THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 118

Hazardous and Toxic Waste Health and Safety Plan

for

Defense Distribution Depot Memphis

August 1995

Prepared for

Huntsville Division Corps of Engineers
Huntsville, Alabama

Prepared by

CH2M HILL Southeast, Inc.
2567 Fairlane Drive
Montgomery, Alabama 36116

110479.HS.ZZ

DEFENSE LOGISTICS AGENCY
DEFENSE DISTRIBUTION DEPOT MEMPHIS
2163 AIRWAYS BLVD.
MEMPHIS, TENNESSEE 38114-5210

IN REPLY
REFER TO DDMT-DE

SUBJECT: Final Health and Safety Plan for Hazardous/Toxic Waste

Mr. Joseph R. Franzmathes, Director
Waste Management Division
U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, GA 30365

Dear Mr. Franzmathes:

1. I have enclosed four copies of the final Health and Safety Plan for Defense Distribution Depot Memphis. We have attempted to revise the previous draft of this document appropriately in response to your comments and those of the Tennessee Department of Environment and Conservation (TDEC). Please note that the revisions to the previous document are in the form of replacement sheets. Directions for replacing pages are enclosed.

2. Should you have any questions or require additional information, please contact me at 901-775-6372.

Frank Novitzki
FRANK NOVITZKI
DDMT Project Manager

cc:
TDEC (J. English)
ASCE-WP (M. Dobbs)
HSHB-ME-SR (D. Druck)
DDMT-D
CEHND-PM-MD (J. Romeo)
ME3 (S. Estes)

DEFENSE LOGISTICS AGENCY
DEFENSE DISTRIBUTION DEPOT MEMPHIS
2163 AIRWAYS BOULEVARD
MEMPHIS, TENNESSEE 38114-5211

118 3

DDMT-DE

JUN 20 1996

Mr. Dann Spariosu
BRAC Division
U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, GA 30365

Dear Mr. Spariosu:

Please find enclosed errata sheets for the Generic RI/FS Work Plan, Generic QAPP, Generic HSP and Screening Sites Field Sampling Plan. We are issuing these errata sheets in response to comments from the Tennessee Department of Environment and Conservation. Should you have any questions or require additional information, please contact me at 901-775-6372.

Sincerely,

Harold Roach

HAROLD ROACH
Environmental Engineer
Environmental Protection and Safety Office

Enclosure

cc:
TDEC (J. English)
CEHNC-PM-ED (J. Savage)
CESAM-PM-TA (K. Braun)
ASCE-WP (M. Dobbs)
HSHB-ME-SR (D. Druck)
AEC (J. Waugh)
ME3 (S. Estes)

Executive Summary

Introduction

In October 1992, the Defense Depot Memphis, Tennessee (DDMT), was placed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA). Therefore, DDMT must fulfill requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Contingency Plan. A remedial investigation/feasibility study (RI/FS) must be prepared to determine the nature and extent of contamination, to evaluate the risk to human health and the environment, and to screen potential cleanup actions. The *Generic RI/FS Work Plan* was prepared to show how the investigation and study would be accomplished. This *Health and Safety Plan* (HASP) was prepared as a supplement to ensure the safety and health of CH2M HILL and their subcontractors whose work CH2M HILL controls during the performance of operable unit (OU) and screening site characterization activities during the RI/FS at DDMT.

The ultimate goal of the RI/FS is to select cost-effective cleanup actions that minimize threats and provide protection of public health and the environment. To accomplish this goal, the nature and extent of the release of hazardous substances must be identified, the source of release must be determined, and proposed cleanup actions must be evaluated. By implementing the procedures described in the site-specific safety and health plan (SSHP), CH2M HILL can perform their activities in a safe environment while the goal of the RI/FS is being achieved.

Site Background and Location

DDMT covers 642 acres of land in Memphis, Shelby County, Tennessee, in the extreme southwestern portion of the state. The installation contains approximately 110 buildings, 26 miles of railroad track, and 28 miles of paved streets. Approximately 5.5 million square feet of storage space is open. Stored items include food, clothing, electronic equipment, petroleum products, construction materials, and industrial, medical, and general supplies.

Description of Operable Units

DDMT is divided into four OUs for evaluation purposes. Dunn Field is designated OU-1. Work at Dunn Field is not covered in this HASP. The Main Installation is divided into three areas: the southwestern quadrant, OU-2; the southeastern lakes and golf course area, OU-3; and the north-central area, OU-4. Substances found in OU-1 probably resulted from use of the area for landfill operations, mineral stockpiles, pistol

range use, and pesticides storage. Potential contamination of OU-2 could have resulted from spills or releases from the hazardous material storage and repouring area, sandblasting and painting activities, or both. Storage of polychlorinated biphenyls (PCBs) and the use of pesticides and herbicides are potential sources of contamination for OU-3. Principal contamination in OU-4 probably resulted from a wood treatment operation and hazardous material storage.

Description of SSHP

The SSHP describes the responsibilities, requirements, and procedures for the protection of personnel while onsite during the field investigations. The project manager (PM) maintains overall responsibility for the performance of the project in a safe manner. However, the field team leader, project safety officers, and site safety officer will aid with the implementation of this SSHP.

The field personnel will be responsible for complying with all SSHP requirements. These requirements include specifications in Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(e), attendance at tailgate safety meetings, knowledge of proper protective equipment and clothing, emergency procedures, hospital routes, standard operating procedures, and other safety topics. Additionally, all personnel monitoring and medical records will comply with OSHA in 29 CFR 1910.120.

Hazard monitoring is essential for safe implementation of the RI/FS. Types of monitoring that will be used at DDMT include heat and cold related illnesses, direct read air monitoring, personal air monitoring, and noise monitoring. After analyzing the hazard monitoring data and confirming the appropriate level of protection for the site, the exclusion, contamination reduction, and support zones will be established. These zones will allow for control of site personnel movement and reduce the likelihood of contaminant migration between sites.

The safety of field personnel is essential for a successful RI/FS. Therefore, the SSHP describes decontamination procedures for field personnel and equipment. Additionally, the proper disposal methods for decontamination equipment are presented. An emergency medical assistance network will be established so that medical emergencies can be attended to quickly and efficiently.

By implementing the procedures outlined in the SSHP, the RI/FS can be conducted in a safe manner and create a healthy environment for CH2M HILL.

Contents

Tables

118 9

Figures

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Acronyms

APR	Air-purifying respirator
ASAP	As soon as possible
ATV	All-terrain vehicles
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act
CIH	Certified Industrial Hygienist
CNS	Central nervous system
COE	U.S. Army Corps of Engineers
CPP	Chemical protection program
CPR	Cardiopulmonary resuscitation
CRC	Contamination reduction corridor
CRZ	Contamination reduction zone
CWM	Chemical warfare material
CWMP	Chemical warfare management plan
dB(A)	Decibels on the A-scale
DDMT	Defense Depot Memphis, Tennessee
DOT	Department of Transportation
EM	Electromagnetic
EPA	U.S. Environmental Protection Agency
ER	Early removal site
EZ	Exclusion zone
FA-CPR	First aid and CPR training
FID	Flame ionization detector
FSP	Field Sampling Plan
FTL	Field team leader
GFCI	Ground fault circuit interrupter
GI	Gastrointestinal
HTW	Hazardous and toxic waste
IDW	Investigation-derived waste
MSDS	Material Safety Data Sheets
NFA	No further action
NIOSH	National Institute of Occupational Safety and Health
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	Operable unit
OVA	Organic vapor analyzer
PAH	Polycyclic aromatic hydrocarbon
PA/SI	Preliminary assessment/site investigation
PCBs	Polychlorinated biphenyls
PCP	Pentachlorophenol
PM	Project manager
PPE	Personal protective equipment
PRFI	Preliminary RCRA facility investigation
PSO	Project safety officer
QA/QC	Quality assurance/quality control

QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RFI	RCRA facility investigation
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
RMSF	Rocky Mountain spotted fever
Screening	Screening site field sampling plan
SOP	Standard operating procedure
SSHP	Site-specific safety and health plan
SSO	Site safety officer
SWMU	Solid waste management unit
SZ	Support zone
TLD	Thermoluminescent dosimeter
UL	Underwriters Laboratories Inc.
USACE	United States Army Corps of Engineers
USCG	U.S. Coast Guard
UXO	Unexploded ordinance
VOC	Volatile organic compound

SEA1002B657.WP5

This site-specific safety and health plan (SSHP) is written for CH2M HILL and their subcontractors whose work CH2M HILL controls. It does not apply to other onsite parties. This SSHP contains information specific to the activities CH2M HILL is conducting, including a hazard analysis for each task, air monitoring requirements, personal protective equipment (PPE) specifications, decontamination procedures, and CH2M HILL emergency procedures and contacts. It only addresses hazardous and toxic wastes (HTWs) and does not apply to chemical warfare materials (CWMs) or unexploded ordinances (UXOs). Work at Dunn Field is not covered under this SSHP because of the potential for CWMs and/or UXOs; work at Dunn Field will be addressed in a separate SSHP. This SSHP adopts, by reference, the standards of practice contained in CH2M HILL's *Corporate Health and Safety Program—Program and Training Manual* and the procedures contained in the work plan. The SSHP must be kept onsite during all field activities and will be reviewed and updated as necessary by the project safety officers (PSOs). All onsite personnel must be familiar with this document and must sign Appendix A to this document indicating that they have read, understand, and agree to follow the SSHP.

