO) - The SSO will serve as the Site HCP Administrator and is responsible for the implementation of this HCP at project specific locations. This activity may also include on-site evaluations of noise levels. The SSO shall be responsible for the enforcement of the elements of this program to prevent excessive exposure to high levels of noise.

Field Operations Leader (FOL) – The FOL will share responsibility with the SSO or in the absence of an SSO ensure the implementation of this program for all operations conducted under their direction employing hearing protection.

Project Manager (PM)/Task Order Manager(TOM) - The PM/TOM is also ultimately responsible for the effective compliance with these requirements. The PM/TOM will ensure that sufficient information has been provided to the PHSO to develop a site-specific HCP appropriate for the nature of the planned activities. This is to be accomplished in conjunction with the preparation of the site-specific Health and Safety Plan (HASP).

Tetra Tech NUS Employees - The employees are responsible for following the tenets of this hearing conservation program and/or conditions or modifications of this program, that may be site-specific in nature.

In addition the employees are responsible for reporting any deficiencies or inadequacies of these program or site-specific elements to the SSO and/or the FOL.

4.0 NOISE LEVEL MONITORING

Noise level monitoring will be accomplished using quantitative and qualitative principles to determine potential high noise areas. Quantitative monitoring will be accomplished using portable sound level survey meters and noise dosimeters. The monitoring results will be used for the following purposes:

- Identifying and defining high operational noise areas and high noise job classifications.
- Identification of personnel for inclusion into the Site-Specific HCP.
- Determining employee exposure to noise.

In addition, qualitative monitoring of work areas may be employed by the FOL and/or SSO or field personnel to determine approximate noise level conditions and the need for hearing protection. This involves observing a common simple rule of thumb. This rule of thumb is that, if you must raise your voice to be heard by someone who is standing within arm's length of you to be heard, then noise levels are likely to exceed 85 dBA. Therefore, hearing protection would be required. This rule of thumb may be used for short duration or intermittent activities, or for activities which have been previously quantified.

Quantitative monitoring may be performed for longer-term projects or for tasks that have not been previously characterized. This will be performed using a sound level meter (SLM), noise dosimeters, or both.

Representative data may be used when appropriate from one project to the next to preclude the necessity to monitor similar tasks and activities .

4.1.1 Noise Level Monitoring Data Accumulation and Record-keeping

The Sound Level Measurement Log and the Noise Dosimetry Log provided in Attachment A will be completed to document quantitative measurements recorded on-site. Upon completion copies of these documents will be

1. Attached to their applicable Safe Work Permits
2. Forwarded to the PHSO for review

Direction for the completion of these documents will be provided through the site-specific HASP. If information is not requested it may be assumed that quantitative measurements for the operations in question are not necessary, or that representative data already exists.

4.1.2 Noise Monitoring Frequency

Depending on the nature of planned operations, the SSO and/or the FOL, may be tasked to perform an initial noise survey on Tetra Tech NUS and subcontractors operations and work areas by the use of a sound level meter and/or noise dosimeters.

Repeat noise monitoring will be conducted should operations, productions, or processes change which could impact noise levels that are generated.

4.2 Health and Safety Plan (HASP)

The HASP will set policy on mandatory use of hearing protection in affected areas, and while performing certain operations such as drilling, excavation, operation of motorized and electrical hand tools and equipment, and/or other activities that can be anticipated to generate excessive noise levels. The FOL and/or SSO will notify all Tetra Tech NUS and subcontractor personnel of high noise areas and operations, prior to work initiation. Notification of these personnel will take place in the following manner:

- Site-specific training – Review of the scope of work inherent hazards and control measures to be employed to minimize the effects of these hazards.

- Personnel will be notified through issuance of the Safe Work Permit.

- Information concerning hearing protection for operations not conducted under a Safe Work Permit will be conveyed verbally and documented within the project logbook.

- Information on high noise areas and hearing protection requirements is most effectively conveyed to Tetra Tech NUS and subcontractor personnel through the use of signs. The FOL and/or the SSO will post or otherwise identify areas of operations that exceed 85 dBA. If significant changes in noise levels occur (such as a shutdown or modification of an operating unit), the noise levels shall be re-evaluated by the SSO and/or the FOL to determine hearing protection needs.

5.0 HEARING PROTECTION

The following information establishes responsibility for the acquisition, selection, dispersal, training, care, storage and use, and evaluation of hearing protection.

5.1 Acquisition

When engineering and/or administrative controls are not feasible to control noise levels, hearing protection will be required. These hearing protection devices will be provided to employees

- Who may be exposed to noise levels in excess of 85 dBA.
- Employees who have not yet had a baseline audiogram.
- Employees who have experienced a >10 dB Standard Threshold Shift (STS) at frequencies of 2,000, 3,000, or 4,000 hertz range in either ear.

The FOL will arrange for hearing protection in the following manner

- Complete an Equipment Requisition indicating the types of hearing protection required and amounts. Remember additional quantities of protective devices may be required for site visitors. Approved site visitors should be equipped to the same level of protection as field personnel.

- When arranging for hearing protection device purchases through procurement the following actions should be taken

    1. Contact the PHSO for assistance in identifying the appropriate hearing protection types and performance criteria.

    2. Complete a Material Requisition sheet describing the type, attenuation capabilities, and quantities required.

    3. Turn in the completed Material Requisition to the Contract Procurement Officer.

5.2 Selection/Dispersal

Employees will be provided with a variety of hearing protection devices to choose from. They will select from these hearing protection devices, unless specific medical restrictions and/or qualifications have been established through the medical surveillance program. All hearing devices made available and approved for use will provide attenuation to lower noise exposures to no more than an 8-Hour TWA of 85 dBA.

The SSO and/or the PHSO will evaluate the attenuation factors of hearing protection devices and may modify selections based on sound level monitoring or personal dosimetry results. These completed documents are to be copied and forwarded to the PHSO upon completion.

The FOL and/or the SSO will be responsible for ensuring adequate stock of hearing protection is maintained and available at the project site for employees and approved site visitors.

Hearing protectors shall be replaced as necessary (per the manufacturer's recommendation).

Employees will be responsible for the care, cleaning, storage, and inspection of hearing protection issued.

5.3 Training

The Health Sciences Group will institute and maintain a training program in support of the HCP covering the following subject matter

- The elements of this HCP
- The mechanism of hearing
- The deleterious effects of excessive noise on hearing
- Medical surveillance of the participants of this program (i.e., audiometric testing).
- Controlling excessive noise through engineering, administrative, and Personal Protective Equipment (PPE)
- PPE – Types, selection, limitations and advantages
- Use, care, and storage of hearing protective devices
- Noise monitoring methodologies and reporting
- Record-keeping – Documentation, retention, and access

Training will be provided to all effected employees through mechanisms including, but not limited to, 40-Hour Hazardous Waste Site General Site Worker Training, 8-Hour Hazardous Waste Site General Site Worker Refresher Training, 8-Hour Management/Supervisory Training, annual Hearing Conservation Program refresher, and Project or Site-Specific training. In addition, training materials may be obtained from the HSM.

Note: Course curriculum for training obtained from outside vendors must be approved by the HSM.

5.4 Care

Individuals issued reusable hearing protection such as earmuffs and plugs will be responsible for the care and of those devices. This includes the removal of any debris using a light detergent with a water rinse, or as directed using manufacturer's instructions.

Disposable plugs are to be disposed of after each use.

5.5 Storage

Hearing protection approved for use will be stored in their individual manufacturer supplied packaging. When this is not possible, storage within suitable containers such as Ziplock bags after cleaning and drying is acceptable.

Hearing protective devices should be stored to

- Prevent distortion
- Prevent contact from chemicals and/or contaminants
- Away from direct sunlight and heat sources which may cause photolytic or thermal degradation

5.6 Use

Hearing protection shall be used in accordance with the employee's training, and as directed within the HASP, Safe Work Permits, as directed by signs, or as directed by the FOL and/or the SSO. Failure to comply with these requirements will result in disciplinary action. The FOL and/or the SSO are responsible for the enforcing the use of hearing protection at project specific locations.

5.7 Evaluation

The elements of this hearing conservation program and the implementation at project sites will be evaluated periodically through the existing health and safety audit function under the direction of the Health and Safety Manager. In addition to this function the program will be evaluated under the following conditions

- STS is indicated within a protected body of employees.
- Normal auditing procedures indicate discrepancies within the implementation of the HCP.

6.0 RECORD KEEPING

The following records will be maintained in support of this HCP

- Exposure measurements - This includes Sound Level Measurement Logs and/or the Noise Dosimetry Logs, and related records. Copies will be kept at the site while the originals are forwarded to the PHSO for review and record retention in the project file. Exposure measurement records will be maintained for a minimum of two years.

- Audiometric Testing Records – These records are maintained as part of the medical surveillance program and all employees who receive an audiogram will be provided a written copy of the results. These records will be retained the duration of the effected employees employment.

- Training Records – Training records for the 40-Hour, 8-Hour Refresher, 8-Hour Management/Supervisory course content is maintained by the HSM and at the project level. The FOL and/or the SSO will be responsible for obtaining from identified field personnel certificates of the most recent successful completion of these courses to be maintained at the site. Site-specific training concerning the elements of this HCP will be maintained at the project site.

Record retention will be performed in accordance with the time periods stated in 29 CFR 1910.95 (retrievable at http://www.osha-slc.gov/OshStd_data/1910_0095.html and 1910.1020 http://www.osha-slc.gov/OshStd_data/1910_1020.html).

7.0 AUDIOMETRIC TESTING

Audiometric testing will be performed on all participants of this HCP based on measured or anticipated noise levels that they may be exposed. The purpose of this testing will be as follows

- Establish an initial or revised baseline audiogram, as applicable, of the participant's current hearing condition.
- Repeat audiograms, in order to track any changes within the participants hearing measured under the baseline examination.
- Provide a mechanism for exit audiograms for personnel leaving the employment of Tetra Tech NUS, or a change in job duties where participation in the HCP is no longer necessary.

These audiograms and documentation pertaining to these tests are administered and maintained under the Tetra Tech NUS Medical Surveillance Program.

ATTACHMENT A

WORK SITE
HEARING CONSERVATION PROGRAM

HEARING CONSERVATION PROGRAM

The following information pertaining to the use of hearing protection is to be completed by the Site Safety Officer (SSO), their duly appointed representative, or the Field Operations Leader (FOL). This work site portion of the Hearing Conservation Program (HCP) will be completed only if hearing protection is to be used in the completion of the assigned tasks as identified per the scope of work, in the work plan, the health and safety plan, bid specifications, or as determined through hazard assessment of the tasks and potential hazards which may be involved. Upon completion of the site-specific elements of this HCP, the Sound Level Measurement Log and/or the Noise Dosimetry Log should be copied and attached to the Safe Work Permit(s) for each activity directed by the HASP to be monitored. Permits and logs should then be forwarded to the Project Health and Safety Officer (PHSO) for evaluation.

Personnel Responsible For Program Completion

The following persons are available to provide assistance in all elements of this program including question/conflict resolution and modification variances. These persons exercise the primary responsibility for the implementation of this site-specific program.

I) **Site Safety Officer (Site HCP Administrator):**_____**Phone #:**_____

Field Operations Leader: _____**Phone #:**_____

Project Health and Safety Officer:_____**Phone #:**_____

Health and Safety Manager: _____**Phone #:**_____

Personnel Who (by Way of Assignment) Will Wear Hearing Protection

The following list represents TtNUS or subcontractor personnel working under the provisions of this HCP. The persons listed below are included in this site-specific HCP and are required to wear hearing protection when performing tasks producing excessive noise.

II)

Personnel	Make/Model of Hearing Protective Devices to be used	Hearing Protection Noise Reduction Rating (NRR #)

III) Noise Evaluation Technique or Quantitative Noise Evaluations

Noise level monitoring performed on-site will be done to quantify noise levels generated during certain operations. Documentation of these measurements will be performed using either the Sound Level Measurement Log or the Noise Dosimetry Log provided in Figure 1 and Figure 2.

The Sound Level Monitoring

Sound level measurements can be used in establishing noise levels for persons working within the exclusion zone. Sound level monitoring will be performed using a Type II Sound Level Meter (SLM) set on the A-Weighted scale and on the SLOW response setting. This type of SLM survey is necessary when the general rule of thumb for noise levels is exceeded, in order to determine if hearing conservation is an issue, and if so, to set the boundaries for where hearing protection will be required. SLM surveys are also used to identify areas or operations where more specific noise exposure evaluations (using noise dosimetry) are appropriate.

General Rule of Thumb for Determining That Noise Levels May Be Excessive

> *If noise levels are loud enough that you need to raise your voice in order to communicate with another person who is within two feet of you, then noise levels may be excessive. In this case, hearing conservation issues must be considered and hearing protection must be used until and unless sound level monitoring or noise dosimetry indicate that it is not necessary.*

To perform a SLM survey, first make sure that the SLM is on the proper settings as noted above, and ensure that it is properly calibrated in accordance with the manufacturer's instructions. Then, take **at least 3 random readings at each location** starting at the spot where the noise source is loudest and working your way away from the noise source, until you have readings that are below an average of 85 decibels on the A-weighted scale (dBA). You should position the SLM so that it is pointing perpendicular to the noise source (do not point the microphone directly at the noise source. This can result in inaccurate readings). "Random readings" means that you should hold the SLM in place and occasionally glance at the readout and record the reading that you see. You should <u>not</u> watch the readout and record the highest peak reading that you see. Pay particular attention to taking readings at any employee or subcontractor employee typical work locations (such as at the controls of a drill rig, at the area where samples are taken, etc.). Record your readings on a draft sketch of the work area (or on a floorplan if working inside of a building).

After you have taken enough readings to adequately characterize the work area, post calibrate the SLM and record the distance from the noise source where the average of the 3 readings was no more than 85 dBA (using Figure 1). All areas inside of the 85 dBA boundary line are to be designated as requiring hearing protection, and this must be communicated to all members of the field team. This can be accomplished by placing appropriate signs at the boundary line, posting Figure 1 at the work area, and by reviewing Figure 1 with the field team as part of a daily tailgate meeting or Safe Work Permit review.

Also, areas where average sound levels are 85 dBA or greater should be brought to the attention of the PHSO for considerations for noise dosimetry.

The Sound Level Measurement Log will be used in the following circumstances.

- Setting exclusion zone boundaries based on noise levels generated.
- Establishing noise contours surrounding operations.

Noise Dosimetry Log

Noise dosimetry is used to accurately characterize the noise exposure that a person actually experiences during a working period. Dosimetry is much simpler to perform than a SLM survey, but it does involve the participation and cooperation of more people (namely, the workers who will wear the dosimeters). As with the use of any instrumentation, you need to closely follow the recommendations of the dosimeter manufacturer. Complete a Noise Dosimetry Log (Figure 2) for each dosimetry evaluation. In general, make sure that each dosimeter is properly calibrated before use, then attach the device to the worker so that the microphone is near the area of their head (i.e., at the collar). The worker should wear the device for the entire day, including breaks, and you should periodically check the device and record any notations of activities performed during the shift, using the Worker Activity Log in Figure 3. At the end of the shift, remove the dosimeter from the worker and post-calibrate it.

Noise Monitoring Results - Notification

The results of the noise monitoring (Sound Level Measurement Log and/or the Noise Dosimetry Log) will be copied and attached to the applicable Safe Work Permit(s). Copies of these documents will be forwarded to the PHSO for evaluation. In addition, a copy or the original shall be posted to inform personnel involved in the test as to the results. The SSO will also provide a narrative of the results to all personnel and subcontractor personnel who wish further explanation.

Calibration

All instruments used for sound level measurements and noise dosimetry will require calibration prior to use. All calibration will proceed as per manufacturer's instructions provided with the instruments. Information required for calibration is provided on the Sound Level and Noise Dosimetry Logs. Pre-and post-calibrations must be performed and recorded for all noise evaluations performed.

IIIA) Sound Level Measurement Log

The Sound Level Measurement Log (Figure 1) is to be used as a general record for sound level measurements recorded during operations. The diagram of the work area is to be completed by the SSO and/or the FOL. Information should include operator/helpers positions, support functions (sample tables, etc.), and noise measurements along the contours provided below. When designating the 85 dBA boundary line, make the approximate distance from the noise source so that it is clearly evident to site personnel where hearing protection is needed. A better approach would be to put signs in place where noise levels are above 85 dBA that hearing protection is required in this area. The contours provided below are set at ten feet intervals from the center, if alternate distances are desired indicate as such on the contour boundaries.

FIGURE 1

SOUND LEVEL MEASUREMENT LOG

Date of Survey	Location of Survey	Surveyed By
Sound Level Meter(Type)	Model #	Serial #
Calibration Date	Calibrated By	
Pre-Calibration Reading	Post-Calibration Reading	
Activity Being Conducted:_____ _____ Equipment Used:_____ Duration of Activity:_____		
Hearing Protection Used?_____Type:_____NRR:_____		
Comments:_____ _____		

IIIB) Noise Dosimetry Log (Figure 2)

This log will be employed when conducting Noise Dosimetry of operations or job classifications. This log contains the necessary information queues for worker information as well as calibration of the noise dosimeters to insure complete documentation. On the reverse side a running log of worker activity is provided. Upon completion of this log, a copy should be made for the file on site, and the original sent to the PHSO for evaluation.

NOISE DOSIMETRY LOG

DATE OF SAMPLE:_____

Individuals conducting the dosimetry initials below indicate that noise dosimeter(s) were calibrated, and the unit(s) test parameters verified, prior to sampling:

_____ 90 dB Criterion

_____ 5 dB Exchange

_____ 80 dB Cut-off Threshold

_____ Pre-sample Calibration @ _____dBA

_____ Post-sample Calibration @____dBA

Calibrator:_____

Type of Noise Dosimeter employed:_____

Worker Sampled:_____Dosimeter Identification No._____

S.S. Number:_____

Job Classification:_____

Job/Task being performed:_____

Equipment/Tools used:_____

Type of Hearing Protection Employed:_____ Noise Reduction Rating:_____

Representative Exposure: _____ _____ _____

For: _____ _____ _____

Start-time: ___:___ Lmax._____ Lavg._____ Lpk._____

Stop-time: ___:___

Elapsed-time: ___:___ Dose: _____% Projected Dose: _____%

Comments:_____

_____

_____

_____ _____

Supervisor in Charge SSO and/or FOL

ALSO COMPLETE WORKER ACTIVITY LOG ON REVERSE SIDE

FIGURE 3

WORKER ACTIVITY LOG

TEST HOUR	TASK(S)	*	LOCATION(S)
1			
2			
3			
4			
5			
6			
7			
8			

IV) Audiometric Testing

Audiometric testing is a standard part of the examination protocol in the Tetra Tech NUS Medical Surveillance Program. If based on scope of work, personnel or subcontractor personnel are required to wear hearing protection as part of their task assignment, it will be the SSO's or the FOL's responsibility to inquire whether their medical evaluation included audiometric testing. At all Tetra Tech NUS, Inc. project sites where hearing protection is required it is imperative that personnel be in a program of audiometric testing. For those who have not had even an initial (or baseline) evaluation, hearing protection will be required if Time-weighted are 8 hour exposure > 85 dBA.

V) Information Access

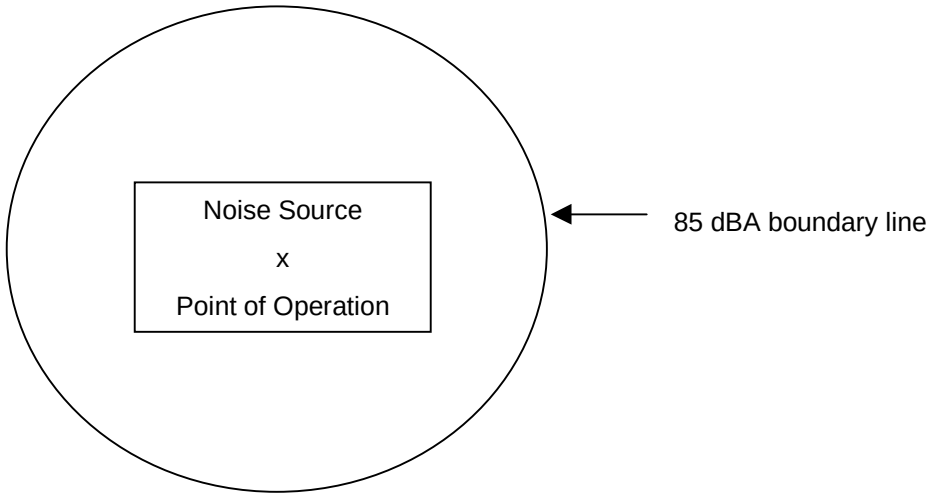
The implementation of this HCP requires information be made available to the participants of this program. Information to be made available include the following:

- Code of Federal Regulations, Subsection 1910.95 - This standard shall be posted on site accessible to all personnel. (retrievable at http://www.osha-slc.gov/OshStd_data/1910_0095.html).
- Monitoring Results – Information concerning quantitative monitoring will be posted accessible to all site personnel.
- Informational materials pertaining to the standard supplied to the employer by the Department of Labor.

IV) Record-Keeping

The following information will be maintained at the project site by the SSO and/or the FOL during the course of on-site activities.

- Exposure monitoring documentation (Sound Level Measurement and Noise Dosimetry Logs shall be maintained with the applicable Safe Work Permit). This information at project completion will be maintained in the project files for a period of no less than two years.
- Medical Surveillance information – Information concerning the individual's fitness for duty should include a declaration that the medical evaluation included establishing a baseline quantification of that persons hearing capabilities.
- Training – On project sites where noise is recognized as a potential hazard (either in the HASP, by following the general rule-of-thumb, or as a result of noise monitoring), hearing conservation training must be provided to al personnel working in these areas. This can be accomplished using Attachment 2.. If training is provided, in part or in whole regarding the subject matter minimum content documentation should be provided attesting to such.


Noise Source
x
Point of Operation
85 dBA boundary line

OSHA Regulations (Standards - 29 CFR)
Occupational noise exposure. - 1910.95

OSHA Regulations (Standards - 29 CFR) - Table of Contents

- **Standard Number:** 1910.95
- **Standard Title:** Occupational noise exposure.
- **SubPart Number:** G
- **SubPart Title:** Occupational Health and Environmental Control
- **Applicable Standard:** Applicable Standard:

Interpretation(s)

(a)

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G-16 when measured on the A scale of a standard sound level meter at slow response. When noise levels are determined by octave band analysis, the equivalent A-weighted sound level may be determined as follows:

FIGURE G-9 - Equivalent A-Weighted Sound Level
(For Figure G-9, Click Here)

Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table 1.G-16.

(b)

(b)(1)

When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

(b)(2)

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

TABLE G-16 - PERMISSIBLE NOISE EXPOSURES (1)

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact

noise should not exceed 140 dB peak sound pressure level.

..1910.95(c)

(c)

"Hearing conservation program."

(c)(1)

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment.

(c)(2)

For purposes of paragraphs (c) through (n) of this section, an 8-hour time-weighted average of 85 decibels or a dose of fifty percent shall also be referred to as the action level.

(d)

"Monitoring."

(d)(1)

When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

(d)(1)(i)

The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

(d)(1)(ii)

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the monitoring requirements of this paragraph unless the employer can show that area sampling produces equivalent results.

..1910.95(d)(2)

(d)(2)

(d)(2)(i)

All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

(d)(2)(ii)

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

(d)(3)

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

(d)(3)(i)

Additional employees may be exposed at or above the action level; or

(d)(3)(ii)

The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of paragraph (j) of this section.

(e)

"Employee notification." The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

(f)

"Observation of monitoring." The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted pursuant to this section.

..1910.95(g)

(g)

"Audiometric testing program."

(g)(1)

The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

(g)(2)

The program shall be provided at no cost to employees.

(g)(3)

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

(g)(4)

All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: "Audiometric Measuring Instruments."

(g)(5)

"Baseline audiogram."

(g)(5)(i)

Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

..1910.95(g)(5)(ii)

(g)(5)(ii)

"Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, the employer shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, employees shall wearing hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

(g)(5)(iii)

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

(g)(5)(iv)

The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(g)(6)

"Annual audiogram." At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

(g)(7)

"Evaluation of audiogram."

(g)(7)(i)

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift as defined in paragraph (g)(10) of this section has occurred. This comparison may be done by a technician.

..1910.95(g)(7)(ii)

(g)(7)(ii)

If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

(g)(7)(iii)

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

(g)(7)(iii)(A)

A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (n) of this section;

(g)(7)(iii)(B)

The baseline audiogram and most recent audiogram of the employee to be evaluated;

(g)(7)(iii)(C)

Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: Audiometric Test Rooms.

(g)(7)(iii)(D)

Records of audiometer calibrations required by paragraph (h)(5) of this section.

..1910.95(g)(8)

(g)(8)

"Follow-up procedures."

(g)(8)(i)

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined in paragraph (g)(10) of this section has occurred, the employee shall be informed of this fact in writing, within 21 days of the determination.

(g)(8)(ii)

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

(g)(8)(ii)(A)

Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

(g)(8)(ii)(B)

Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

(g)(8)(ii)(C)

The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

(g)(8)(ii)(D)

The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

..1910.95(g)(8)(iii)

(g)(8)(iii)

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

(g)(8)(iii)(A)

Shall inform the employee of the new audiometric interpretation; and

(g)(8)(iii)(B)

May discontinue the required use of hearing protectors for that employee.

(g)(9)

"Revised baseline." An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:

(g)(9)(i)

The standard threshold shift revealed by the audiogram is persistent; or

(g)(9)(ii)

The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

(g)(10)

"Standard threshold shift."

(g)(10)(i)

As used in this section, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

..1910.95(g)(10)(ii)

(g)(10)(ii)

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in Appendix F: "Calculation and Application of Age Correction to Audiograms."

(h)

"Audiometric test requirements."

(h)(1)

Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(h)(2)

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

(h)(3)

Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: "Audiometric Measuring Instruments."

(h)(4)

Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: "Audiometric Test Rooms."

..1910.95(h)(5)

(h)(5)

"Audiometer calibration."

(h)(5)(i)

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

(h)(5)(ii)

Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

(h)(5)(iii)

An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3.; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

(i)

"Hearing protectors."

(i)(1)

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

(i)(2)

Employers shall ensure that hearing protectors are worn:

(i)(2)(i)

By an employee who is required by paragraph (b)(1) of this section to wear personal protective equipment; and

..1910.95(i)(2)(ii)

(i)(2)(ii)

By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

(i)(2)(ii)(A)

Has not yet had a baseline audiogram established pursuant to paragraph (g)(5)(ii); or

(i)(2)(ii)(B)

Has experienced a standard threshold shift.

(i)(3)

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

(i)(4)

The employer shall provide training in the use and care of all hearing protectors provided to employees.

(i)(5)

The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

(j)

"Hearing protector attenuation."

(j)(1)

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

..1910.95(j)(2)

(j)(2)

Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.

(j)(3)

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

(j)(4)

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

(k)

"Training program."

(k)(1)

The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 decibels, and shall ensure employee participation in such program.

(k)(2)

The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

(k)(3)

The employer shall ensure that each employee is informed of the following:

..1910.95(k)(3)(i)

(k)(3)(i)

The effects of noise on hearing;

(k)(3)(ii)

The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

(k)(3)(iii)

The purpose of audiometric testing, and an explanation of the test procedures.

(l)

"Access to information and training materials."

(l)(1)

The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

(l)(2)

The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

(l)(3)

The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

..1910.95(m)

(m)

"Recordkeeping" -

(m)(1)

"Exposure measurements." The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.

(m)(2)

"Audiometric tests."

(m)(2)(i)

The employer shall retain all employee audiometric test records obtained pursuant to paragraph (g) of this section:

(m)(2)(ii)

This record shall include:

(m)(2)(ii)(A)

Name and job classification of the employee;

(m)(2)(ii)(B)

Date of the audiogram;

(m)(2)(ii)(C)

The examiner's name;

(m)(2)(ii)(D)

Date of the last acoustic or exhaustive calibration of the audiometer; and

(m)(2)(ii)(E)

Employee's most recent noise exposure assessment.

(m)(2)(ii)(F)

The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

(m)(3)

"Record retention." The employer shall retain records required in this paragraph (m) for at least the following periods.

..1910.95(m)(3)(i)

(m)(3)(i)

Noise exposure measurement records shall be retained for two years.

(m)(3)(ii)

Audiometric test records shall be retained for the duration of the affected employee's *employment.*

(m)(4)

"Access to records." All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary. The provisions of 29 CFR 1910.20 (a)-(e) and (g)-

(m)(4)(i)

apply to access to records under this section.