1.0 PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: U.S. Army Corps of Engineers (COE) **PROJECT NO:** 110479

PROJECT MANAGER: Mark Corey **OFFICE:** MGM

SITE NAME: Defense Depot Memphis, Tennessee (DDMT)

SITE ADDRESS: 2163 Airways Blvd., Memphis, Tennessee 38114

DATE HEALTH AND SAFETY PLAN PREPARED: March 1994

DATE OF INITIAL VISIT: March 9, 1994

DATES OF SITE WORK: January - December 1995

HEALTH AND SAFETY PLAN UPDATE REQUIRED: August 1996

SITE ACCESS:

Before going onsite, each employee's name must be placed on a list of authorized personnel. To avoid delays in entering the site, access should be coordinated with DDMT at least 1 day prior to visiting the site. Upon arriving at the site, each person will be required to check in with the security guard and presenting his or her driver's license or another form of picture identification. Vehicle registration also must be presented to the guard. DDMT's security guards will issue temporary passes or identification badges for each person, which must be returned.

The site safety officers (SSOs) is responsible for prohibiting unauthorized personnel from entering the exclusion zone. Because of the size of the project and the limited number of people involved, no formal identification system is required. However, the SSOs may establish a sign-in procedure, as necessary, for all personnel entering the exclusion zone. Visitors who must enter the exclusion or contamination reduction zones must be approved by the project team leader.

SITE SIZE: 642 acres

SITE TOPOGRAPHY: Flat to gently sloping

1.1 SITE DESCRIPTION AND HISTORY

The DDMT is located in the southern portion of the City of Memphis approximately 6 miles north of the Tennessee-Mississippi border and 8 miles east of the Mississippi River. The installation was officially activated on January 26, 1942.

Its mission has been related to the Army Engineer, Chemical, and Quartermaster Services, providing supply, stock control, storage, and maintenance for all three services. During World War II it performed supply missions for the Signal and Ordnance Technical Services and also served as a prisoner-of-war camp for enemy prisoners. This installation was originally named Memphis General Depot but was also known by the following names: Memphis Quartermaster Depot, Memphis Army Service Forces Depot, Memphis Army Depot, and Defense Depot Memphis.

1.2 DESCRIPTION OF OPERABLE UNITS

A brief description of each operable unit is provided in this section to include a qualitative assessment of past sampling activities. Detailed site descriptions, sample locations, and quantitative sampling results are provided in the operable unit (OU)-specific field sampling plans (FSPs). Figure 1 for the location of the OUs. Table 1 provides a summary of the sites and solid waste management units (SWMUs) within each OU and their respective status.

Operable Unit 1, Dunn Field. Dunn Field is the only known burial area at DDMT. Installation records indicate that various types and quantities of wastes were buried in the northwestern corner of Dunn Field. Each burial site within Dunn Field is described in detail in the OU-1 FSP. OU-1 includes 36 sites from the SWMU and remedial investigation/feasibility study (RI/FS) lists. Of these sites, 4 have been identified as sites where chemical warfare materials have been disposed (addressed by the Chemical Warfare Management Plan), 17 have been identified for early removal, 4 have been designated for no further action, 6 are RI sites and addressed by the OU-1 FSP, and the remaining 5 sites are being screened to determine whether a release of contaminants has occurred (addressed in the Screening Sites FSP). Other sites at Dunn Field are anticipated as a result of other investigation activities.

Work at this OU is <u>not</u> covered in this SSHP because there is a potential for CWM and/or UXO. A separate SSHP will be developed for work at Dunn Field.

Operable Unit 2, Southwestern Quadrant of Main Installation. OU-2 is geographically defined as the southwestern quadrant of DDMT and is further characterized as an area where maintenance and repair activities have taken place. OU-2 includes three key areas of the DDMT:

118 14

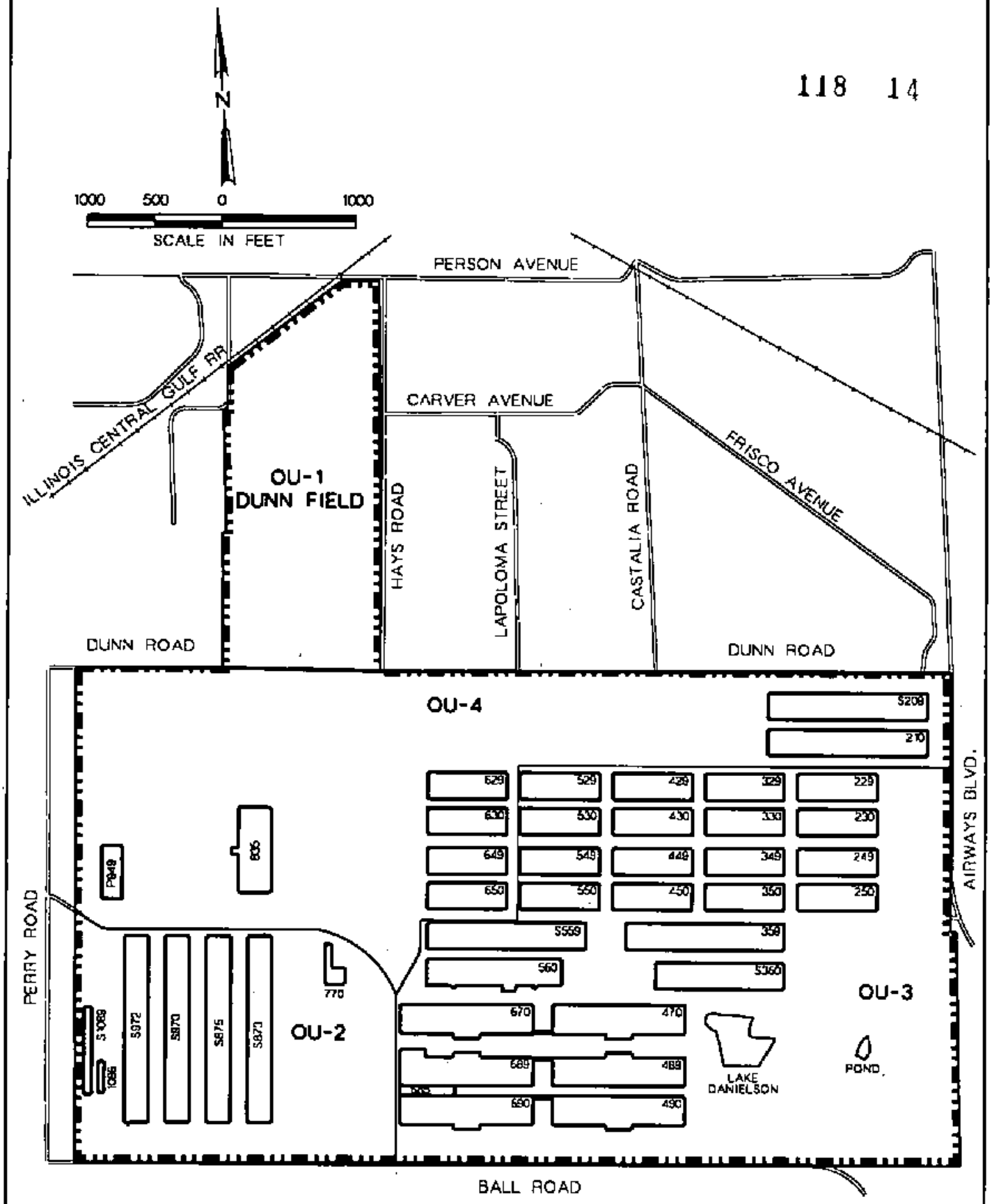

Figure 1
OPERABLE UNIT LOCATIONS
Defense Depot Memphis, Tennessee

Source: Engineering-Science, 1993

Table 1
CERCLA Site Status (08/23/95)
Defense Depot Memphis, Tennessee

Site Number	Operable Unit	Description	SWMU Number	LAW Number	RFA Status	Current Status
1	OU-1	Mustard and Lewisite Training Sets (6) Burial Site (1955)	1	1	PRFI	CWMP
9	OU-1	Ashes and Metal Burial Site (burning pit refuse) (1955)	9	10	PRFI	CWMP
24	OU-1	Former Burn Site (1946)	24	31	PRFI	CWMP
86	OU-1	Food Supplies (Dunn Field)	-	29	-	CWMP
2	OU-1	Ammonia Hydroxide (7 lbs) and Acetic Acid (1 gal.) Burial (1955)	2	2	PRFI	ER
3	OU-1	Mixed Chemical Burial Site (orthotoluidine dihydrochloride, 1955)	3	3	PRFI	ER
4	OU-1	POL Burial Site (13, 55-gal. drums of oil, grease, and paint; date unknown)	4	4	PRFI	ER
4.1	OU-1	POL Burial Site (32, 55-gal. drums of oil, grease, and thinner, 1955)	-	5	PRFI	ER
5	OU-1	MethylBromide Burial Site A (3 cubic feet) (1955)	5	6	PRFI	ER
7	OU-1	Nitric Acid Burial Site (1,700 bottles) (1954)	7	8	PRFI	ER
8	OU-1	MethylBromide Burial site B (3,768 - 1 gal. cans) (1954)	8	9	PRFI	ER
11	OU-1	Trichloroacetic Acid Burial Site (1,433 - 1-oz bottles) (1965)	11	11	PRFI	ER
12	OU-1	Sulfuric and Hydrochloric Acid Burial (quantity?) (1967)	12	12	PRFI	ER
12.1	OU-1	Sulfuric and Hydrochloric Acid Burial (quantity?) (1967)		-		ER
13	OU-1	Mixed Chemical Burial (Acid, 900lbs. Deter., 7,000lbs. AL2SO4, and 200lbs.	13	13	PRFI	ER
16	OU-1	Unknown Acid Burial Site (1969)	16	16	PRFI	ER
16.1	OU-1	Acid, date unknown	-	18	PRFI	ER
17	OU-1	Mixed Chemical Burial Site C (1969)	17	17	PRFI	ER
60	OU-1	Pistol Range Impact Area/Bullet Shop	-	24	-	ER
62	OU-1	Bauxite Storage (Eastern Half Quadrant of Dunn Field)	-	27	-	ER
64	OU-1	Bauxite Storage (SW Quadrant of Dunn Field) (1942 through 1972)	-	32	-	ER
85	OU-1	Old Pistol Range Bldg. 1184/Temporary Pesticide Storage	-	25	-	ER
18	OU-1	Plane Crash Residue (Dunn Field)	18	-	NFA	NFA
22	OU-1	Hardware Burial Site (Nuts and Bolts) (Dunn Field)	22	19	NFA	NFA
23	OU-1	Construction Debris and Food Burial Site (Dunn Field)	23	30	NFA	NFA
63	OU-1	Fluorspar Storage (SE Quadrant of Dunn Field)	-	28	-	NFA
6	OU-1	40,037 units ointment (oye) Burial Site (1955)	6	7	PRFI	RI
10	OU-1	Solid Waste Burial Site (near MW-10) (metal, glass, trash, etc.)	10	74	PRFI	RI
14	OU-1	Municipal Waste Burial Site B (near MW 12) (food, paper products)	14	75	PRFI	RI

Table 1
CERCLA Site Status (08/23/95)
Defense Depot Memphis, Tennessee

Site Number	Operable Unit	Description	SWMU Number	LAW Number	RFA Status	Current Status
15	OU-1	Sodium Burial Sites (1968)	15	14	PRFI	RI
15.1	OU-1	Sodium Phosphate Burial (1968)	-	15	PRFI	RI
15.2	OU-1	14 Burial Pits: Na2PO4, Na, Acid, Medical Supplies, and Chlorinated Lime	-	33	PRFI	RI
19	OU-1	Former Tear Gas Canister Burn Site (Dunn Field)	19	21	PRFI	Screening
20	OU-1	Probable Asphalt Burial Site (Dunn Field)	20	20	PRFI	Screening
21	OU-1	XXCC-3 Burial Site (Dunn Field)	21	22	PRFI	Screening
50	OU-1	Dunn Field Northeastern Quadrant Drainage Ditch	AOC-A	23	PRFI	Screening
61	OU-1	Buried Drain Pipe (NW Quadrant of Dunn Field)	-	26	-	Screening
30	OU-2	Paint Spray Booths (2 of 3 total; Bldgs. 770 and 1086)	30	-	NFA	NFA
40	OU-2	Safety Kleen Units - 5 of 9 total (All located in Bldg. 770)	40	-	NFA	NFA
41	OU-2	Satellite Drum Accumulation Areas - 2 of 4 total (vicinity Bldg. 770)	41	-	NFA	NFA
47	OU-2	Former Cont. Soil Drum Storage Area (300 ft W of Bldg. 689, removed 1988)	47	-	NFA	NFA
29	OU-2	Former Underground Waste Oil Storage Tank	29	66	PRFI	ER
87	OU-2	DDT, banned pesticides (Bldg. 1084)	-	64	-	ER
88	OU-2	POL (Bldg. 1085)	-	65	-	ER
27	OU-2	Former Recoup Area	27	60	RFI	RI
32	OU-2	Sandblasting Waste Accumulation Area	32	67	RFI	RI
34	OU-2	Building 770 Underground Oil Storage Tanks	34	58	PRFI	RI
31	OU-2	Former Paint Spray Booth (Bldg. 1087)	31	-	PRFI	Screening
33	OU-2	Sandblasting Waste Drum Storage Area (Metal Shed S. of Bldg. 1088)	33	-	NFA	Screening
82	OU-2	Flammables (Bldg. 783)	-	59	-	Screening
84	OU-2	Flammables, Solvents, Waste Oil, etc. (Bldg. 972)	-	63	-	Screening
89	OU-2	Acids (Bldg. 1089)	-	68	-	Screening
73	OU-2	2,4-Dichlorophenoxyacetic Acid (all grassed areas)	-	73	-	Feasibility Study
30	OU-3	Paint Spray Booths (1 of 3 total - Bldg. 260)	30	-	NFA	NFA
40	OU-3	Safety Kleen Units - 4 of 9 total units (Bldgs. 253; 469; 490; 689)	40	-	NFA	NFA
41	OU-3	Satellite Drum Accumulation Areas - 2 of 4 total areas (Bldgs. 469 and 260)	41	-	NFA	NFA
49	OU-3	Medical Waste Storage Area	49	46	NFA	NFA
48	OU-3	Former PCB Transformer Storage Area	48	39	PRFI	RI

Table 1
CERCLA Site Status (08/23/95)
Defense Depot Memphis, Tennessee

Site Number	Operable Unit	Description	SWMU Number	LAW Number	RFA Status	Current Status
58	OU-3	Pesticides, herbicides (PAD 267)	-	38	-	RI
59	OU-3	Pesticides, cleaners (Bldg. 273)	-	40	-	RI
51	OU-3	Lake Danielson Outlet Ditch	AOC-B	-	PRFI	Screening
52	OU-3	Golf Course Pond Outlet Ditch	AOC-C	-	PRFI	Screening
65	OU-3	XXCC-3 (Bldg. 249)	-	34	-	Screening
66	OU-3	POL (Bldg. 253)	-	35	-	Screening
67	OU-3	MOGAS (Bldg. 253)	-	36	-	Screening
68	OU-3	POL (Bldg. 263) (20 x 40 feet)	-	37	-	Screening
69	OU-3	2,4-D, M2A1, and M4 flamethrower liquid fuels (surface appl)	-	41	-	Screening
75	OU-3	Unknown Wastes near Bldg. 689	-	50	-	Screening
76	OU-3	Unknown Wastes near Bldg. 690	-	51	-	Screening
77	OU-3	Unknown Wastes near Bldgs. 689 and 690	-	52	-	Screening
78	OU-3	Alcohol, Acetone, Toluene, Naptha; Hydroflouric Acid Spill	-	53	-	Screening
25	OU-3	Golf Course Pond	25	42	RFI	Feasibility Study
26	OU-3	Lake Danielson	26	43	RFI	Feasibility Study
73	OU-3	2,4-Dichlorophenoxyacetic Acid (all grassed areas)	-	73	-	Feasibility Study
41	OU-4	Satellite Drum Accumilation Area (1 of 5 total - Bldg. 210)	41	-	NFA	NFA
44	OU-4	Former Wastewater Treatment Unit Area	44	56	NFA	NFA
45	OU-4	Former Contaminated Soil Staging Area	45	56	NFA	NFA
53	OU-4	X-25 Flammable Solvents Storage Area (near. Bldg 925)	AOC-D	61/62	NFA	NFA
57	OU-4	Building 629 Spill Area	AOC-H	49	RFI	RI
28	OU-4	Recoup Area Building	28	-	NFA	Screening
35	OU-4	DRMO Bldg T - 308 Hazardous Waste Storage	35	46	NFA	Screening
36	OU-4	DRMO Hazardous Waste Concrete Storage Pad	36	-	NFA	Screening
37	OU-4	DRMO Hazardous Waste Gravel Storage Pad	37	-	PRFI	Screening
38	OU-4	DRMO Damaged/Empty Hazardous Materials Drum Storage Area	38	-	PRFI	Screening
39	OU-4	DRMO Damaged/Empty Lubricant Container Area	39	-	PRFI	Screening
42	OU-4	Former PCP Dip Vat Area	42	56	PRFI	Screening
43	OU-4	Former Underground PCP Tank Area	43	56	PRFI	Screening

Table 1
CERCLA Site Status (08/23/95)
Defense Depot Memphis, Tennessee

Site Number	Operable Unit	Description	SWMU Number	LAW Number	RFA Status	Current Status
46	OU-4	Former PCP Pallet Drying Area	46	56	PRFI	Screening
54	OU-4	Main Installation - DRMO East Storm Water Runoff Canal	AOC-E	-	NFA	Screening
55	OU-4	Main Installation - DRMO North Storm Water Runoff Area	AOC-F	-	NFA	Screening
56	OU-4	Main Installation - West Storm Water Drainage Canal	AOC-G	-	NFA	Screening
70	OU-4	POL, Various Chemicals (RR tracks 1, 2, 3, 4, 5, 6) - Leaks	-	70	-	Screening
71	OU-4	Herbicide (All RR tracks) (used to clear tracks)	-	71	-	Screening
72	OU-4	Waste Oil (PDO yard) (surf. appl. for dust control)	-	72	-	Screening
74	OU-4	Flammables, toxics (West End - Bldg. 319)	-	45	-	Screening
79	OU-4	Fuels, Misc. Liquids, Wood, Paper (Vicinity S702)	-	54	-	Screening
80	OU-4	Fuel and cleaners dispensing (Bldg. 720)	-	55	-	Screening
81	OU-4	Fuel Oil (Bldg. 765)	-	57	-	Screening
83	OU-4	POL (isoctane, toluene, actone, MEK, naptha) Areas X-13, 15, 25	-	69	-	Screening
73	OU-4	2,4-Dichlorophenoxyacetic Acid (all grassed areas)	-	73	-	Feasibility Study

RFA-RCRA facility assessment
NFA-No further action
PA/SI-Preliminary assessment/site investigation
PRFI-Preliminary RCRA facility investigation
RFI-RCRA facility investigation
SWMU-Solid waste management unit
Screening-Screening site field sampling plan
ER-Early removal site
RI-Remedial investigation site
CWMP-Chemical warfare management plan
Sites with shading indicate TDEC lead sites. Other sites are EPA lead sites.