(m)(5)

"Transfer of records." If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (m)(3) of this section.

(n)

"Appendices."

(n)(1)

Appendices A, B, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

..1910.95(n)(2)

(n)(2)

Appendices F and G to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

(o)

"Exemptions." Paragraphs (c) through (n) of this section shall not apply to employers engaged in oil and gas well drilling and servicing operations.

(p)

"Startup date." Baseline audiograms required by paragraph (g) of this section shall be completed by March 1, 1984.

[39 FR 23502, June 27, 1974, as amended at 46 FR 4161, Jan. 16, 1981; 46 FR 62845, Dec. 29, 1981; 48 FR 9776, Mar. 8, 1983; 48 FR 29687, June 28, 1983; 54 FR 24333, June 7, 1989; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996]

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APPENDIX N

RESPIRATORY PROTECTION PROGRAM

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TETRA TECH NUS
RESPIRATORY PROTECTION PROGRAM

NAVAL SURFACE WARFARE CENTER CRANE
CRANE, INDIANA

1.0 PURPOSE

The Respiratory Protection Program (RPP) establishes the uniform procedures and minimum requirements for use of respiratory protection at the Naval Surface Warfare Center (NSWC) Crane in Crane, Indiana.

1.1 Scope

This program applies to all Tetra Tech NUS using respiratory protection as specified in the site-specific health and safety plan (HASP) or specified work plan. This program will be implemented based on directed use or personal preference of Tetra Tech NUS personnel to employ respiratory protection. This program has been developed on the basis of the following requirement:

- That this program will be implemented on a site-specific basis, establishing flexibility to provide for the protection of the health and safety of Tetra Tech NUS personnel, as well as for internal and regulatory compliance. This concept recognizes that Tetra Tech NUS personnel work on many different sites, often with only brief field operations tasks, as opposed to longer term project sites.

This site-specific program includes technical guidelines that are based on sound accepted industrial hygiene and safety and health principles. The guidelines presented in this program are generated and maintained through Tetra Tech NUS corporate safety and health administrative structure and by persons identified as responsible for the execution of NSWC Crane elements. This program will be maintained and improved through the participation of all Tetra Tech NUS personnel and through information generated through periodic program evaluations.

2.0 RESPONSIBILITIES

The following Tetra Tech NUS personnel are responsible for the support and implementation of the described program elements.

2.1 Tetra Tech NUS President

Has the overall responsibility for the health and safety of all personnel and operations in the Tetra Tech NUS. This responsibility is principally satisfied through delegating the necessary authority and accountability to the Tetra Tech NUS Office Management level. Successful accomplishment and maintenance of this and other health and safety programs will be achieved through such means as ensuring that health and safety is a principal component of personnel annual performance reviews ranging from Tetra Tech NUS top management through to each employee.

2.2 Tetra Tech NUS Health and Safety Manager (HSM)

The HSM will serve as the Program Administrator and provide technical management and oversight of this program, and will aid all Tetra Tech NUS locations in effectively implementing these requirements. The

Tetra Tech NUS HSM will also be responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Performing random field audits where respiratory protection is employed.
- Obtaining feedback concerning the effectiveness of the program elements.
- Maintaining proficiency in regulatory requirements regarding the use of respiratory protection.
- Modifying elements of this program, when or as appropriate.
- Defining minimum components of respiratory protection training course material, both for in-house and subcontractor-provided training courses
- Maintaining appropriate record-keeping for this program.

2.3 Site Safety Officers (SSO)

Ensure that the requirements of this program are satisfied for all Tetra Tech NUS operations performed or managed at the site. Other responsibilities include ensuring that:

- All respiratory equipment to be used is inspected meeting manufacturer's minimum operational readiness requirements, and ensuring that all equipment is certified for its intended use. Approved respiratory devices will be identified through the use of stickers and/or markers to indicate operational status as well as a log to indicate Tetra Tech NUS numbers inspected and approved. All respiratory devices, prior to being issued will be inspected and this inspection documented. The SSO will examine all equipment to ensure that it is operationally ready.

- All site personnel who will use respiratory protection are trained to the appropriate level for the tasks to be performed. Documentation certifying this training is obtained or generated on site through the incorporation of this program as part of site-specific training.

- All site personnel meet the necessary medical qualifications to perform their identified tasks wearing negative or positive pressure respiratory protection.

- Rescue services are readily available during IDLH operations.

- Intended rescue services receive the necessary information concerning the hazards associated with IDLH operations. Including Material Safety Data Sheets or HASPs, where available, information concerning hazard atmospheres and any associated physical hazards.

2.4 Equipment Manager

The Equipment Manager is the primary point of reference for dispersion of respiratory protective equipment to Tetra Tech NUS project work-sites. In addition the Equipment Manager is responsible for the following elements:

- Ensuring all respirators sent to Tetra Tech NUS project work-sites have been inspected and meet the manufacturer's definition for operational readiness. This inspection will take place prior to shipping. The Equipment Manager shall also mark and label respiratory devices for readiness through the use of stickers, tags, or other labels.

- Repairing respiratory protection (within training and qualification limits). When needed repairs are at a level for which the Equipment Manager is not qualified, he/she shall expedite repairs at an approved location.

3.0 RESPIRATORY PROTECTION PROGRAM ELEMENTS

The following elements represent the minimum RPP requirements. Within these requirements, elements of this program have been subdivided to represent administrative responsibilities and sections to be completed at NSWC Crane (Attachment A). The minimum elements to be covered as part of this RPP and the administrative or work-site responsibility for their completion is as follows:

- Procedures for selecting the proper respirators for use - Administrative
- Medical evaluations of employees - Administrative/Work site
- Fit testing respiratory protective equipment - Administrative/Work site
- Procedures for proper use and application of respiratory equipment - Administrative
- Maintenance procedures (cleaning, inspection, storage, repairs, and replacement) - Administrative/Work site
- Procedures for atmospheric supplying respirators (air quality, quantity, and delivery) - Administrative/Work site
- Training in all aspects of this program including respiratory hazards, use/application of respiratory protection in controlling these hazards, and program maintenance elements - Administration/Work site
- Program evaluation/modification - Administrative/Work site

The following elements represent the administrative responsibilities to be carried out under the guidance and direction of the HSM in accordance with corporate policy and regulatory requirements as established in 29 CFR 1910.134.

3.1 Procedures For Selecting The Proper Respirators For Use

Currently, respiratory protection fall into four classifications. These are as follows:

- Air Purifying Respirators (APRs) - These include half and full-face mask configurations using filter elements including cartridges and canisters to clean atmospheric air.

- Powered Air Purifying Respirators (PAPRs) - This type of respirator also employs air purifying elements as the APRs above. The primary difference is a power source or battery operated pump establishing positive pressure in an APR.

- Supplied Air Respirators (SARs) - This type of respiratory protection device uses breathing grade quality air (Grade D) supplied via an airline from a source point. This source can be temporary containers (pressurized cylinders) or obtained from an air compressor source. This configuration is always employed with a 5-minute escape cylinder should the source fail or become compromised.

- Self Contained Breathing Apparatus (SCBA) - This is a self contained supply of Grade D breathing air in a portable cylinder attached to a back plate assembly. This configuration provides a portable air source for the user for up to 30 minutes in duration.

From these four respiratory device categories, selection is made to provide Tetra Tech NUS personnel protection from airborne inhalation hazards. Proper selection of respiratory protection for use in the work place takes place in the following manner:

A designated Health and Safety professional analyzes information concerning NSWC Crane including:

- Chemical contaminant(s) and concentrations present

- Quantified or estimated concentrations

- Media (soil, groundwater, etc).

- Chemical and physical properties.
- Permissible Exposure Limits and Threshold Limit Values.
- Routes of exposure.
- Warning properties.
- Conditions for an IDLH situation.
- Toxicological profiles
- Potential migration pathways
- This information is used to estimate potential airborne concentrations given the physical and chemical properties of the contaminant(s).
- The Health and Safety Professional then evaluates the tasks to determine the possibility for exposure. This evaluation includes:
    - Intrusive nature of the task
    - Physical properties and hazards (flammable, explosive, corrosive, shock sensitive, etc.).
    - Determine work conditions including considerations such as hot work operations that may increase hazard potential.
    - Determine if flammable, explosive or other IDLH atmosphere may result.

Once this information is available a logic flow chart (see Figure 1) is used to assist in the selection of respiratory protection equipment.

3.2 Medical Evaluations

Once respiratory protection has been selected, the physiological wellness of the user must be determined. All personnel who are required to wear respiratory protection must be medically evaluated prior to being permitted to do so.

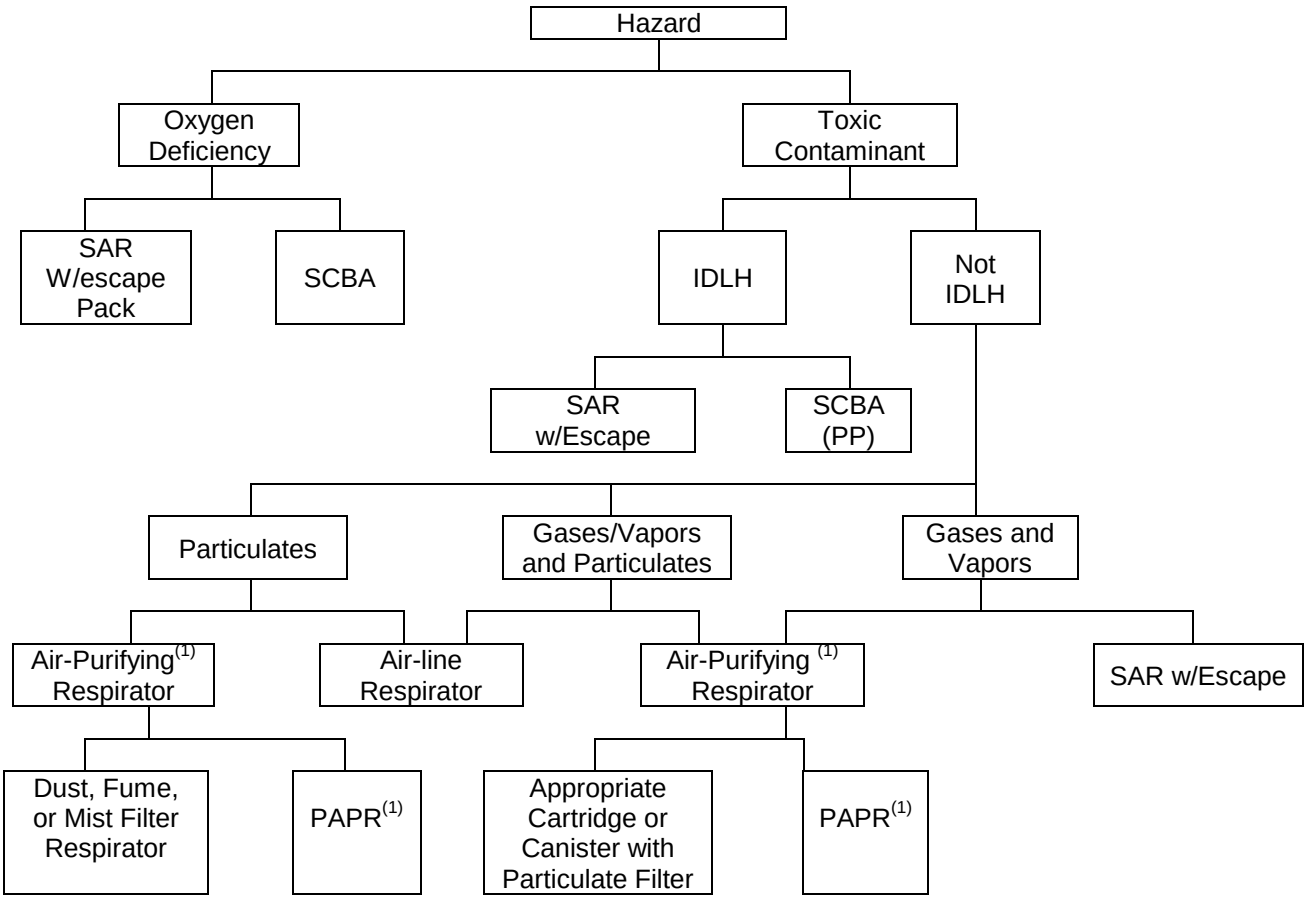
The HSM (with the assistance of the Health Care Management Provider) has defined the medical evaluation protocol for all Tetra Tech NUS personnel. The health care provider will determine through a physical wellness profile and medical screening the ability of Tetra Tech NUS personnel to perform their duties using positive and negative-pressure respiratory protection. Approved personnel will be permitted to use respiratory protection. Under certain conditions during field activities (temperature extremes or heavy work loads) additional biological monitoring may be conducted to monitor cardiovascular and pulmonary activity.

Those individuals not approved by the health care provider to wear respiratory protection while performing assigned duties will be assigned supporting functions not requiring respiratory protection.

Information concerning the exact protocol or questions regarding its content should be directed to the HSM.

FIGURE 1

DECISION LOGIC FLOWCHART
FOR THE
SELECTION OF RESPIRATORY PROTECTION



(1) Conditions and criteria for using air purifying respirator are considered acceptable. This includes:
- Contaminant(s) are known
- Concentrations are quantifiable
- No chance for fire/explosion
- IDLH concentrations will not be achieved
- Approved cartridge/canister is available
- Adequate warning properties

Note: This decision logic flowchart has been structured based on advantages and limitation of the respiratory protection used by Tetra Tech NUS. This information (along with that derived or provided concerning project work-sites or tasks) defines the selection of the appropriate respiratory protection device.

3.3 Fit Testing

All Tetra Tech NUS personnel who are required to wear respiratory protection will be required to be fit tested. Qualitative Fit Testing (QLFT) will be performed as a minimum protocol. This fit testing will be performed to qualify respiratory protective devices for use in service for concentrations of up to 10 times the PEL or TLV. Estimated or potential concentrations in excess of 10 times the PEL will require Quantitative Fit Testing (QNFT).

Fit testing will be provided to Tetra Tech NUS personnel on an as-needed basis as determined by project requirements. Fit testing and re-fit testing will be provided under the following conditions:

- The scope of work defines activities to be conducted which include working with chemical(s) identified in the OSHA standards (29 CFR 1910.1000 series) that have their own fit testing requirements.

- A change in the type(s) of respiratory protection for which the individual had been originally fit tested.

- A change involving the individual fit tested which may impact the respiratory protective device fit. This may include significant weight change, changes in facial composition due to scarring, dental changes, or any change which may adversely impact the face-to-seal fit.

The procedures to be followed for QLFT are provided in Attachment B.

3.4 Procedures for Respirator Use

Under the elements established for this program (and in order to maintain compliance) specified protocol must be maintained. All Tetra Tech NUS wearing respiratory protection will ensure the following:

- All facial hair that may impede the face-piece to face seal is removed. Personnel will be clean-shaven each day when required to wear respiratory protective devices.

- The SSO is to be informed of personnel who must wear corrective lens for vision correction. Vision kits for the respiratory device selected may be obtained and corrective lens prescriptions filled. Contact lenses will be permitted with approval of the HSM.

- Tetra Tech NUS personnel shall inspect the respiratory device prior to use in accordance with section 4.1.1.5. The inspections will include an initial inspection and a functional field inspection. All deficient findings will be reported and repaired regardless of the severity prior to using the device.

- Each time a respirator is doned, a positive and negative pressure check will be performed to ensure proper respirator to face-piece seal

- All air purifying cartridges/canister removed from their wrappers will be dated and the time of installation recorded on the label. If successive use is approved for these cartridges/canisters, each date and time used items will be chronicled on the label.

Note: Reuse of cartridges/canisters will be determined by the End-of-Service-Life-Indicator on the cartridges/canisters and Guidance documents governing on-site activities (HASP, Safe Work Permit, etc.). These documents contain information concerning chemicals, measured concentrations, and warning properties.

- When air-purifying cartridges/canisters are used, they must be made unusable and thrown away.

- Report to the SSO any time task or environmental conditions may be impacting the use of the respirator. This includes temperature extremes, close working quarters, or other PPE which may impede the respiratory device selected.

- All Tetra Tech NUS personnel shall be made aware of associated physiological stresses. Signs and symptoms of physiological stress (such as increased pulse or respiration) should be immediately reported to the SSO. The physiological conditions are as follows:

  Conditions related to heat stress –

  Oral temperature = 100.6°F
  Pulse rate = 110 beats per minute

  Conditions related to cold stress –

  Oral temperature = 95.0°F Core temperature
  Pulse rate = 110 beats per minute

These quantifiable conditions (as well as other signs and symptoms) determine the necessity to increase cooling or warming periods. Work/rest and work/rest periods should be established in accordance with recommendations established by American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values.

The SSO shall continually monitor the work area for conditions which may negatively impact the effectiveness of respiratory protection, as well as, other PPE devices or which may invoked increased stress on Tetra Tech NUS personnel.

3.5 Maintenance Procedures (inspection, cleaning, storage, repairs, and replacement)

Tetra Tech NUS personnel will be responsible for the inspection, cleaning, storage, and minor (manufacturer approved) repairs to the respiratory devices issued.

3.5.1 Inspections

All Tetra Tech NUS personnel will be required to complete an inspection of the respiratory device prior to use. Inspections will occur upon initial receipt and after maintenance procedures have been performed. This will require site personnel to complete a Respirator Inspection Record (See Attachment D). Respirators with identified deficiencies that have been turned in for maintenance will be accompanied by a copy of this inspection record.

3.5.2 Cleaning

Respirators will be cleaned and disinfected after each use. The cleaner and sanitizer used will be a commercially available detergent/disinfectant or when possible those recommended by the manufacturer. Cleaning will proceed as follows:

3.5.2.1 Washing by hand

Add cleaning solution to wash waters. Optimum temperature of the wash waters should be between 90°F (18°C) and not exceed 110°F (43°C).

Disassemble the respirator mask removing the cartridges/canister or low pressure breathing tube, nose cup, speaking diaphragm, spider wheel assembly and one-way disc valve(s), and protective acetate lens cover.

Using a soft brush or sponge clean all accessible parts of the mask. The mask should be permitted to soak in the solution at a minimum one minute in duration and a maximum one hour. This will permit the removal of associated chemical contaminants, and will permit the disinfectant an opportunity to eradicate the majority of microorganisms that may be derived from the user or biological based organisms associated within limited job scope applications. All other areas of the respirator device such as air cylinder, back-plate assembly, when applicable should have the surfaces washed, rinsed, and permitted to dry.

Note: A variety of chemical solutions can be used to remove chemical contaminants from equipment used in field operations. Should an exotic blend of cleaning solutions, other than the detergent/disinfectant described above, be identified for use, approval for such use on respiratory equipment should be obtained from the SSO prior to such use.

3.5.2.2 Rinsing

Respirators, where possible, should be rinsed under running water. Rinse time should also be sufficient to remove all detergent/disinfectant from the mask. Residual detergent/disinfectant left on the mask may cause irritation, rash, or dermatitis to the area of contact. Optimum temperature of the rinse waters should be between 90°F (18°C) and not exceed 110°F (43°C) to avoid damaging the rubber seals and face-piece components.

3.5.2.3 Air drying

Disassembled respirator parts, once cleaned and rinsed, should be allowed to air dry in a clean area other than that from which the respiratory device was disassembled to avoid contamination. All parts should be laid in such a position to minimize distortion of rubber gaskets, face-to-mask seals, etc.

Reassemble the respiratory device once it is dry. Prior to use, test the respiratory device using positive and negative pressure tests to ensure operating status.

3.5.3 Storage

Follow manufacturer's storage instructions, which are always furnished with new respirators or affixed to the lid of the carrying case. The following general instructions may also be helpful:

- After respirators have been inspected, cleaned, and repaired, they will be stored so that they are protected against dust, excessive moisture, damaging chemicals, extreme temperatures, direct sunlight, and mechanical damage or distortion.

- Respirators will be stored in a sealed plastic bag, in wall compartments at workstations, or in a work area designated for emergency equipment. Respirators will be stored in their original carton or a protective carrying case to prevent mechanical damage.

- Each Tetra Tech NUS respirator should be sealed in a plastic bag, placed in a separate box, and tagged for immediate use. The tags recommended for use are fluorescent green adhesive stickers that can be dated and initialed indicating approval for use.

Storage of SCBA/SAR . Check to ensure that

- Cylinder is refilled as necessary and the unit is cleaned and inspected.

- Cylinder valve is closed.

- High-pressure hose connector is tight on cylinder.
- Pressure is bled off high-pressure hose and regulator.
- Bypass valve, as applicable is closed.
- Mainline valve is closed.
- All straps are completely loosened and laid straight.
- Face-piece is properly stored to protect against dust, sunlight, extreme temperatures, excessive moisture, damaging chemicals, and mechanical damage.

All cartridges/canisters, if they have not exceeded their useful life will be bagged and stored separately (i.e., they will not be stored in the APR). It is important to remember once cartridges are removed from their wrapper, they must be dated including the time installed. Thereafter, for each date and time frame, these air purifying elements are used this information must also be recorded on the cartridge/canister.

3.5.4 Repairs

Only a trained person with proper tools and replacement parts shall be permitted to work on respirators. No one should ever attempt to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. Repairs should be made as follows:

- Tetra Tech NUS personnel may assemble and disassemble respiratory components to the level which they been trained and which has been specified through the inspection protocol. Repairs in excess of this level should be routed to the Equipment Manager for repair or to have the respiratory device sent out for repairs by a certified repair service.
- Once repairs have been completed, re-assemble entire respirator, visually inspect completed assembly, and test completed assembly to ensure proper operation.
- Insert new filters, cartridges, or canisters, as required. Make sure that gaskets or seals are in place and tightly sealed.

3.6 Procedures for Supplied Air Respirators (air quality, quantity, and delivery)

In situations where Tetra Tech NUS personnel must use SCBA/SAR, the SSO must insure the following:

Air Quality - Grade D breathing air in accordance with ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989 (or latest edition). If the source of breathing air is supplied in pressurized cylinders for use by Tetra Tech NUS personnel, certification of analysis shall be obtained by the SSO from the supplier indicating Grade D quality.

3.6.1 Pressurized Cylinders

All cylinders used as a source for breathing air shall meet requirements as specified in 49 CFR 173 and 178. These requirements include specifications for:

- Construction
- Classification
- Marking and labeling
- Storage

- Transportation
- Testing

If the source of breathing air is supplied through a compressor, air samples will be periodically extracted to ensure Grade D breathing air quality. The SSO shall ensure, based on the type of compressor, it is equipped as necessary with carbon monoxide and high temperature alarms.

3.6.2 Air Quantity and Delivery

- SAR delivers air to users through the high pressure lines between 80-120 psi to maintain sufficient pressure on the low pressure side to maintain positive pressure.

- All sections of airlines joined together will be combined by locking connections between the user and the source.

- The airline, in order to maintain an average working pressure between 80-120 psi shall not be permitted to exceed 300 feet in total length between the source an individual user.

- Portable cylinders will be fully charged prior to being used for entry in regulated locations. All points of the delivery system between the user and the portable cylinder will have all gaskets and seals in place to minimize inefficient loss of air supplies.

3.7 Training

The HSM will ensure training will be provided to ensure proficiency and uniformity of approach in the use of respiratory equipment for all Tetra Tech NUS personnel. Respiratory protection training at Tetra Tech NUS is provided to personnel during 40-Hour General Site Worker Training in accordance with 29 CFR 1910.120, 8-Hour Refresher Training in accordance with 29 CFR 1910.120 (e)(8), or 8-Hour Management and Supervisory Training.

Training of a minimum content will include:

Respiratory protection -

- Purpose
- Engineering controls
- Selection
- Use - Routine and emergency situations
- Limitations and advantages of the respiratory protection devices
- Physiological stresses of the user
- Elements of this Respiratory Protection Program
- Maintenance (Inspection and Care)
- Respiratory program evaluations/findings

The following information will be included in the site specific training:

- Names of personnel and alternates responsible for the implementation of the site-specific RPP

- Safety, health and other hazards present on site

- Selection of respiratory protection

- Work practices to minimize risks from hazards

- Safe use of engineering controls and equipment

- Medical surveillance requirements

- Procedures for proper use of respiratory equipment to be employed
  - Donning and doffing
  - Routine use and foreseeable emergency situations
  - Action levels for upgrade in protective levels and evacuation procedures
  - IDLH atmosphere rescue support
  - Supplied air respirators (air quality, quantities, and delivery systems)

- Respiratory protection maintenance procedures including inspection, cleaning, storing and repairing respiratory protection.

- The contents of the health and safety plan including Tables 5-1 and 6-1 regarding health effects and physical properties of the contaminants and associated control measures.

- Fit testing documentation

Annual refresher training will be provided to Tetra Tech NUS personnel.

Additional training may be required when unacceptable levels of deficiencies are noted through work-site and program evaluations. These may include:

- Deficiencies in employee comprehension concerning respiratory protection and the elements of this program.
- Program based deficiencies
- New or modified respiratory equipment is introduced

All initial, refresher, and retraining will be supported by content examinations and hands on application.

3.7.1 Testing

A written examination is used to test Tetra Tech NUS personnel. A minimum test score of 70% is required to receive a passing grade. All tests are reviewed with Tetra Tech NUS personnel to provide opportunity for discussion. A practical examination is also administered. At a minimum Tetra Tech NUS personnel are required to disassemble and assemble respiratory protective devices including APRs and SCBAs. Individuals are also required to trouble shoot respiratory protective devices. Pass or fail in this application is based on a functional respiratory device after the exercise. Failure will require review of the material and the exercise to be re-conducted until successful completion.

3.7.2 Trainer's Qualifications

Training may be conducted by only those individuals specified through job experience or academic credentials regarding respiratory protection. These individuals must also be approved by the HSM.

Training documentation for work-site personnel will utilize Attachment D. For record-keeping purposes a copy of Attachment D will be maintained with NSWC Crane specific respiratory program.

3.8 Program Evaluation

In order to ensure effectiveness of this program the HSM or designated representative will evaluate the implementation of this program at various work-sites. The evaluation will include pre-, during, and post-activity appraisals. The evaluations will include:

- Employee comprehension of the RPP.
- Employee use and application of respiratory protective devices.
- Employee comment regarding selection and effectiveness of the respiratory devices selected.
- Respirator maintenance including inspection, cleaning, and storage.
- Record Keeping

  - Medical evaluation for each employee who will wear respiratory protection
  - Fit Test results for each employee who will wear respiratory protection
  - Completed Site-Specific Respiratory Protection Program (See Attachment A).

This evaluation will be performed on a periodic basis, but not less than once a year. This minimum frequency may be increased based on the findings generated from the evaluations.

4.0 SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

This Site-Specific Respiratory Protection Program (SRPP) defines responsibilities, administrative procedures, training, and program evaluation. The second segment of the program identifies Tetra Tech NUS project work-site function and application of these identified program elements.

4.1 Work Site Responsibilities Of The Identified Program Elements

The following elements represent NSWC Crane responsibilities to be carried out under the guidance and direction of the HSM in accordance with corporate policy and regulatory requirements as established in 29 CFR 1910.134. The person responsible for the execution of these elements and record-keeping requirements is the SSO (or the FOL when the SSO is not available). The following information provides a summary background of the requirements. Completion of Attachment A will satisfy NSWC Crane portion of this program.

- Medical evaluations of employees
- Fit testing respiratory protective equipment
- Maintenance procedures (cleaning, inspection, storage, repairs, and replacement)
- Procedures for atmospheric supplying respirators (air quality, quantity, and delivery)
- Training in all aspects of this program including respiratory hazards, use/application of respiratory protection in controlling these hazards, and program maintenance elements
- Program evaluation/modification

4.1.1 Medical Evaluations

The work-site responsibility for medical evaluations is primarily record-keeping. It is the responsibility of the FOL or acting SSO to ensure all Tetra Tech NUS personnel and subcontractor personnel provide documentation regarding medical evaluation and clearance to wear respiratory protection. Documentation stipulating medical evaluation and clearance to use respiratory protection shall be obtained from a licensed health care provider and is maintained on-site. Under no circumstances will persons be permitted to use respiratory protection (whether it is of their own volition or it is a required use of respiratory protection) unless medical evaluation documentation is available on site for that person(s).

4.1.2 Fit Testing

This work-site function entails two primary functions, which must be carried by the FOL or SSO. These include record-keeping activities and actual fit testing. Conditions of these activities are as follows:

- Documentation will be maintained on-site regarding Fit Tests for all Tetra Tech NUS and subcontractor persons who will wear respiratory protection. The Fit Tests documentation will be for the types of respiratory protection to be worn in support of on-site activities. If multiple types are to be employed, Fit Test records must be available for each type of respiratory protection to be used. This includes both negative and positive pressure masks.