Site Summary: 12 NFA Sites (16 listings-same sites in multiple numbers(4))
41 Screening Sites
13 RI Sites
4 CWMP Sites
20 Early Removal Sites
3 Feasibility Study Sites (5 listings-Site 73 in OU-2/3/4)
93 Sites (5 sites in multiple OUs, 99 listings)

- The former hazardous materials recoupment area (Building S-873), designated as Site 27
- The sandblasting and painting area (Building 1088), designated as Site 32, and associated buildings (Buildings 1084, 1085, and 1089), designated as Sites 89, 90, and 91
- The maintenance shop area (Building 770), designated as Site 34

Operable Unit 3, Southeastern Watershed. OU-3 includes the Golf Course Pond (Site 25), Lake Danielson (Site 26), the former transformer storage area (Site 48), Pad 267 (Site 58), and Building T-273 (former pesticide storage area, Site 59). Past studies on Lake Danielson and the Golf Course Pond have shown that the surface water, sediment, and fish in these water bodies exhibit exposure to pesticides and polychlorinated biphenyls (PCBs). Because these water bodies receive surface runoff from the surrounding industrial and recreational areas, this OU contains the entire southeast watershed of the facility.

Operable Unit 4, North-Central Area. The most prominent feature of this OU is the main hazardous materials storage building (Building 629) at DDMT. The geographical area of OU-4 contains the former pentachlorophenol (PCP) dip vat area sites (all near Building 737) and Building 629. Pesticides, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs) were detected during the RI Report (Law Environmental, August 1990) near Site 57.

Screening Sites. The screening sites are sites identified in the Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) and the RI Report (ref. 18 in the Generic RI/FS WP), that appear to have been minor waste disposal areas during past operations or, based on historical records, have less potential for contamination than sites in the OUs described above. A wide variety of sites are included in this category, such as storm water drainage ditches, fuel storage areas, suspected spill areas, areas where hazardous substances were used and may have been released, and areas where pesticides had been applied (railroad tracks, vegetation). The purpose of screening these sites is to assess whether a release has occurred from past practices.

Chemical Warfare Sites. A variety of chemical warfare materials (CWMs) have been used, stored, and/or disposed of at the site. CH2M HILL is not working in areas that have been identified as CWM sites or in areas where CWMs are suspected. Figures 2, 3, and 4 show the locations of known and potential CWM areas, respectively. A separate health and safety plan is required for areas where CWMs are known or suspected.

TDEC Lead Sites. These sites were designated in Appendix A-3 of the DDMT RCRA Part B Permit (No. TN2 210 020 570) as sites regulated by the State of Tennessee's portion of the RCRA permit.

No Further Action Sites. Twelve sites are proposed for no further action (NFA)—four of which are on multiple OUs—for one or more of the following reasons:

- Solid wastes were never managed or disposed at the site.
- The site is not a threat for releases because of past waste management activities.
- There is no observed contamination based on previous sampling results.
- Current operational and structural features preclude action.

A separate NFA report that documents these sites and the rationale for the NFA determination has been prepared by DDMT for regulatory approval.

PARTIALLY REMOVED

REMOVED

LEGEND:

- TRACK 27A
- TRACK 28
- ORIGINAL LOCATION OF CHEMICAL TRAIN.
- PROBABLE UNLOADING / RELOADING LOCATION OF CHEMICAL TRAIN.
- BUILDINGS AND AREAS USED BY CHEMICAL WARFARE SERVICE.
- PISTOL RANGE
- FLAMETHROWER TEST AREA

N

NOT TO SCALE

FIGURE 2

MEMPHIS ORDNANCE DEPOT
MEMPHIS, TENNESSEE
DEPOT MAP

PROJ. DATE: JAN. 1995	DATE OF MAP: X
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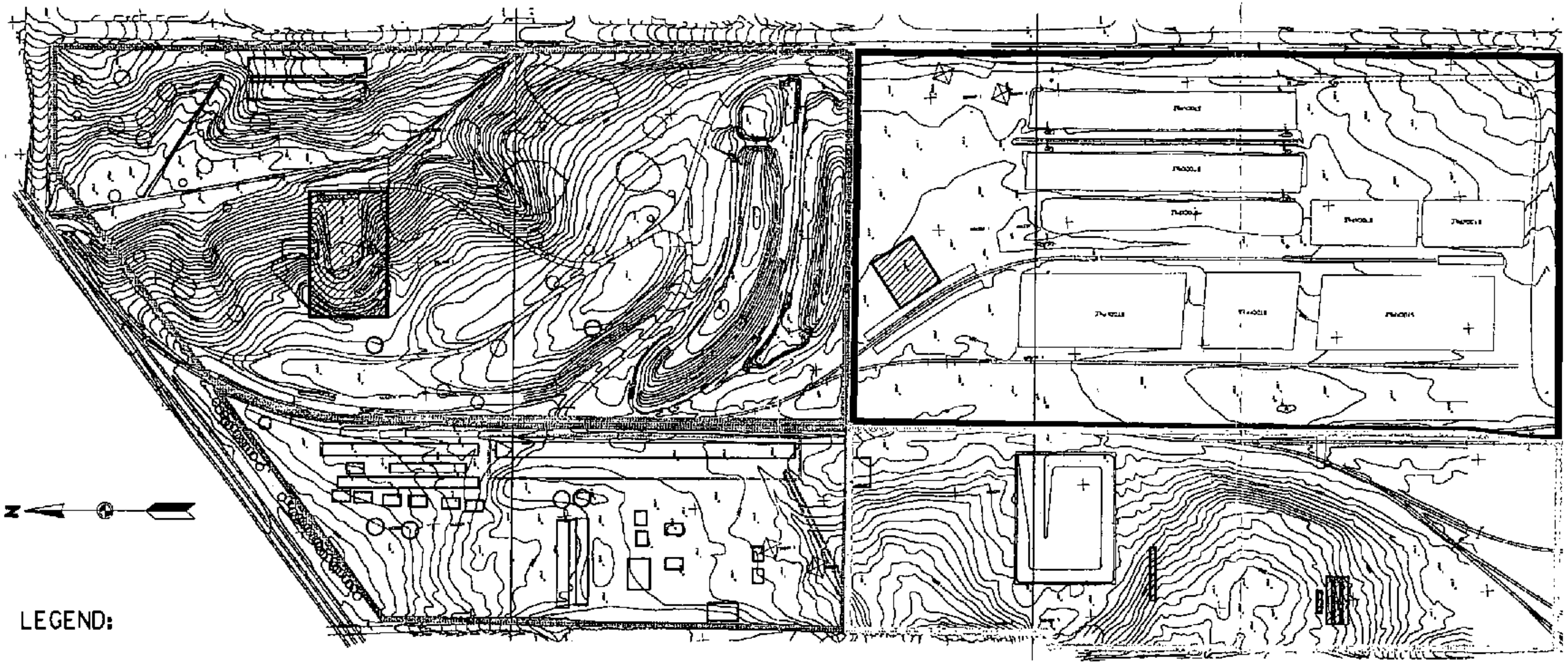

LEGEND:

- POSSIBLE SITE OF JULY 1946 DESTRUCTION OF GERMAN MUSTARD BOMBS.
- 86,100 LBS CC-2 IMPREGNITE (18 FEB. 1947).
- 300,000 LBS XX-CC-3 IMPREGNITE
- 1955-1956 AREA USED TO BURY CHEMICAL ID SETS AND XX-CC-3 IMREGNITE. POSSIBLE BURIAL OF DANC, CHLORINATED LIME AND RH195.
- CHLORINATE LIME PITS.
- FLAME THROWER TEST AREA.
- USATHAMA IDENTIFIED BURIAL OF CHEMICAL ID SETS.
- BURIALS PREVIOUSLY IDENTIFIED BY USATHAMA.
- UNIDENTIFIED CLEARED AREA (LOCATED ON 1958 AERIAL PHOTO).
- PISTOL RANGE
- CANISTERS (POSSIBLE GAS MASK FILTERS)
- AREA A
- AREA B - SEE NOTE 2
- AREA C
- AREA D

BURIALS NOT LOCATED:

AREA A: PITS USED TO DESTROY ORDNANCE.

AREAS A, B, OR C: 1947 BURIAL OF 32,636 LBS OF ACETYLENE TETRACHLORIDE.