- Fit Tests for each type of mask will be conducted on-site. The SSO and/or the FOL shall perform fit testing in accordance with the fit test protocol established in Attachment B.

4.1.3 Maintenance Procedures

On-site personnel are responsible for the maintenance and upkeep of the respiratory protection assigned. This includes inspection, cleaning, manufacturer approved level repairs, and storage. The FOL and/or the SSO will be responsible for ensuring the completed documentation (Attachment C) is collected, collated, and filed.

4.1.4 Procedures for Atmospheric Supplying Respirators (air quality, quantity, and delivery) - Administrative/Work site

In situations where Tetra Tech NUS personnel must use SAR/SCBA, the FOL and/or the SSO must insure the following:

- Documentation is obtained from the supplier attesting to the air Quality - Grade D breathing air in accordance with ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

- All cylinders used as a source for breathing air shall meet requirements as specified in 49 CFR 173 and 178. Work site responsibilities pertaining to these requirements include:

  – Construction - Visual inspection of cylinders to ensure no evidence of leaks, bulges, physical abuse, excessive corrosion, fire/heat damage, defective safety devices.

  – Classification - Nonflammable gas, oxygen compressed, U.N. 2.2. Documentation will also be requested concerning USP Grade D breathing air certification.

  – Marking and labeling - Work site responsibility includes ensuring the cylinders received have the appropriate markings. This would include the DOT or UN classification. Breathing air cylinders used by Tetra Tech NUS are DOT-3AA2400. This number may be followed sequentially by an Inspectors Identification number XXXX and then a date designation

    DOT-3AA2400-1234-8-98 or DOT-3AA2400 (Cylinder type and service pressure)
    1234 (Inspector's I.D. Number)
    8-98 (Date)

4.1.4.1 Storage

- All cylinders will be stored in the vertical upright position.
- All cylinders will be stored to prevent physical damage.
- All cylinders when in use should be accompanied by a hood to protect the valve stem, as designs permit.
- All cylinders when not in use will have their caps replaced, again to protect the valve stem.
- All cylinders will be stored separately from flammable and incompatible materials.

4.1.4.2 Transportation

- Cylinders transported via site equipment will be done so in the vertical position with protective caps in place.
- Work site vehicles will require placarding for the transport of cylinders if the weight of the cylinders cumulatively is in excess of 1,000 pounds.

4.1.4.3 Testing

The SSO and/or the FOL will be responsible for ensuring the cylinders received have been hydrostatically tested within the last ten years. This is determined looking at the last test date as indicated under marking and labeling above. Portable cylinders such as the types used on SCBAs and SAR units will require hydrostatic testing of a different frequency. These are as follows:

- Aluminum wrapped in fiberglass - Hydrostatically tested every 3 years, for a total of 5 test cycles or 15 years.
- Steel or aluminum - Hydrostatically tested every 5 years for as long as the cylinders pass the testing criteria.

If the source of breathing air is supplied through a compressor, air samples will be periodically extracted to ensure Grade D breathing air quality. The SSO shall ensure, based on the type of compressor, it is equipped as necessary with carbon monoxide and high temperature alarms.

4.1.4.4 Air Quantity And Delivery

- Air will be delivered to users through the high-pressure lines between 80-120 psi, to maintain sufficient pressure on the low pressure side to maintain positive pressure.

- Additionally, all sections of airlines joined together will be combined by locking connections between the user and the source.

- The airline, in order to maintain an average working pressure between 80-120 psi shall not be permitted to exceed 300 feet in total length between the source an individual user.

4.1.5 Training

All site personnel will be properly trained on the respiratory protection at the site prior to use. This training will be conducted/coordinated by the SSO and include classroom-style instruction, opportunities to wear the respirator, fit-testing (see 4.1.2), and other pertinent topics. The provision of this training will be documented using training records for the personnel on-site for the types of respiratory protection to be employed.

In addition to the record-keeping function, the SSO and/or the FOL will be responsible for completing Attachment A which will include the elements of this respiratory protection program. Site-specific training documentation is provided as part of site-specific training for the HASP or as stand-alone provided in Attachment D.

Trainer's Qualifications - Training may only be conducted by those individuals specified through job experience or academic credentials regarding respiratory protection. These individuals must also be approved by the HSM.

4.1.6 Program Evaluation

This activity will be supported by site personnel using the respiratory equipment. This function will entail providing information to the SSO and the HSM regarding the performance and the suitability of the respiratory protective devices used. This information may be provided in the following formats:

- Documented on the back of the Safe Work Permit(s) you are operating under, thereby identifying the activity for which the respiratory protection evaluation is pertaining to.

- Written documentation - This format must also identify tasks and activities that were being conducted for which this evaluation pertains to.

- Verbal to the SSO and/or the FOL which are then required to document the evaluation as a logbook entry.

In all cases information pertaining respiratory protection performance and suitability regarding application will be maintained as part of NSWC Crane file and copied to the HSM who will determine the need or conditions for modification.

APPENDIX I

DEFINITIONS

Atmosphere-supplying respirator means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) Tetra Tech NUSs.

Canister or cartridge means a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Emergency situation means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee exposure means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respirator protection.

End-of-service-life indicator (ESLI) means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator means a respirator intended to be used only for emergency exit.

Filter or air purifying element means a component used in respirators to remove solid or liquid aerosols from the inspired air.

Fit test means the use of a protocol to quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test QLFT and Quantitative fit test QNFT.)

High efficiency particulate air (HEPA) filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Immediately dangerous to life or health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individuals ability to escape from a dangerous atmosphere.

Maximum use concentration (MUC) means a respiratory protective device may be employed in concentrations of hazardous chemicals up to the protective factor assigned to the mask, times the Permissible Exposure Limit or Threshold Limit Value. It should be noted, that this qualifies the respirator mask capabilities and does not address the full criterion for respirator selection regarding the use of air purifying versus atmosphere supplying.

Negative pressure respirator (tight fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator

Oxygen deficient atmosphere means an atmosphere with an oxygen content below 19.5% by volume.

Physician or other licensed health care professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e) of this section.

Positive pressure respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator means a positive pressure atmopshere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that resides on the individual's response to the test agent.

Quantitative fit test (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Self-contained breathing apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life means the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-air respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

ATTACHMENT A

NSWC CRANE
RESPIRATORY PROTECTION PROGRAM

NAVAL SURFACE WARFARE CENTER CRANE
RESPIRATORY PROTECTION PROGRAM

The following information pertaining to the use of respiratory protection is to be completed by the Site Health and Safety Officer (SSO), their duly appointed representative, or the Field Operations Leader (FOL). The use of respiratory protection will be specified as identified per the HASP or as determined through hazard assessment of the tasks and potential hazards, which may be involved.

Personnel Responsible for Program Completion

The following persons are available to provide assistance in all elements of this program including question/conflict resolution and modification variances. These persons exercise the primary responsibility for the implementation of this site-specific program.

I) **SSO (On-site Program Administrator):** TBD **Phone:**
Field Operations Leader: Thomas Johnston, Ph.D **Phone:** (412) 921-8615
Project H&Safety Officer: Thomas M. Dickson, CSP **Phone:** (412) 921-8457
Health and Safety Manager: Matthew M. Soltis, CIH, CSP **Phone:** (412) 921-8912

Personnel Who by Way of Assignment Will Wear Respiratory Protection

The following lists of personnel represent Tetra Tech NUS, Inc. personnel or subcontractor personnel working under the provision of this respiratory protection program. The persons listed below represent only those who will actively employ respiratory protection by way of assignment or of their own volition.

II)

Personnel	Make/Model of Respiratory Protective Devices to be used	Medical Evaluation(s)(1)	Fit Tested(2)
Keith Simpson	MSA Advantage 1000 CBA-RCA		
	MSA Ultra-Lite II SCBA		

(1) Medical Qualifications for all personnel who will wear respiratory protection by way of assignment or of their own volition shall be attached.
(2) Fit test records for each type of respiratory protection site personnel will employ shall also be attached to this program.

Inspection Qualification of Respiratory Devices to Be Used

The following information provides a summary sheet of the inspections performed on respiratory devices to be used on-site.

III)

Personnel (Person Issued the Respiratory Device Performing the Inspection)	Make/Model of Respiratory Protective Devices to be used	Deficiencies[3]	Supervisor/Responsible Person Review
TBD			

(3) Respirator Inspection Checklist shall be attached for each respiratory device listed above. All respirators inspected shall be tagged or stickered to indicate inspection status.

IIIA) Supplied Air

Cylinder Identification Number	Hydrostatic Test Date[4] and Inspectors identification Number		Certification of Grade D Breathing Air Quality[5]	Airlines, Connections, and Gauges[6]
TBD				

(4) Hydrostatic Test Frequencies are as follows:
- Aluminum wrapped fiberglass SCBA/SAR cylinders - every 3 years for a total of 5 inspection cycles
- Steel or aluminum SCBA/SAR cylinders - every 5 years
- Steel supply cylinders (source type) - every 10 years

(5) Certification of Grade D Breathing air will be supported by documentation supplied by the supplier stipulating Lot number and air quality or if air is supplied via a compressor the sample number attesting to the air quality.

(6) Delivery airlines no greater than 300 feet from source to user; operating pressure 80-120psi; locking connections between source and user

Respiratory Protection Use and Application

The following table represents only tasks to be initiated in Level B or C, or if a task through achieving an elevated level of protection by surpassing established action levels.

IV) Classification of Respiratory hazard

Task(s) to be Completed(7)	Contaminants of Concern and associated PEL or TLV	Estimated Airborne Concentrations and Media(8)	Classification of Respiratory Hazard/Level of Protection(9)	Action Levels for Upgrade/Evacuation(7)
Soil Borings	Refer to Table 6-1 of the HASP	Undetermined	Level C (with contingencies to upgrade to Level B)	- > 50 ppm (solvents) - any detection (CWM) - > 250 cpm (radioactivity)

(7) Each task which will employ respiratory protection will be listed.
(8) Estimated airborne concentrations may be obtained from the Health Sciences group.
(9) Classification of the type of respiratory hazard:

Oxygen deficiency
Gas/vapor
particulate(dust, fume, smoke, fog, mist)
Immediately Dangerous to Life or Health

RESPIRATORY PROTECTION TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potentially hazardous nature of performing work under respiratory protection at NSWC Crane, and that I have received project-specific respiratory protection training, which included the elements presented below:

- Names of personnel and alternates responsible for the implementation of the site-specific respiratory protection program
- Safety, health and other hazards present on site
- Selection of respiratory protection
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Procedures for proper use of respiratory equipment to be employed
    - Donning and doffing
    - Routine use and foreseeable emergency situations
    - Action levels for upgrade in protective levels and evacuation procedures
    - IDLH atmosphere rescue support
    - Supplied air respirators (air quality, quantities, and delivery systems)
- Respiratory protection maintenance procedures including inspection, cleaning, storing and repairing respiratory protection.
- Where applicable the contents of the health and safety plan including Tables 5-1 and 6-1 regarding health effects and physical properties of the contaminants and associated control measures. In situations where a HASP is not employed Tetra Tech NUS personnel will review contents of relevant Material Safety Data Sheets or other information where physical, chemical, and toxicological information may exist.
- Fit testing documentation

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

NAME(Print)	DATE	SIGNATURE

INSTRUCTOR(S): _____

_____

_____

ATTACHMENT B

RESPIRATOR FIT TESTING

RESPIRATOR FIT-TESTING

There are several manufacturers (Wilson, Norton, MSA, Scott, etc.) who carry respirators approved by NIOSH. Each company manufactures one or more air-purifying cartridge/canister respirator. Each make and model has a slightly different fit. Although each manufacturer designs his facepieces to fit a broad section of the working population as possible, no respirator marketed will fit everyone. Conditions that affect a good facepiece fit include: growth of beard, sideburns, a skull cap that projects under the facepiece, temple pieces on glasses, facial scars, facial injuries, and presence or absence of dentures. Therefore Tetra Tech NUS shall select several manufacturers so that each employee can take advantage of the different fitting characteristics to find a respirator that fits properly. Also, the opportunity to select from various manufacturers allows the wearer to choose a respirator that is reasonably comfortable while providing good protection. It is in the process of matching the respirator to the individual user that a FIT-testing procedure is needed.

OSHA regulations (29 CFR Part 1910.134) requires that each person who wears a respirator shall have it properly fitted, test the facepiece to face seal, and wear it in a test atmosphere. In compliance with this regulation, each respirator user should be given a fit test to determine his/her ability to obtain a satisfactory fit with a "negative-pressure," air-purifying respirator (half or full-face) and positive pressure masks. The results of the fit test will be used to select the specific type, make, and model of the mask which is most comfortable and fits best for use by the wearer.

The following policies shall be adhered to in the fitting and use of the negative and positive pressure respirator masks:

1. An employee must have passed the FIT test in order to use a respirator.

2. If it is found that an employee cannot obtain a good respirator-to-face seal because of facial or medical characteristics, that employee will not use and/or enter an atmosphere that will require the use of a respirator.

3. Facial hair such as beards, sideburns, or certain mustaches that may interfere with the fit test are not allowed.

4. Persons requiring corrective lenses shall be provided with specially mounted lenses inside the full-face mask. Under no circumstances will contact lenses and/or glasses be worn while using respirators.

5. A person may only use the specific make(s) and model(s) of air-purifying respirators for which he has obtained a satisfactory fit via the qualitative FIT-testing procedures. Under no circumstances shall a person be allowed to use any make or model respirator in which he has not passed a FIT-test.

In the fulfillment of the commitment to comply with the FIT-testing requirement, Tetra Tech NUS has selected qualitative FIT -testing for concentrations of up to 10 times the PEL or TLV which ever is more conservative rather than quantitative FIT-testing procedures. Quantitative FIT-testing will be employed when estimated or potential concentrations can exceed 10 times the PEL or TLV.

Qualitative FIT-test procedures involve two stages of testing. Stage I involves a simple respirator positive and negative-pressure seal check for facepiece fit. Stage II involves the exposure of the respirator wearer to a test atmosphere. This will include two separate atmosphere tests to double-check the adequate fit of the respirator.

Stage I

Positive-Pressure Sealing Check for Air-Purifying Respirators

This test is performed after donning an air-purifying respirator that contains an exhalation and inhalation valve. The test is conducted by closing off the exhalation valve and exhaling gently. The fit of a respirator equipped with a facepiece is considered to be satisfactory if a slight positive pressure can be built up inside the facepiece for at least 10 seconds without detecting any outward leakage of air between the sealing surface of the facepiece and the respirator wearer's face.

This test is made as a gross determination of fit prior to the respirator being used in a toxic atmosphere. This test shall be used each time the user must enter a toxic atmosphere.

Negative-Pressure Sealing Check for Air-Purifying Respirators

The wearer can perform this test by himself or herself in the field or office after donning the air-purifying respirator. The test is performed by closing off the inlet opening of the respirator cartridge(s) by covering it with the palm of the hand(s) so that it will not allow the passage of air. Then, by inhaling gently, and holding the breath for at least 10 seconds, the face-piece should collapse slightly and no inward leakage of air into the facepiece should be detected. If no leakage is perceived, it can be reasonably assumed that the fit of the respirator to the wearer is satisfactory.

This test, like the positive-pressure sealing check, is to be used as a gross determination of fit prior to the respirator being used in a toxic/ atmosphere. (Both the positive and negative-pressure sealing checks can be used on the SCBA air mask to determine the gross fit characteristics.) This test shall be used just before entering any toxic atmosphere.

Stage II

A person wearing an air-purifying respirator will be exposed to two test agents: isoamyl acetate--an odorous vapor--and stannic chloride--an irritant smoke. A respirator mask equipped with an air-purifying cartridge/canister, which effectively removes the test agents from respired air. If the respirator wearer is unable to detect penetration of the test agent into the respirator, he has achieved a satisfactory fit. FIT-test results must be documented using a form like that provided in this section.

Procedures for the Isoamyl Acetate Test

Isoamyl acetate is a chemical that produces a pleasant banana-smelling organic vapor. It is an easily detectable odor. The isoamyl acetate FIT-test will be conducted by using a plastic garbage bag as a test hood covering hung from the ceiling over a coat hanger suspended by twine or other suitable enclosure. Inside the enclosure ampoules will be broken to release sufficient concentrations (10-50 ppm) to be detected if a seal is not sufficient. This test is a FIT-check protocol, which will be used to check a respirator face-to-mask seal, prior to exposing the test subject to irritant smoke. The following isoamyl acetate FIT-check will be performed as follows:

1. The wearer puts on the respirator in a normal manner. If it is an air-purifying device, it must be equipped with a cartridge(s) specifically designed for protection against organic vapors. Positive and negative pressure checks are performed.

2. Upon successful completion of the positive and negative pressure checks, the wearer enters the test enclosure, so that his head and shoulders are well inside the enclosure.

3. The Tester breaks an ampoule containing the isoamyl acetate and allows the test enclosure to capture the vapors generated. If the wearer smells banana oil, he/she returns to clean air until no longer detecting the odor of isoamyl acetate. Upon clearing mask, readjusts the facepiece and/or adjusts the headstraps without unduly tightening them, and re-tests. The test subject will not submit to the stannic chloride test until successfully passing the isoamyl acetate test.

FIT-TEST RECORD

Name:_____

Location:_____

Signature:_____Date:_____

Name of FIT-TESTER:_____

Signature:_____Date:_____

TYPE OF TEST	ISOAMYL ACETATE	IRRITANT SMOKE
Type of Mask: Manufacturer: Model:	Pass/Fail	Pass/Fail
Type of Mask: Manufacturer: Model:	Pass/Fail	Pass/Fail
Type of Mask: Manufacturer: Model:	Pass/Fail	Pass/Fail
Type of Mask: Manufacturer: Model:	Pass/Fail	Pass/Fail
Type of Mask: Manufacturer: Model:	Pass/Fail	Pass/Fail

Comments:_____

_____

_____

4. The wearer repeats the second step. If he/she does not smell banana oil, he/she is assumed to have obtained a satisfactory fit. If he/she smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried. If this leaks, another brand of respirator with a facepiece of the same type should be tried.

5. After satisfactory fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridge(s), or canister for the anticipated hazard.

During the test, the subject makes movements that approximate a normal working situation. This may include the following:

1. Normal breathing.
2. Deep breathing, as during heavy exertion.
3. Side-to-side and up-and-down head movements. These movements should be exaggerated.
4. Talking. This is most easily accomplished by reading a prepared text and/or reciting the alphabet loudly enough to be understood by someone standing nearby.
5. Other exercises may be added depending upon the situation. For example, if the wearer is going to spend a significant part of his time bent over at some task, it may be desirable to include an exercise approximating this bending.

The major drawback of the isoamyl acetate test is that the odor threshold varies widely among individuals. Furthermore, the sense of smell is easily dulled and may deteriorate during the test so that the wearer can detect only high vapor concentrations. Another disadvantage is that isoamyl acetate smells pleasant, even in high concentrations. Therefore, a wearer may say that the respirator fits although it has a large leak. Therefore, these test results must be checked carefully and confirmed by the next test atmosphere.

Procedures for the Irritant Smoke (Stannic Chloride) Test

This qualitative test is similar to the isoamyl test in concept. It involves exposing the respirator wearer to an irritating smoke. Sealed glass tubes, approximately 12 cm long by 1 cm in diameter, filled with pumice impregnated with stannic chloride are used to produce the smoke. When the tube ends are broken and air is allowed to enter, the material inside reacts with the moisture in the air to produce a dense, highly-irritating smoke.

As a qualitative means of determining respirator fit, this test has a distinct advantage in that the wearer usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of his/her giving a false indication of proper fit is reduced. However, because this smoke is very irritating, it can cause problems for the test applicators or other persons in the same room. Therefore, it is advisable to have good ventilation in the room in which the testing is to be conducted.

The irritant smoke test will be conducted by using a plastic garbage bag or other suitable enclosure as a test hood. The bag shall be hung from the ceiling over a coat hanger suspended by twine. If a bag is used, a small hole is made in the top portion of the bag so that the irritant smoke can be dispensed into the bag when the test subject has entered the bag.

The air-purifying respirator to be used in this test must be equipped with a high-efficiency particulate filter. The irritant smoke FIT-test will be performed as follows:

1. The wearer puts on the respirator normally, taking care not to tighten the headstraps uncomfortably. Once the respirator is on, positive and negative pressure checks are performed. Upon successful completion of the positive and negative pressure checks, the subject is to enter the suspended bag so that his head and shoulders are well inside the enclosure.

2. Once the subject is inside the bag, the tester will introduce the smoke, still remaining alert to the wearer's reactions.

3. If the wearer detects no leakage, the tester may increase the smoke density, still remaining alert to the wearer's reaction.

4. At this point, if no leakage has been detected, the wearer may cautiously begin the head movements and exercises mentioned in the isoamyl acetate test. The tester should remain especially alert and be prepared to stop producing smoke immediately and remove the subject from the bag.

5. If a leakage is detected at any time, the tester should stop the smoke and let the wearer out of the bag to readjust the facepiece or headstrap tension. The tester should then start the test over at step 1.

6. If at the end of all the movements and exercises the wearer is unable to detect penetration of the irritant smoke into the respirator, the respirator wearer has a satisfactory fit.

7. After the test is completed, the subject should be removed from the test atmosphere.

ATTACHMENT C

RESPIRATOR INSPECTION CHECKLIST

RESPIRATOR INSPECTION CHECKLIST

Type and Model Number _____ Manufacturer _____
Location of Respirator _____ Inspector _____
Serial Number _____ Date: _____

All Respirators

1. Storage:

(a) Properly Stored ..... Yes No (b) Sanitized ..... Yes No
(c) Cleaned & Packaged ..... Yes No (d) Accessible ..... Yes No
(e) Other Comments/Corrective Actions _____

2. Examine Face-piece for:

(a) Clean/Odor Free ..... Yes No (b) Cracked Lens, Scratches ..... Yes No
(c) Flexibility (flexible)..... Yes No (d) Cracks, tears, holes, or distortion..... Yes No
(e) Connectors, clamps, mounting clips OK..... Yes No
(f) Other Comments/Corrective Actions _____

3. Examine Head straps:

(a) Loss of elasticity..... Yes No (b) Any breaks or fraying..... Yes No
(c) Buckles or snaps good..... Yes No (d) Clean & in good condition..... Yes No
(e) Other Comments/Corrective Actions _____

4. Exhalation Valve: (Remove Cover)

(a) Any foreign material on seal Yes No (b) Any cracks, tears, or distortion..... Yes No
(c) Properly inserted valve & Valve Body..... Yes No (d) Valve cover proper..... Yes No
(e) Other Comments/Corrective Actions _____

AIR PURIFYING RESPIRATORS ONLY

5. Air Purifying Element Holder:

(a) Cracked or broken ..... Yes No (b) Gasket present and in good condition ..... Yes No
(c) Badly worn threads ..... Yes No
(d) Other Comments/Corrective Actions _____

6. Air Purifying Element:

(a) Correct Cartridge, etc..... for hazard..... Yes No (b) Correct cartridge for respirator ..... Yes No
(c) Evidence of cross-threading Yes No (d) Shelf-life current ..... Yes No
(e) Other Comments/Corrective Actions _____

7. Canister Type Respirator:

(a) Breathing tube good condition..... Yes No (b) Missing or loose hose clamps ..... Yes No
(c) Broken/missing end connectors ..... Yes No (d) Canister harness OK ..... Yes No
(e) Broken straps or fastenings . Yes No (f) Shelf-life on canister current..... Yes No
(g) Canister previously void..... Yes No
(h) Other Comments/Corrective Actions _____

SELF CONTAINED BREATHING APPARATUS (SCBA)
SUPPLIED AIR RESPIRATOR (SAR)

8. Inspect For:

(a) Type D Breathing Air..... Yes No
(b) Cylinder sufficiently charged..... Yes No
(c) Alarms Work ..... Yes No
(d) Valves function properly ..... Yes No
(e) Harness good condition ..... Yes No
(f) Properly stored & cleaned ..... Yes No
(g) Unit accessible..... Yes No
(h) Airlines structurally sound..... Yes No
(i) Locking connections between air liner sections ..... Yes No
(j) Air pressure maintained to 80-120 psi..... Yes No
(k) Number of feet of airline used _____
(l) Tanks (hydrostatically tested)..... Yes No
(m) Hydrostatic Testing in compliance..... Yes No
(n) CO absorbent canister OK) (closed-circuit devices) Yes No
(o) Other Comments/Corrective Actions _____

OTHER

9. Hoods, Helmets, Blouses, or Suits:

(a) Properly stored..... Yes No
(b) Suspension good condition ..... Yes No
(c) Integrity OK; No split seams, rips, or tears ..... Yes No
(d) Vision through face-piece adequate..... Yes No
(e) Protective Screen intact ..... Yes No
(f) Type “D” Breathing Air ..... Yes No
(g) Compressor in OSHA compliance compliance (if used)..... Yes No
(h) Regulators and valves good condition & functioning properly..... Yes No
(i) Integrity of airlines & hoses OK ..... Yes No
(j) Other Comments/Corrective Actions _____

ONE-USE DISPOSAL RESPIRATORS

10. Examine Full Face-piece for:

(a) Stored in proper manner ..... Yes No
(b) Used without modification..... Yes No
(c) Used properly..... Yes No
(d) Other Comments/Corrective Actions _____

ATTACHMENT C-II

SELF-CONTAINED BREATHING APPARATUS

CHECKOUT PROCEDURE

SELF-CONTAINED BREATHING APPARATUS (SCBA)

Introduction

The self-contained breathing apparatus is the most effective of the protective breathing devices. SCBAs/SARs are used if the nature of the respiratory hazard is unknown or if the concentration of toxic pollutants is too high to allow the use of air-purifying respirators.

Inspection of Positive-Pressure, Self-Contained Breathing Apparatus

The following checklist is to be used by Tetra Tech NUS personnel whenever they have to check out an SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repair person.)

Note: This check out procedure is specifically directed at MSA equipment, which is the primary type employed by Tetra Tech NUS. The actual checklist may vary if other manufacturer's equipment is used. Therefore, when other manufacturers equipment is used a check out list shall be obtained from that manufacturer to direct sit personnel in the inspection.

1. Preliminary inspection. Check to ensure that

    a. O-ring in high-pressure hose connector is not cut, frayed, or damaged.
    b. High-pressure hose connector is tight on cylinder fitting.
    c. Bypass valve is closed.
    d. Mainline valve is closed.
    e. There is no cover or obstruction on regulator outlet.
    f. Pressure in the tank is at least 1800 psi.

2. Backpack and harness assembly

    a. Straps
        (1) Visually inspect for complete set.
        (2) Visually inspect for frayed or damaged straps that may break during use.
        (3) Visually inspect all rivets to ensure integrity.
        (4) Assure that they are not tangled.

b. Buckles

(1) Visually inspect for mating ends.

(2) Check locking function.

c. Backplate and cylinder lock

(1) Visually inspect backplate for cracks and for missing rivets or screws.

(2) Visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged.

3. Cylinder and cylinder valve assembly

a. Cylinder

(1) Physically check cylinder to ensure that it is tightly fastened to backplate.

(2) Check hydrostatic test date to ensure that it is current.[1]

(3) Visually inspect cylinder for large dents or gouges in metal.*

b. Head and valve assembly

(1) Visually inspect cylinder gauge for condition of face, needle, and lens.*

(2) Open cylinder valve and listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.)

4. Regulator and high-pressure hose

a. High-pressure hose and connector

Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)

[1]Monthly inspection only.

b. Regulator and low-pressure alarm

(1) Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1800 psi and not more than rated cylinder pressure).

(2) Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.

(3) Place a napkin or other suitable barrier around the regulator outlet. Next place your mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 sec without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 sec. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

(4) Open cylinder valve.

(5) Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.

(6) Ascertain that no obstruction is in or over the regulator outlet. Open and close bypass valve momentarily to ensure flow of air through bypass system.

c. Don backpack.

5. Facepiece and corrugated breathing tube

a. Facepiece

(1) Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.

(2) Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and for cracks or large scratches.

(3) Visually inspect exhalation valve for visible deterioration or foreign materials buildup.

b. Breathing tube and connector

(1) Visually inspect for deterioration and holes.

(2) Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.

(3) Negative-pressure test on facepiece

(a) Don backpack and facepiece.

(b) Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 sec. If this is not accomplished, the facepiece assembly is not adequate and should not be worn.