- NOTE 1: LOCATIONS ARE APPROXIMATE
- NOTE 2: AREA USED AS A BORROW PIT, TO TEST HEAVY ENGINEER EQUIPMENT, AND AS A VEHICLE HOLDING AREA.

0 200 400

APPROXIMATE SCALE IN FEET

FIGURE 3

MEMPHIS ORDNANCE DEPOT
MEMPHIS, TENNESSEE
GARVER AND GARVER DRAWING

PROJ. DATE: JAN. 1995	DATE OF MAP:
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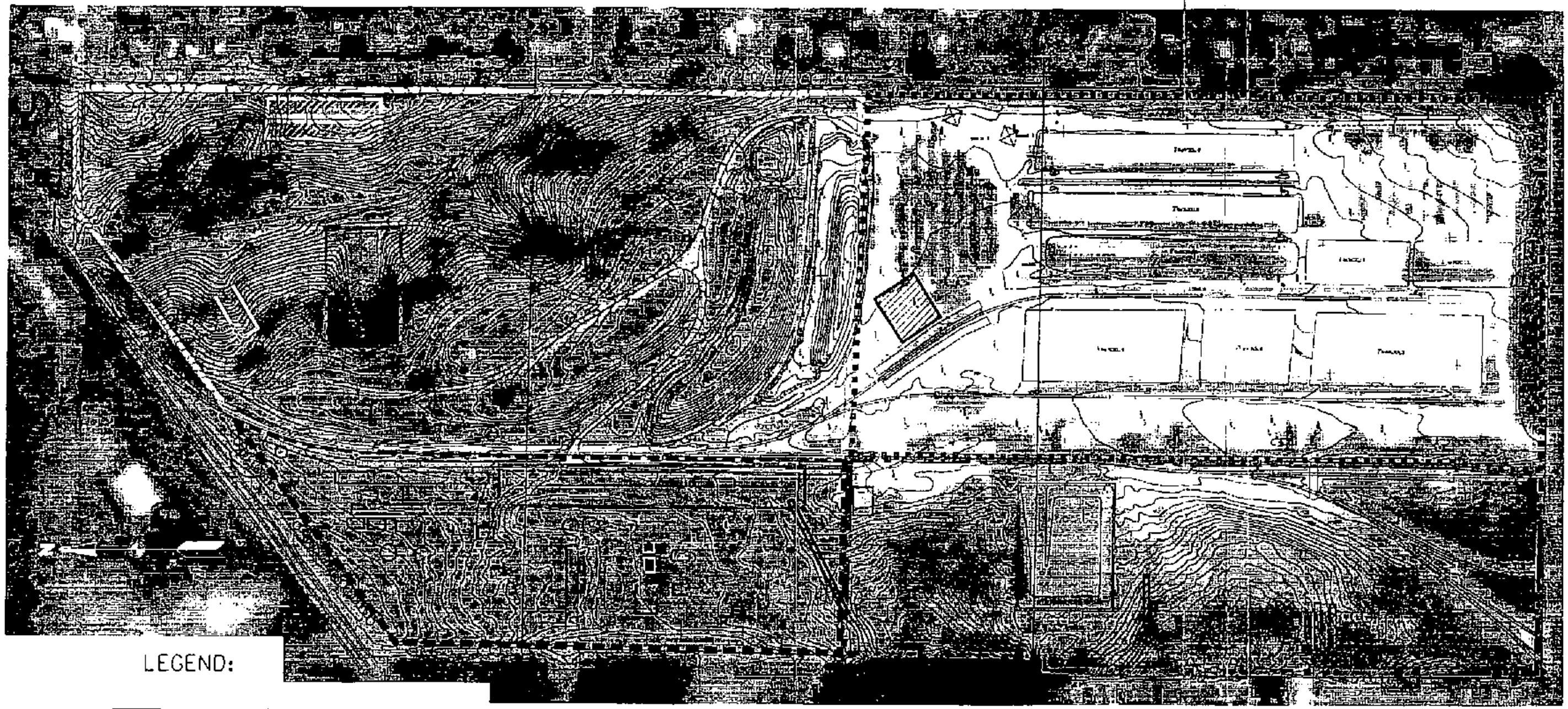

LEGEND:

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- 86,100 LBS CC-2 IMPREGNITE (18 FEB. 1947)
- 300,000 LBS XX-CC-3 IMPREGNITE
- 1955-1956 AREA USED TO BURY CHEMICAL ID SETS AND XX-CC-3 IMREGNITE. POSSIBLE BURIAL OF DANC. CHLORINATED LIME AND RH195.
- CHLORINATE LIME PITS.
- FLAME THROWER TEST AREA.
- USATHAMA IDENTIFIED BURIAL OF CHEMICAL ID SETS.
- BURIALS PREVIOUSLY IDENTIFIED BY USATHAMA.
- UNIDENTIFIED CLEARED AREA (LOCATED ON 1958 AERIAL PHOTO).
- PISTOL RANGE
- CANISTERS (POSSIBLE GAS MASK FILTERS)
- AREA A
- AREA B - SEE NOTE 2
- AREA C
- AREA D

BURIALS NOT LOCATED:

AREA A: PITS USED TO DESTROY ORDNANCE.

AREAS A, B, OR C: 1947 BURIAL OF 32,636 LBS OF ACETYLENE TETRACHLORIDE.

* NOTE 1: LOCATIONS ARE APPROXIMATE
* NOTE 2: AREA USED AS A BORROW PIT, TO TEST HEAVY ENGINEER EQUIPMENT, AND AS A VEHICLE HOLDING AREA.

NOT TO SCALE

0 200 400

APPROXIMATE SCALE IN FEET

FIGURE 4

MEMPHIS ORDNANCE DEPOT
MEMPHIS, TENNESSEE
1990 AERIAL PHOTO

PROJ. DATE: JAN. 1995	DATE OF PHOTO: 1990
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2.0 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

The project team will be organized in contractor, U.S. Army Corps of Engineers (COE), and offsite laboratory work groups. The contractor group will consist of a project manager, a project hydrogeologist, a project engineer, and various support staff. The COE group will consist of a project manager, a project engineer, a project geologist, and a project environmental engineer, who will develop work plans and scopes of work, oversee field performance, and review technical documents. The contractor group at the field site will consist of the field team leader, who will be onsite for all phases of the project, the field geologists, the SSOs and sampling team, and various other support technicians. The laboratory work groups include the technical staff and quality assurance/quality control (QA/QC) personnel at the laboratories. Additional project organization information will be provided upon selection of a contractor. Figure 5 illustrates the general health and safety project organization for CH2M HILL's onsite work. In addition, Table 2 summarizes key personnel involved in this project.

2.2 ASSIGNMENT OF RESPONSIBILITIES

Assignment of responsibilities for development, coordination, and implementation of the health and safety program is essential for proper administration of program requirements. Implementation of the health and safety program will be accomplished through an integrated effort by the following personnel:

Mr. John Romeo, P.E. – COE Project Manager
Mr. Frank Novitzki – DDMT Installation Restoration Project Manager
Contractor Officer-In-Charge
Contractor Project Safety Officer
Mark Corey – Contractor Project Manager
Greg Underberg – Contractor Project Hydrogeologist
Contractor Field Team Leader/Quality Assurance Coordinator
Mollie Netherland and Dan Locke – Contractor Site Safety Officers
Laboratory Project Safety Officer

Additional information regarding key positions is provided below.

Project Manager. The CH2M HILL project manager (PM) maintains overall responsibility for the performance of CH2M HILL's work as well as that of their subcontractors. He ensures work is conducted in a safe manner. He is the point of contact with the COE through the COE project manager. Should a health and safety issue develop in the performance of the contract requiring consultation with the COE, the field project manager or project hydrogeologist will immediately contact the COE project manager.

Project Hydrogeologist/Field Team Leader. The project hydrogeologist is responsible for ensuring that the goals of the RI are attained in a manner consistent with the health and safety program requirements. Coordination will be performed with the site safety officers in the selection of sampling locations, media, and techniques. The field team leader (FTL) is the secondary contact with the COE regarding SSHP implementation. The FTL will be identified in an addendum prior to initiation of fieldwork.

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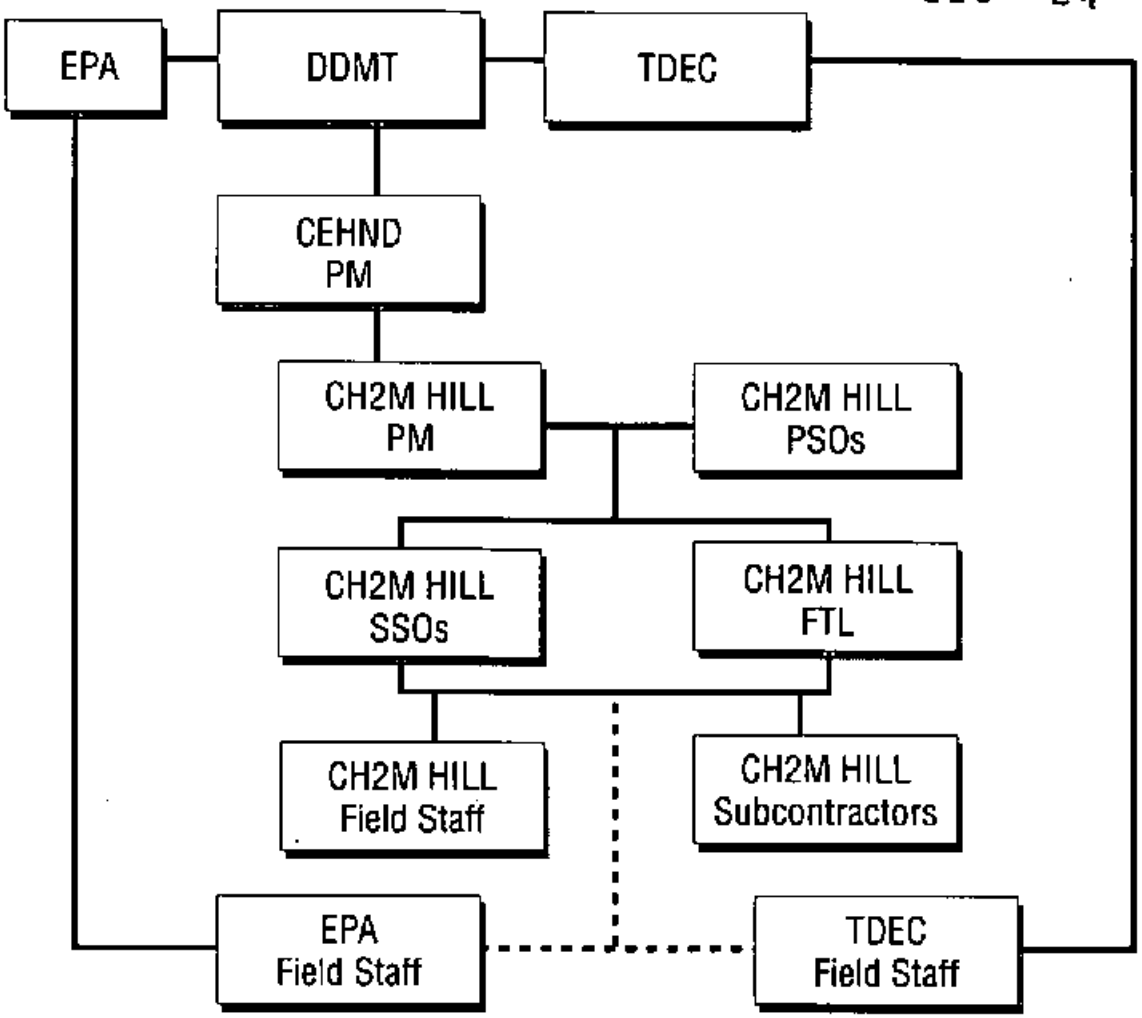

LEGEND

——— Direct reporting

- - - - - Informal communication

CEHND	Corps of Engineers, Huntsville Division
DDMT	Defense Depot, Memphis, Tennessee
EPA	Environmental Protection Agency
FTL	Field Team Leader
PM	Project Manager
PSOs	Project Safety Officers
SSOs	Site Safety Officers
TDEC	Tennessee Department of Environmental Conservation

Figure 5

CH2M HILL PROJECT HEALTH AND SAFETY ORGANIZATION

Defense Depot Memphis, Tennessee

Table 2
DEFENSE DEPOT MEMPHIS, TENNESSEE
Project Communications Information

Last Update: 23-Jun-95

Office Address	Name	Responsibility	Phone (Voice Mail)	Home Phone	FAX No. E-Mail
CORPS OF ENGINEERS					
BUILDING ADDRESS:	John Romeo	Project Manager	(205) 895-1461		(205) 895-1173 or 1171 or 1469
U. S. Army Engineer Division, Huntsville	Computer Modem				(205) 895-1173
4820 University Square	Scott Bradley	Environmental Engineer	(205) 895-1637		(205) 895-1607
Huntsville, Alabama 35816-1822	Julett Denton	Geologist	(205) 895-1624		
	John Matthews	Contract COR	(205) 895-1571		
MAILING ADDRESS:	Dee Salter	PM Assistant	(205) 895-1570		
U. S. Army Engineer Division, Huntsville	Ken Edmundson	Director/Programs & PM	(205) 895-1781		(205) 895-1185
P.O. Box 1600	Pat Newman	Contracts Specialist	(205) 895-1383		(205) 895-1185
Huntsville, AL 35807-4301	Ernest White	Project Management/Construction	(205) 895-1588		(205) 895-1469
	J. N. Ethridge	Contract Officer	(205)895-_____		
MAILING ADDRESS:					
U.S. Army Corps. of Engineers,	Bill Gibson		(901) 544-3602		(901) 544-4065
Memphis District	John McCormick		(901) 544-3605		(901) 544-4065
B-202 Clifford Davis Federal Bldg.					
Memphis, TN 38103					
DDMT					
Defense Depot Memphis, Tennessee	Frank Novazel	Project Manager/Envir. Protection	(901) 775-6372 Pager 775-6444 code=105 voice		(901) 775-4372 or (901) 775-5019 (Legal Office)
2163 Airways Boulevard	Janice Henderson	Office Secretary	(901) 775-4566		
Memphis, TN 38114-5210	Christine Kastman	Mgr. of Envir. Protection & Safety	(901) 775-4568		(901) 775-4372
	Denise Cooper	PM Assistant	(901) 775-4379		
	Roy Varnell	Records Management	(904) 775-6242		
	Eric Holladay	Installation Commander (Acting)	(901) 775-6411		
	Robert Sanders	Environmental Protection Engineer	(901) 775-4003		
DORE					
Building 1-1, 2nd Floor	Clarence Smith				
Defense Distribution Region East	Mike Dobbs		(717) 770-6950		
New Cumberland, PA 17070-5001	Larry Neidinger, DORE-W		(717) 770-6030		(717) 770-7244
DLA					
Defense Logistics Agency	Dennis Lake, CAAE		(703) 274-6124		
Bldg 4, Room 4D469					
Cameron Station					
Alexandria, VA 22304-6100					
AEHA					
Army Environmental Hygiene Agency	Dennis Druck	Risk Assessment Review	(410) 671-2253		
HSHB-ME-SR, Dennis Druck					
Bldg E1677					
Aberdeen Proving Ground, MD 21010-5422					
MEMPHIS GROUNDWATER INSTITUTE					
Civil Engineering Dept.	John Smith	Director	(901) 678-3283	(901)754-2129	(901) 678-3076 Home: 10305 Lating Road, Memphis, TN 38018
Memphis State University	Robert Braun	Student			
Memphis, Tennessee 38152					

Table 2
DEFENSE DEPOT MEMPHIS, TENNESSEE
Project Communications Information

Last Update: 23-Jun-95

Office Address	Name	Responsibility	Phone (Voice Mail)	Home Phone	FAX No. E-Mail
EPA					
Federal Facilities Branch 345 Courtland St. N.E. Atlanta, GA 30365	Martha Berry Allison Humphrie Joseph Franzmathes	RPM Director-Waste Management Div.	(404) 347-3555 x6431 (404) 347-3016 (EPA general #)		(404) 347-5205 or (404) 347-0076
TENNESSEE DEPT. OF CONSERVATION & ENVIRONMENT					
Division of Superfund 645 Perimeter Park, Suite E 2510 Mt. Moriah Road Memphis, TN 38115-1520	Terry Templeton, R.P.G. Jordan English	Project Manager TDEC-Environmental Field Office Mgr.	(901) 368- (901) 368-7953		(901) 368-7979
USACORA					
United States Army Chemical Destruction Remediation Activities (USACORA)					
Non-Stockpile Chemical Materials AMCPM-NSM Edgewood, Area Aberdeen Proving Grounds, Maryland 21010-5401	Chuck Heyman Gini Bragunas	Program Manager	(410) 671-1090		(410) 612-8737
TEU					
Technical Escort Unit	Howard Beardsley Capt. Rogers		(410) 671-3127 (410) 612-8516		(410) 671-3001
CESTL					
USACE - St. Louis District	Tom Murrell Archive Search		(314) 331-8782		(314) 331-8828
MEMPHIS AND SHELBY CO. HEALTH DEPT.					
814 Jefferson Avenue Memphis, TN 38105	Carter Gray Allen Simpson Barry Moore	Pollution Control Pollution Control	(901) 576-7600 (901) 576-7600		
MLGW					
Memphis Light, Gas, and Water Company Post Office Box 430 Memphis, TN 38101-0430	James Webb		(901) 320-3901		(901) 320-3095
CH2M HILL SUBCONTRACTORS					
HydroVision 2261 Perimeter Park Drive, Suite 2 Atlanta, Georgia 30341	Ram Arora	Senior Hydrogeologist	(404) 454-3285	(404) 453-1477	(404) 4543284
El Dorado Engineering Inc. 2964 West 4700 South Suite 109 Salt Lake City, Utah 84118-2554	Randy Bossard Ralph Hayes Glenn Roberts	Chemical/Warfare Agents Specialist President	(801) 966-8288		(801) 966-8499
MES, L.L.C. 9631 Waldrop Drive Huntsville, AL 35803	Sue Estes	President	(205) 880-1153		(205) 880-1153