Recharging SCBA Air Cylinder

The air cylinder of an open-circuit (SCBA) can supply air for up to 30 or 60 minutes, depending on the units rating. Then the cylinder must be removed and refilled, either by an air compressor or a cascade system. A cascade system consists of several large air cylinders and a filling system. This system is used almost exclusively on sites. All persons who must wear a SCBA should be familiar with the proper procedures for recharging the cylinder.

Procedure

The recharging system operates on the principle of cascading, the equalization of pressure between the supply cylinders and the apparatus cylinder in sequence. The proper procedure for SCBA recharging is as follows:

1. Open and close the valve on each supply cylinder to find its air pressure relative to other supply cylinders.
2. Mark the appropriate pressures directly on the cylinders.
3. Attach high pressure hose from cascade manifold to SCBA cylinder valve.
4. Check pressure in SCBA cylinder.
5. Slowly open valve on SCBA cylinder.
6. Slowly open valve on high-pressure hose from cascade manifold.
7. Determine which supply cylinder should be used to begin the cascading operation. The supply cylinder with the lowest pressure, yet has a greater pressure than that in the SCBA cylinder should be used.
8. Slowly open the valve on this supply cylinder No. 1.
9. When pressure on the manifold gauge stabilizes, pressure in the two cylinders has equalized.
10. Close the supply cylinder valve.
11. Mark the new pressure reading on the supply cylinder used.
12. If apparatus cylinder has not reached desired pressure; repeat procedure using the next highest pressure cylinder.
13. If the final supply cylinder does not fully recharge apparatus cylinder, remove supply cylinder No. 1 and replace with a full cylinder.
14. Return to Step No. 7.
15. Once the SCBA cylinder is at the desired pressure, close all values in the system and disconnect it from the cascade high-pressure hose.
16. Mark any empty supply cylinders so that they can be identified and replaced.

APPENDIX O

DRUM/CONTAINER MANAGEMENT PLAN

DRUM/CONTAINER MANAGEMENT PLAN

1.0 INTRODUCTION

Accidents may occur during handling of drums and other hazardous waste containers. Hazards include detonations, fires, explosions, vapor generation, and physical injury resulting from sudden pressure releases, moving heavy containers by hand and working around stacked drums, heavy equipment, and deteriorated drums. While these hazards may always be present, proper work practices such as minimizing drum handling, and using equipment or procedures that isolate workers from hazardous substances, can minimize the risks to site personnel.

This plan defines practices and procedures for safe handling of drums and other hazardous waste containers. It is intended to aid the Task Order Manager/Project Manager in setting up a waste container handling program. Information contained in this plan was obtained from the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985), and OSHA 29 CFR 1910.120 (j), Handling drums and containers.

2.0 INSPECTION

The appropriate procedures for handling drums/containers depend on the contents. Thus, prior to any handling, drums/containers should be visually inspected to gain as much information as possible about their contents. The inspection should include looking for the following items:

- Symbols, words, or other marks on the drum indicating that its contents are hazardous, (e.g., radioactive, explosive, corrosive, toxic, flammable).

- Signs of deterioration such as corrosion, rust, and leaks.

- Drum type (see Table 2-1 "Special Drum Types"). Drums and containers which do not meet these definitions will be addressed accordingly.

- Configuration of the drumhead (see Table 2-2)

Conditions in the immediate vicinity of the drums may provide information about drum contents and their associated hazards. Monitoring shall be conducted around the drums/containers using instruments for measuring atmospheric concentrations of contaminants (radiation survey meter, organic vapor monitors [PID andFID], and/or a LEL/O_2 meter).

The results of this survey can be used to classify the drums into preliminary hazard categories, for example:

- Radioactive
- Leaking/deteriorated
- Bulging
- Explosive/shock sensitive
- Contains small-volume individual containers of laboratory waste or other dangerous materials.
- Non-hazardous waste

Note: This preliminary assessment is impacted by the limitation of the instruments employed.

As a precautionary measure, personnel should assume that unlabelled drums contain hazardous materials until their contents are characterized. Also, they should keep in mind that drums are frequently mislabelled, particularly drums that are reused. Thus, a drum's label may not accurately describe its contents.

TABLE 2-1

SPECIAL DRUM TYPES AND THEIR ASSOCIATED HAZARDS

Polyethylene or PVC - Lined Drums	Often contain strong acids or bases. If the lining is punctured, the substance may quickly corrode the steel, resulting in a significant leak or spill.
Exotic Metal Drums (Aluminum, nickel, stainless steel, steel, or other unusual metal)	Very expensive drums that usually contain an extremely dangerous material.
Single-Walled Drums Used as a Pressure Vessel	These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. May contain reactive, flammable, or explosive substances.
Laboratory Packs	Used for disposal of expired chemicals and process samples form university laboratories, hospitals, and similar institutions.

TABLE 2-2

INFORMATION PROVIDED BY DRUMHEAD CONFIGURATION

CONFIGURATION	INFORMATION
Whole lid of drum is removable	Designated to contain solid material.
Drum lid is removable with bung	Designated to contain solid or liquid material
Drum lid has a bung	Designated to contain a liquid.
Contains a liner	May contain a highly corrosive or otherwise hazardous material.

Valuable information can be obtained from drum markings. There are primarily two types of drum markings that could be encountered on a drum. These types of markings include those which employ a typical United Nations classification marking and approval and the second is one derived from United States DOT. Examples of these types of markings are presented below.

United Nations Classification

U N 1A2/Y150/S/89/USA/VL825

INFORMATION PROVIDED BY DRUM MARKINGS

Packaging Symbol	Information
United Nations	Indicates packaging complies with United Nations packaging requirements.
1A2	Indicates packaging type which are as follows: 1 – Drum; 2 – Wooden barrel; 3 – jerrican; 4 – Box; 5 – Bag; 6 – Composite package; 7 – Pressure receptacle

INFORMATION PROVIDED BY DRUM MARKINGS (cont.)

Packaging Symbol	Information
1**A**2	Indicates types of materials which are as follows: A – Steel (All types and surface treatments); B – Aluminum; C – Natural wood; D – Plywood; F – Reconstituted wood; G – Fibreboard; H – Plastic materials; L – Textile; M – Paper (Multi-wall); N – Metal; P – Glass, porcelain, & stoneware
1A2/**Y**	This letter designates the packaging group or degree of hazard. The letter designation is as follows: X – Packaging Groups I, II, and III Y - Packaging Groups II, and III Z - Packaging Group III only
1A2/Y**150**	Indicates package was tested to hold 150 kilograms
1A2/Y150/**S**/	Indicates the packaging is intended to contain solids
1A2/Y150/S/**89**/	Year the package was made
1A2/Y150/S/89/**USA**	Where the package was made
1A2/Y150/S/89/USA**/VL825**	Manufacturer's Registered Symbol

Additional markings which may be seen include "**R**" for reconditioned such as 1A2/Y150/S/89/USA/RB/90**R**. Additional marking of a "**T**" indicates salvage or over-pack container such as 1A2**T**/Y300/S/94/USA.

United States Department of Transportation (DOT)

Former U.S. DOT designations were more abbreviated. Examples of the two typically seen are:

- U.S. DOT 17E – Closed or tight end. The top is not removable. This top will have bung openings for the introduction of liquids.

- U.S. DOT 17H – Open top. The top is removable. This top may or may not have bung openings.

In addition, to carry this qualification (17 E or H) the drum had to be constructed of at least 16 or 18 gauge material. Which gauge was selected was based on material to be transported and the density or specific gravity of the substance to be transported.

It should be noted that in October of 1991, U.S. DOT adopted HM-181 charter aligning DOT's requirements with the international community. In doing so adopted container designations, hazard classifications (some, DOT still retains some of their own for transportation of dangerous goods in the continental U.S.), and many of the United Nations rules and regulations for the transportation of dangerous goods.

3.0 PLANNING

Since several hazards are associated with drum handling, every step of the operation should be carefully planned, based on all the information available at the time. The results of the preliminary inspection can be used to determine: (1) if any hazards are present and the appropriate response, (2) where opportunistic openings exist (i.e., rust holes, breaks in the shell) and can be accessed for sampling the drums content, and (3) which drums need to be moved in order to be opened and sampled.

3.1 Sampling

Excavated drums will be placed in DOT-approved over-pack containers and secured on-site until analytical results of the soil samples are received. Whenever possible, excavated materials will be returned to the appropriate excavation. If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside of the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date. If necessary, drums that are deteriorated or otherwise breached and contain liquids, sludges, or semi-solids, will be sampled through opportunistic routes such as holes or other openings. Once containers or over-packs have been opened to permit sample acquisition they will be resealed upon completion of the sampling.

4.0 HANDLING

The purpose of handling the drums/containers is to:

(1) respond to any obvious problems that might impair worker safety, such as radioactivity, leakage, or the presence of explosive substances,

(2) unstack and orient drums for sampling, and

(3) if necessary, to organize drums into different areas on site to facilitate characterization and remedial action. Drum/container movement for sample acquisition in support of this operation will be held to a minimum whenever possible.

Since accidents occur frequently during drum/container handling (particularly initial handling), drum/container movement will be minimized. Prior to drum/container mobilization, all personnel will be warned about the potential hazards associated with movement and handling of the drum/container. In all phases of drum/container management, personnel should be alert for new information about potential hazards.

The following procedures will be used to maximize worker safety during drum handling and movement:

1. Where possible use mechanized equipment to move and stage drums.

2. All equipment used in support of drum handling, staging, sampling, and disposal should be inspected and in good working order. This includes nylon slings, cargo net slings, and drum grapplers all used for drum handling.

3. Remove all non-essential personnel when moving drums from their originating location to the staging area. Personnel will only be introduced if they are needed for controlling the load or hook-up and release of the load.

4. Train personnel in proper lifting and moving techniques to prevent back injuries.

5. Have over-packs, spill material, and emergency aid equipment ready before any attempt is made to move drums.

6. Before moving anything, determine the most appropriate sequence in which the various drums and containers should be moved.

7. Exercise extreme caution in handling drums/containers that are not intact and tightly sealed.

8. Wear appropriate PPE as directed by the HASP and/or the Safe Work Permit.

4.1 Hoisting and Rigging – Drums/Containers

All hoisting and rigging of drums/containers shall be performed by knowledgeable person(s) educated in the selection and use of rigging devices.

All rigging apparatus/appliances received on the site will be inspected

- Prior to each use
- For acid/caustic burns
- For melting or charring of the nylon
- Snags, punctures, tears, or cuts
- Wear or elongation exceeding the manufacturer allotted amount.
- Distortion of fittings
- Apparent defects
- Lifting capacity not tagged
- Hooks
  - Cracked
  - Wear exceeding 10% original dimension
  - A bend exceeding 10 degrees out of plane from an unbent hook
  - Increased throat opening exceeding 15% from new condition
  - If safety latch is provided, it is in working order

Other rigging appliances may also be used including shackles, lifting bars and spreaders. The important thing to remember is the inspection is identifying physical damage and distortion. These items along with the lifting capacity will be the focus of the inspection. The FOL and/or the SSO will be responsible for inspecting and documenting the inspection of equipment of this nature.

The scope of this work identifies drums to be handled as part of this Drum Management Plan as those which may be encountered during test pit operations. To accomplish rigging an intact drum/container out of a test pit the following steps will be required:

- Excavate around the drum/container being careful not to contact the container.

- A nylon sling looped back through an end loop (forming a choker) will be lower from the side of the excavation over the drumhead to below the first structural ring.

AT NO TIME WILL ANYONE UNDER ANY CIRCUMSTANCES ENTER A TEST PIT TO HOOK UP A DRUM/CONTAINER.

- The choker will be tightened and attached to the backhoe bucket.

- The backhoe will extract the drum from the pit and place it into a secondary containment structure outside the pit.

To remove a drum/container whose structural integrity is damaged it is recommended that the backhoe attempt to scoop the drum/container with the bucket as gentle as possible.

Note: All of the above activities will take place employing the precautions identified in this Drum Management Plan, the HASP, and the Safe Work Permit.

4.2 Spill Management

Bulk hazardous materials (over 55-gallons) may be handled during some of the site activities conducted as part of the scope of work. Independent of the contents of any drums/containers that are excavated, at a minimum Investigative-Derived Wastes (IDW) will be produced. Depending on the nature and identity of site contaminants that are identified, spills of drums/containers may constitute a danger to human health or the environment. As site contaminants are identified and characterized, the Spill Management Program will be modified to reflect the nature of the contaminants.

4.2.1 Potential Spill Areas

To prevent and control further potential contamination of the environment, vulnerable areas to this hazard include

- the area surrounding the drums/containers.
- areas used for staging area.
- the handling, loading and unloading areas.
- resource staging and storage area.

4.2.2 55-Gallon Drums

All drums containing liquids or solids which require over-packing and/or transfer of its contents will be staged, as necessary, within a lined berm capable of holding a maximum of the drum(s) contents plus volumes reduced caused by the displacement of the drums. Capacity of the bermed area is generally fixed at approximately 110% of the total volume stored. Rainwater capture inside the lined area will be allowed to evaporate providing it does not exceed 1% of the bermed areas capacity.

4.2.3 Leak and Spill Detection

The early detection of potential spills or leaks will be accomplished through the initial inspection to identify deteriorated drums/containers. If a leak is detected the drum contents will be transferred using a hand pump into a new 55-gallon drum. The leak will be collected and contained using absorbents such as Oil-dry, vermiculite, or sand, stored at the staging area in a drum conspicuously marked. This material too, will be containerized for disposal pending analyses. All inspections will be documented in the Project logbook.

4.2.4 Personnel Training and Spill Prevention

All personnel will be instructed on the procedures for spill prevention, containment, and collection of hazardous materials in the site specific training. The FOL and the SSO will serve as the Spill Response Coordinator for this operation should the need arise.

4.2.5 Spill Prevention and Containment Equipment

The following represents the minimum equipment which will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other noncombustible absorbent (oil-dry);
- Drums (55-gallon U.N.1A2)
- Over-packs (U.N. 1A2T/Y300)
- Shovels, rakes, and brooms
- Hand operated drum pump with hose
- Labels
- Drum Patch kit
- Potable water (emergency drenching purposes- minimum 55 gallons)

- PPE:

  - SCBA's or Airline respirators with escape capabilities (3 sets – 2 in and 1 back-up)
  - Rain suits with hoods
  - Nitrile inner and outer gloves
  - Silver shield glove liners
  - Hardhats
  - Rubber over boots

4.2.6 Spill Control Plan

This section describes the procedures the TtNUS field crew will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove all non-essential personnel.