Table 2
DEFENSE DEPOT MEMPHIS, TENNESSEE
Project Communications Information

Last Update: 23-Jun-05

Office Address	Name	Responsibility	Phone (Voice Mail)	Home Phone	FAX No.	E-Mail
ATSDR Agency for Toxic Substances & Disease Registry 1600 Clifton Road, E-56 Atlanta, GA 30333	Jeff Kellam	Health Risk Assessment	(404) 639-0058		(404) 639-6075	
CH2M HILL OFFICES						
Montgomery, Alabama CH2M HILL 2567 Fairlane Drive Montgomery, Alabama 36116-1622 Phone (334) 271-1444 FAX (334) 277-5763	Mark Corey	Project Manager	(334) 271-1445 ext. 310	(334) 269-4901	(334)277-5763	CH2MHILLMGMMWCOREY@CH2MHILL1.ATTMAIL.COM
	Hunter Sartain	Environmental Engineer	(334) 271-1445 ext. 327	(334)288-0911	(334)277-5763	CH2MHILLMGMHSARTAIN@CH2MHILL1.ATTMAIL.COM
	Alan Todd	Invoicing/Contracts	(334) 271-1445 ext. 712	-		
	Millie Johnson	Records Management	(334) 271-1445 ext. 303	-		
	Sam Shannon	Senior Hydrogeologist	(334) 271-1445 ext. 322			
	Leslie Shannon	Project Execution Manager	(334) 271-1445 ext. 325			
	Jaison Glasgow	Jr. Env. Engineer	(334) 271-1445 ext. 316			
	Sandi Holland	Jr. Hydrogeologist	(334) 271-1445 ext. 773			
Atlanta, Georgia 115 Perimeter Center Place, N.E. Suite 700 Atlanta, Georgia 30346-1278	Mike Harris	Program Manager	(404) 604-9182 ext. 414	(404)772-9497	(404) 604-9183	
	Claire McDonald	Mike's Assistant	(404) 604-9182 ext. 443		(404) 604-9183	
	Doug Baughman	Environmental Scientist (NEPA)	(404) 604-9182 ext. 510			
	Sandra Glenn	Environmental Engineer	(404) 604-9182 ext. 431			
	Larry Boyd	Contract Administrator	(404) 604-9182 ext. 516			
	Mark Nielsen	Remedial Design P. M.	(404) 604-9182 ext. 416			
Oak Ridge, TN 599 Oakridge Turnpike Oak Ridge, TN 37830-7187	Greg Underberg	Hydrogeologist	(615) 483-9032 ext. 543		(615) 481-3541	
	Sybil Hatch	Environmental Engineer	(615) 483-9032 ext. 514		(615) 481-3541	
	Greg Schaefer	Environmental Engineer	(615) 483-9032 ext. 570		(615) 481-3541	
Memphis, TN 765 Crossover Lane Suite 101 Memphis, TN 38117-4908	Bob Blanz	Senior Environmental Engineer	(901) 683-7330 ext.		(901) 683-8665	
Gainesville, FL 7201 NW 11th Place Gainesville, FL 32605-3158	Ann Castleberry	Project Chemist - QAPP	(904) 331-2442 ext. 422		(904)331-5326	
	Vijaya Mylavarapu	Risk Assessment	(904) 331-2442 ext. 224			
	Pat Cline	Risk Assessment	(904) 331-2442 ext. 625			
Denver, Colorado 8060 S. Willow Drive Englewood, CO 80111-5142	Clif Thompson	Chief of Operations	(303) 771-0900 ext. 2459			
	Jim Ferris	Head of Federal Operations	(303) 771-0900 ext. 2285			
Washington, D.C. 625 Herndon Parkway Herndon, VA 22070-5416	Randy Underwood	Early Removal	(703) 471-1441 ext. 4427		(703)481-0080	
Seattle, Washington 777 108th Avenue NE Bellevue, WA 98009-2050 Suite 200	Mollie Netherland	Health & Safety	(206) 453-5000 ext 5342		(206)462-5957	

Project Safety Officers. The PSOs will ensure that the safety plan complies with all federal, state, and DDMT non-military requirements. If necessary, the PSOs can modify the SSHP to adjust for onsite changes that affect safety. The PSOs will coordinate with the FTL and with the SSOs on all modifications to the SSHP, and will be available for consultation when required. The PSOs will not be onsite during the entire investigation. He or she will prepare the materials to be used in the training program and ensure that the SSOs are knowledgeable in all components of the SSHP. The PSOs for this project are Mollie Netherland/SEA and Dan Locke/MGM. Bob Nash/SCO is the CIH involved in the project.

Site Safety Officers. The SSOs is responsible for the implementation of the SSHP. Field personnel will have an SSO present during all field activities. The SSOs have the responsibility and authority to halt or modify site operations in the event any unsafe or hazardous condition occurs. The SSOs will consult with and keep DDMT safety office informed of all safety-related matters. The SSOs will be the main contact in any onsite emergency situation and will direct all field activities involved with safety. The SSOs are responsible for ensuring that onsite personnel understand and comply with safety requirements. Except in an emergency, they can modify the SSHP requirements only after consultation and agreement with the PSOs.

Field Staff. All field personnel will be responsible for understanding and complying with all requirements of the SSHP. Field personnel will be instructed during each Tailgate Safety Meeting to bring all perceived unsafe site conditions to the attention of the SSOs.

2.3 DESCRIPTION OF TASKS

The work activities to be conducted during the RI consist of monitoring well sampling, borehole drilling and sampling, soil sampling, surface water and sediment sampling, surveying, well logging, and test pit excavation. This section describes the general site investigation activities and where they will occur. These activities are summarized in Table 3. A detailed description of the procedures to be used in performing these activities is contained in the FSPs and/or the Quality Assurance Project Plans (QAPPs).

Table 3
Site Investigation Activities
Defense Depot Memphis, Tennessee

Area	Proposed Activities
OUs-1, 2, 3, 4, and screening sites; offsite locations	Monitoring well installation and sampling, surveying, soil sampling, soil borings, surface water/sediment sampling, test pit (OU-1 only)
OU-3, southwestern quadrant	Soil sampling, surface water/sediment sampling, monitoring well sampling
Stream sediment and surface water offsite locations	Surface water/sediment sampling

The following tasks, which CH2M HILL and their subcontractors will conduct, are covered under this SSHP:

- Water level measurement and groundwater well sampling
- Land surveying
- Soil sampling
- Soil borings
- Monitoring well installation
- Surface water and sediment sampling

This plan does not cover activities conducted in areas where CWMs and/or UXOs have been detected. If such materials are encountered, CH2M HILL personnel will immediately leave the area.

2.4 DESCRIPTION OF SUBCONTRACTORS

When CH2M HILL controls its subcontractors' work, CH2M HILL is responsible for the subcontractors' health and safety. In such cases, the subcontractors may follow CH2M HILL's SSHP, or they may develop their own plan. If the subcontractors opt to follow CH2M HILL's SSHP, they must supplement it with information regarding the hazards in which they have expertise. Such information must be attached to the CH2M HILL SSHP. If the subcontractors develop their own SSHP, it must be approved by the CH2M HILL PSOs before work is started.

If CH2M HILL does not control the subcontractors' work or if another onsite party is contracted directly to the COE, CH2M HILL is not responsible for their health and safety.

CH2M HILL has contracted the following firm that is covered under this plan:

- Hydrovision (hydrology review)
- Toles and Associates

As required, additional subcontractors will be identified in an addendum before conducting work onsite.

3.0 HAZARD EVALUATION AND CONTROL

The SSOs will conduct an initial hazard assessment to locate hazards and determine appropriate control measures before initiation of work activities. Hazard assessment will be conducted as an ongoing process. The following sections indicate the known physical, chemical, and biological hazards of concern for each site and for each task and operation to be performed. The selection of chemicals as indicators of hazard was based on media concentrations, toxicity, and volatility or risk potential for air entrainment at hazardous levels and frequency of detection. The SSHP included the physical and chemical properties of selected contaminants, sources and pathways of employee exposures anticipated onsite and offsite, exposure level potentials, and regulatory or recommended protective exposure standards.

3.1 HEAT AND COLD STRESS (REFERENCE CHEM HILL SOP HS-09)

The following are general guidelines for site workers. Acclimated workers should follow the Pulse Criteria listed below whereas, the non-acclimated worker or personnel known to be sensitive to the effects of heat should follow the guidelines listed in 3.1.1 until acclimated to the weather conditions.

3.1.1 GUIDELINES FOR WORKING IN TEMPERATURE EXTREMES WHILE WEARING PERSONAL PROTECTIVE EQUIPMENT

Temperature	Work Cycle	Rest Cycle	Control Measures
<32° F or <55° F & raining	2 hrs	15 min	Review cold stress in safety meeting. Rest in a warm area. Drink at least 8 ounces of warm non-caffeinated, non-alcoholic beverage at each rest break. Schedule a mid-day lunch break of at least 30 minutes in a warm area to begin not later than 5 hours after startup.
72° to 77° F	2 hrs	5 min	Review heat stress in safety meeting. Take resting pulse rate before beginning work. Drink 8 ounces of cool water before beginning work and 4 ounces at rest break. Have ice available.
77° to 82° F	2 hrs	5 min	As above, but seated rest break. Monitor pulse rate. (See Pulse Criteria below.)
82° to 87° F	60 min	15 min	As above, but rest area to be shaded.
87° to 90° F	30 min	15 min	As above. Try to provide a shaded work area.
>90° F	15 min	15 min	As above. Provide a shaded area with seats in the work area for team members to use as needed. Reschedule work to avoid mid-day heat.