2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.

4. Re-containerize spills, including top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO following direction provided in the HASP.

Over-pack drums (larger drums in which leaking or damaged drums/containers are placed for storage or shipment) and an adequate volume of absorbent will be kept near areas where minor spills may occur.

4.3 Drums Containing Radioactive Waste

It is not anticipated that any drums located at this site will contain radioactive waste. However, due to the uncertainty associated with the site, all containers encountered will be screened as part of the monitoring activity. If any drums/containers are identified that have radiation levels significantly above background level (> 250 cpm), immediately contact the PHSO or HSM.

4.4 Drums that May Contain Explosive or Shock-Sensitive Waste

It is not anticipated to encounter explosive or shock sensitive waste material. However, if a drum is suspected to contain explosive or shock-sensitive waste as determined by visual inspection, this drum/container will be barricaded and left alone until specialized equipment and assistance may be obtained before handling.

4.5 Bulging Drums

Pressurized drums are extremely hazardous. This condition is not anticipated for this project. However where pressurized drums/containers are encountered they will be handled in the same manner as explosive or shock sensitive materials.

4.6 Leaking, Open, and Deteriorated Drums

As discussed under Section 3.1, excavated drums will be placed in DOT-approved overpack containers and secured on-site until analytical results of the soil samples are received. If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside of the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date. Leaking, open, and/or deteriorated drums may not be able to be moved without rupture or compromising the integrity of the drums.

All drums/containers used as part of this operation should be compatible with the type of material to be introduced. If you are overpacking a plastic drum, then it should be placed in a plastic overpack. The same shall apply when transferring from one container to another. All containers used for these purposes shall meet or exceed the appropriate DOT, OSHA, or EPA regulations for the wastes containerized. These drums/containers will be staged at a predetermined location.

5.0 OPENING

Drums/containers may be opened and sampled during this site operation. However, drums/containers of a suspicious nature will be handled at a later time once incidental drums/containers can be removed and conditions for specialized operations structured. Procedures for opening drums/containers are the same, regardless of where the drums are opened. To enhance the efficiency and safety of drum-opening personnel, the following procedures will be instituted:

- Personnel will use supplied-air respiratory protection, preferably airline respirators with a bank of air cylinders located outside the work area which supply air to the operators via airlines and escape SCBA.

- Site control will keep nonessential personnel at a safe distance from the drums/containers being opened. Drums/containers of a suspicious nature will be handled remotely where possible. Drum opening equipment, monitoring equipment, fire suppression equipment (i.e., fire extinguishers), emergency aid equipment (i.e., First-aid, stretcher, etc.) will be placed at an accessible distance to support the operation.

- Use the following remote-controlled devices will be employed for high hazard drum opening operations including exotic metal drums, bulging drums:

  - Remote operated pneumatically operated impact wrench to remove drum bungs.
  - Remote operated hydraulically or pneumatically operated drum piercers.
  - Backhoes with shielded cabs equipped with bronze spikes for penetrating drum tops in large-scale operations.

- Personnel will **not** use picks, chisels, or other potential sparking media to open drums.

- If any drum/container shows signs of swelling of bulging (positive pressure), it will be left alone until the appropriate barriers and equipment can be mobilized to support relieving excess pressure prior to opening.

- Monitor the air continuously during drum/container opening exercises. Place probes of monitoring equipment (PID, FID, and LEL/O_2) as close as possible to the source of contaminants.

- Polyethylene or polyvinyl chloride-lined (PVC-lined) drums can be accessed through the bung by removal or drilling. Exercise extreme caution when manipulating these containers.

- Do **not** open or sample individual containers within laboratory packs.

- Reseal open bungs and drill openings as soon as possible with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an over pack. Plug any openings in pressurized drums with pressure-venting caps set at a 5-psi release to allow venting of vapor pressure.

- All drum/container opening will be done so using spark proof tools with all potential ignition sources removed.
- Decontaminate equipment after each use to avoid mixing incompatible wastes.
- Employees shall not stand or work from atop any drum/container.

6.0 SAMPLING

Drum sampling can be one of the most hazardous activities to worker safety and health because it presents direct contact with unidentified wastes. Prior to collecting a sample, the following steps have been executed to minimize the potential hazards involved in this operation.

- Research background information about the waste as thoroughly as possible.
- Determine how the drums/containers should be sampled.
- Select the appropriate sampling device(s) and container(s).
- Develop a sampling plan which includes the number, volume, and locations of samples to be taken.
- Develop Standard Operating Procedures for opening drums/containers, sampling, and sample packaging and transportation.
- The SSO is part of the sampling team and will offer assistance based on available information about the waste and site conditions, the appropriate actions, personal protection modifications to be used during sampling and decontamination activities. Guidelines for PPE usage have been established as part of this HASP.

When manually sampling from a drum, use the following techniques:

- Of the two men team to perform the sampling, one will open the drum/container, and perform the initial monitoring, while the sampling team member maintains a safe distance. Both members will participate in the closure of the drums/containers. During all operations of this nature, a back-up member will remain at the ready to assist if needed.
- Cover drum tops with plastic sheeting or other suitable non-contaminated materials to avoid excessive contact with the drum tops.

7.0 CHARACTERIZATION

The goal of characterization is to obtain the data necessary to determine how to safely and effectively package, transport, and manage the waste for treatment and/or disposal. If wastes are bulked, they must be sufficiently characterized to determine which of them can be safely combined. As a first step in obtaining these data, standard tests should be used to classify the wastes into general categories, including auto reactives, water reactives, inorganic acids, organic acids, heavy metals, pesticides, cyanides, inorganic oxidizers, and organic oxidizers. In some cases further analysis should be conducted to more precisely identify the waste materials. A complete and detailed description of the analysis may be obtained from the Quality Assurance Project Plan. The Drum/Container Characterization Sheet (Figure 1) will aid field personnel in the general field characterization of the contents of the unidentified drums.

Figure 1
DRUM/CONTAINER CHARACTERIZATION SHEET

Site Name:_____	**Date:**_____	**Project #:**_____
Project Description: _____	**Drum #**	**Field Crew/Role:** _____

Drum Size	**Drum Type**	**Head Configuration**	**Identifiable markings:**
Unknown	Steel	Ring top (no bungs)	Sketch drum/container position
30 gallon	Aluminum	Ring top (bungs)	
55 gallon	Plastic	Closed top	
80 Gallon	Glass	Unknown	
Other (Specify) _____	Metal/Other (Specify Type) _____	Other (Specify) _____	
Estimated Volume: _____			

General condition of the drum/container: _____	**Can it be handled/moved and re-staged or over-packed?**_____

Screening Data		**Drum Contents (Indicate % if mixture of more than one media)**	
Radioactivity _____mR Background	_____mR	Solids Classification	Liquids Viscosity
PID _____eV Lamp _____ ppm (background)	_____ppm	Trash	Other
FID____ ppm (background)	_____ppm	**Drum Contents (Color)**	
Combustibility	_____%LEL_____%O2	Unknown	Red
Draeger Multi-test	_____	Cream	Yellow
Air Reactive	_____Δ Temp	Clear	Amber
Water Reactive	_____Δ Temp	White	Purple
Water solubility	_____Yes _____ No _____ % Partial	Gray	Black
Flammable	_____Yes _____No	Orange	Brown
pH	_____	Green	Other:
Cyanide	_____ ppm (Draeger Tube over Water Bath)	Greenish Blue	

Area surrounding drums/containers (stressed vegetation, distribution pathways):
_____

Comments:
_____

_____**See Attached Safe Work Permit for Protective/Hazard Control Measures**
_____**See Attached Drum/Container Inventory**

It should be noted that once a sample aliquot is removed from the drum to be characterized and sampled, the characterization of this media should occur a safe distance from the drum. This activity is best accomplished at a remote work station slightly removed from the drums in question. This will permit the control of the hazards associated with the sample aliquot and will permit quick characterization as all testing stations can be previously constructed and ready for use.

8.0 LABELING

All containers once characterized will be labeled for purposes of hazard communication. For this purpose the following three label choices will be employed.

Non-hazardous Material labels – These labels will be used only when the opening, characterization and/or analytical results confirm that this material is non-hazardous.

Hazardous Material labels – These labels will be employed when through drum characterization or analytical results a material falls into a hazard class definition as per DOT and/or RCRA 40 CFR 261.

Investigative Derived Waste (IDW) labels – These labels will be employed when the information derived from all characterization efforts are negative in determining the physical, chemical, radioactive, or reactive properties of the substance being tested.

Once the material is subjected to analytical testing and results obtained, the material in question will be relabeled for purposes of hazard communication, transportation, and disposal. The FOL and/or the SSO will be responsible for this activity.

8.1 Drum Inventory

All drums/containers which are uncovered as part of this field effort will be numbered and inventoried. Drum characterization sheets will be referenced to the drum number. See Figure 2 for the Drum Inventory sheet.

9.0 STAGING

Every attempt will be made to minimize drum handling until characterization. Staging involves a trade-off between the increased hazards associated with drum movement and the decreased hazards associated with the enhanced organization and accessibility of the waste materials.

One staging area will be created to support this operation should it be required. It is not anticipated this staging area will be used as the reconnaissance indicated all drums/containers were accessible and therefore movement would not be required.

10.0 BULKING

Wastes that have been characterized are often mixed together and placed in bulk containers for shipment to treatment or disposal facilities. This increases the efficiency of transportation. Bulking will only be performed after thorough waste characterization.

Figure 2
DRUM INVENTORY LOG

Drum Number #	Drum/Container Type	Media (Contents)	Estimated Volume	Date - Contents Characterized Sampled	Recommended Sample Analyses	Comments

APPENDIX P

TtNUS TRAINING

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at NSWC Crane, and that I have received site-specific training that included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the health and safety plan including Tables 5-1 and 6-1
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets and Chemical Data Sheets / Hazard Lines

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state by the presence of my signature below the date of my training (introductory, refresher, and supervisory, as applicable), and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

Example

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing investigation activities at NSWC Crane, and that I have received site-specific training that included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the health and safety plan including Tables 5-1 and 6-1
- Emergency response procedures (evacuation and assembly points)
- Review contents of relevant Material Safety Data Sheets and Chemical Data Sheets / Hazard Lines

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state by the presence of my signature below the date of my training (introductory, refresher, and supervisory, as applicable), and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name (Printed and Signature)	**Site-Specific Training Date**	**40-Hour Training (Date)**	**8-Hour Refresher Training (Date)**	**8-Hour Supervisory Training (Date)**	**Medical Exam**

APPENDIX Q

MEDICAL SURVEILLANCE

HEALTH STATUS MEDICAL REPORT

Employer Copy

TYPE OF EXAMINATION: **Periodic Examination**

EMPLOYEE:
SSN:
DATE OF EXAM: **01/16/01**
EXPIRATION DATE: **01/16/03**

COMPANY: **TT/NUS**
POSITION:
LOCATION: **TT/NUS-Pittsburgh**
SITE: **Pittsburgh**

The following recommendations are based on a review of one or all of the following: a base history questionnaire, supporting diagnostic tests, physical examination, and the essential functions of the position applied for or occupied by the individual named above.

	Yes	No	Undecided
Has the employee any detected medical conditions that would increase his/her risk of material health impairment from occupational exposure in accordance with 29 CFR §1910.120?	☐	☑	☐
Does the employee have any limitations in the use of respirators in accordance with 29 CFR §1910.134?	☐	☑	☐

STATUS

1. ☑ **QUALIFIED** The examination indicates no significant medical condition. Employee can be assigned any work consistent with skills and training.
2. ☐ **QUALIFIED - WITH LIMITATIONS** The examination indicates that a medical condition currently exists that limits work assignments on the following basis:
3. ☐ **NOT QUALIFIED**
4. ☐ **DEFERRED** The examination indicated that additional information is necessary. The employee has been given the following instructions.

COMMENTS:

I have reviewed the medical data of the above named employee, and informed the employee of the results of the medical examination and any medical conditions that require follow-up examination or treatment.

Name of Physician: Peter P. Greaney, MD / Peter H. Wald, MD Date: 01/23/01

Signature: Pete Wald

WorkCare
333 S. Anita Drive, Suite 630, Orange, CA 92868
(714) 978-7488 • (800) 455-6155 • FAX (714) 456-2154

Example

APPENDIX R

SUBCONTRACTOR SITE CLEARANCE

APPENDIX S

SUBCONTRACTOR MEDICAL SURVEILLANCE

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Tom Johnston
Task Order Manager
Tetra Tech NUS
661 Andersen Drive
Pittsburgh, PA 15220

Subject: HAZWOPER Medical Surveillance – NSWC Crane

Dear Mr. Johnston:

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response: Final Rule." I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a licensed physician, to perform hazardous waste site work and to wear positive- and negative-pressure respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the NAS Jacksonville site.

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

Example

APPENDIX T

SUBCONTRACTOR MEDICAL DATA SHEETS

MEDICAL DATA SHEET

This Medical Data Sheet must be completed by all on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals _____

_____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

_____

Name, Address, and Phone Number of personal physician: _____

_____

_____

I am the individual described above. I have read and understand this HASP.

_____ _____

Signature Date

Example

MEDICAL DATA SHEET

This Medical Data Sheet must be completed by all on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals _____

_____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

_____

Name, Address, and Phone Number of personal physician: _____

_____

_____

_____

I am the individual described above. I have read and understand this HASP.

_____ _____

Signature Date

APPENDIX U

SUBCONTRACTOR TRAINING

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Tom Johnson
Task Order Manager
Tetra Tech NUS
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220

Subject: HAZWOPER Training – NSWC Crane

Dear Mr. Johnston:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 126.

I also understand that Title 29 CFR 1910.120, entitled "Hazardous Waste Operations and Emergency Response," requires an appropriate level of training for certain employees engaged in hazardous waste operations. In this regard, I hereby state that the following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as requested by 29 CFR 1910.120(e) and have had 8 hours of refresher training as applicable and as required by 29 CFR 1910.120(e)(8) and that site supervisory personnel have had training in accordance with 29 CFR 1910.120(e)(4).

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

Example

APPENDIX V

EQUIPMENT CALIBRATION

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: _____ PROJECT NO.: _____

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

Example

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APPENDIX W

OSHA POSTER

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

Example

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The Occupational Safety and Health Act of 1970 (OSH Act), P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at www.osha.gov. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

www.osha.gov

U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165

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