PULSE CRITERIA. Take resting radial (wrist) pulse at start of work day; record it. Measure radial pulse for 30 seconds as rest period begins. Pulse not to exceed 110 beats per minute (bpm) or 20 bpm above resting pulse. If pulse exceeds this criteria, reduce work load and/or shorten the work cycle by one third, and observe for signs of heat stress. No team member is to return to work until his/her pulse has returned to <110 bpm or resting pulse +20 bpm.

3.1.2 SYMPTOMS AND TREATMENT OF HEAT AND COLD STRESS

Heat Stroke	Heat Exhaustion	Frostbite	Hypothermia
Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high body temperature.	Pale, clammy, moist skin; profuse sweating; weakness; normal temperature; headache; dizzy; vomiting.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Cool victim rapidly by soaking in cool (not cold) water. Get medical attention immediately!!	Remove victim to a cool, air conditioned place. Loosen clothing, place in head low position. Have victim drink cool (not cold) water.	Remove victim to a warm place. Rewarm area quickly in warm (not hot) water. Have victim drink warm fluids—not coffee or alcohol. Do not break any blisters. Elevate the injured area and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids—not coffee or alcohol. Get medical attention.

3.2 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls and work practices are generally to be implemented by the party in control of the site or hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees must, at a minimum, remain aware of hazards affecting them, regardless of who is responsible for controlling the hazards.

Hazard (Refer to SOP, or SHP Section)	Engineering Controls, Administrative Controls, and Work Practices	Tasks						
		General Site Hazards Geophysical Investigation, Civil, and Biological Sampling	Test Pit and Excavation	Drilling, Soil Boring, and Monitoring Well Installation and Abandonment	Groundwater Monitoring Activities	Surface Water and Sediment Sampling Using a Boat	Surface Water and Sediment Sampling from the Shore or Water	Hand Augering
Flying debris/objects (HS-07)	Shielding and PPE such as safety glasses, hard hat, and steel-toed boots, will be provided.		X	X		X	X	X
Noise > 85 dBA	Noise protection required when working around heavy equipment or conversations have to be shouted at 3 feet or less. Monitoring required above 85 dB(A).	X	X	X	X	X		X
Steep terrain/unstable surface	Personnel will proceed with caution and brace and shore equipment.		X	X				
Gas cylinders (HS-21)	Instruct employees in the safe use of compressed gases. Make certain gas cylinders are properly anchored and chained. Keep cylinders away from ignition sources.		X	X				
Electrical	• Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so. Ground as appropriate. • Heavy equipment (e.g., drill rig) to remain at least 15 feet from overhead power line for power lines of 50 kV or less. For each 10 kV > 50, increase distance by ½ foot. • Project field sites should have ground fault circuit interrupters (GFCIs) installed for all wiring, including extension cords. • Heavy equipment (e.g., drill rig) should remain at least 15 feet from overhead power line for power lines of 50 kV or less. For each 10 kV > 50, increase distance by ½ foot. • Operate and maintain equipment according to manufacturer's instructions. • Use only extension cords that are three-wire grounded. Cords passing through work areas must be covered or elevated to protect from damage. • Use only electrical tools and equipment that are either effectively grounded or double-insulated UL approved. • Properly label switches, fuses, and circuit breakers. • Remove cord from an outlet by grasping the plug, not pulling the cord. • Protect all electrical equipment, tools, switches, etc., from elements. • Avoid physical contact with power circuit. • Only qualified electricians are to install and work on electrical circuits and equipment.		X	X		X		
Suspended loads	Work not permitted under suspended loads.		X	X		X		
Buried utilities, drums, tanks, etc. (Section 3.3)	Locate buried utilities, drums, tanks, etc., prior to digging or drilling and mark location.		X	X				
Slip, trip, fall hazards	Personnel will use caution and will use wood pallets or similar devices in muddy work areas. Provide slip-resistant surfaces, ropes, and/or other devices to be used as needed.		X	X	X	X	X	X
Back injury (HS-29)	Use proper lifting techniques, or provide mechanical lifting aids.		X	X	X	X	X	X
Confined space entry (Section 9.0)	Space must be evaluated by qualified person. Additional controls and monitoring, and an approved entry permit are generally required.		Not approved					
Trenches/excavations (HS-32)	Make certain trench meets OSHA standard before entering. All excavations >4 feet deep must be sloped or shored and have a ladder every 25 feet. Personnel and equipment remain 2 feet from edge of trench at all times.		X					
Protruding objects	Visible objects will be flagged.	X	X	X	X	X	X	X
Visible lightning	Cease work.	X	X	X	X	X	X	X
Vehicle traffic (HS-24)	Provide temporary traffic controls, including trained flaggers and lookouts. Implement traffic control program when required. Personnel are required to wear orange safety vests in areas with heavy traffic.	X						
Elevated work area/falls (HS-31)	Provide guardrail, safety net, floor covers, body harness, and monitoring system, where applicable. Document employee training.						X	
Fire/explosion	• Turn equipment off before refueling. • No spark sources within exclusion or decontamination zones. • Appropriate firefighting equipment must be available onsite. • Extinguishers are to be inspected and maintained. • Open flames are prohibited in the vicinity of flammable materials. • Combustible materials stored outside should be at least 10 feet from the building. • Unnecessary combustible materials and flammable or combustible liquids must not be allowed to accumulate. • Flammable or combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.			X			X	
Inadequate illumination	Site work will be performed during daylight hours whenever possible. Any work conducted during hours of darkness will require enough illumination intensity "to read a newspaper without difficulty."	X	X	X	X	X	X	X
Entanglement in rotating equipment	• Prohibit loose clothing and hair • Prohibit wearing jewelry			X				X

3.2 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls and work practices are generally to be implemented by the party in control of the site or hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees must, at a minimum, remain aware of hazards affecting them, regardless of who is responsible for controlling the hazards.

Hazard (Refer to SOP, or SHP Section)	Engineering Controls, Administrative Controls, and Work Practices	Tasks: General Site Hazards Geophysical Investigation, Civil, and Biological Sampling	Test Pit and Excavation	Drilling, Soil Boring, and Monitoring Well Installation and Abandonment	Groundwater Monitoring Activities	Surface Water and Sediment Sampling Using a Boat	Surface Water and Sediment Sampling from the Shore or Water	Hand Augering
Drilling	CH2M HILL employees must be aware of the safety hazards affecting them, related to the operation of drilling equipment. NOTE that the operator (a specialty subcontractor) is responsible for safe operations of drilling equipment and the safety of his employees. CH2M HILL employees are not to operate the drilling equipment, or assist the operator. General work practices to be followed while working around drilling equipment include: • The drill rig is not to be operated in inclement weather. • The driller is to verify that the rig is properly leveled and stabilized before raising the mast. • Personnel should be cleared from the sides and rear of the rig before the mast is raised. • The driller is not to drive the rig with the mast in the raised position. • The driller must check for overhead power lines before raising the mast. A minimum distance of 15 feet between mast and overhead lines (<50 kV), is recommended. Increased separation may be required for lines greater than 50 kV. • Personnel should stand clear before rig startup. • The driller is to verify that the rig is in neutral when the operator is not at the controls. • Become familiar with the hazards associated with the drilling method used (cable tool, air rotary, hollow-stem auger, etc.). • Do not wear loose-fitting clothing, watches, etc., that could get caught in moving parts. • Do not smoke or permit other spark-producing equipment around the drill rig. • The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location. • Be aware and stand clear of heavy objects that are hoisted overhead. • The driller is to verify that the rig is properly maintained in accordance with the drilling company's maintenance program. • The driller is to verify that all machine guards are in place while the rig is in operation. • The driller is responsible for housekeeping (maintaining a clean work area). • The drill rig should be equipped with at least one fire extinguisher. • In the event the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.			X				
Heavy equipment	CH2M HILL employees must be aware of the safety hazards affecting them, related to the operation of heavy equipment. NOTE that the operator (a specialty subcontractor) is responsible for the safe operations of heavy equipment and the safety of his employees. CH2M HILL employees are not to operate the heavy equipment, or assist the operator. General work practices to be followed while working around heavy equipment include: • Become familiar with hazards particular to the equipment being used. • Observer will remain in contact with operator and signal safe backup. • Always confirm that operator is aware of your location-particularly when you approach or pass by equipment. • Do not count on backup alarms always functioning. Look around when alarm sounds. • Do not ride equipment not designed for passengers. • Do not climb on operating equipment. • Do not place yourself between fixed and moving parts or objects. • Do not stand adjacent to the equipment. • Stay clear of equipment on cross slopes and unstable terrain. • Stay clear of pile-driving operations. • Remain outside the turning radius of the equipment. • Operators using all-terrain vehicles (ATV) must be trained; other ATV requirements may apply. • Backup alarm required for heavy equipment. • Observer remains in contact with operator and signals safe backup. • Personnel to remain outside the turning radius.	X	X	X		X		
Tripping, slipping, falling (wet surfaces, inadequate railing, waves, instability of boat)	Personnel will use careful footing. Operations will be halted if adverse weather conditions are encountered.					X		
Entanglement in lines, ropes, cables, equipment	The buddy system will be used.					X		
Falling overboard	The boat/barge will have adequate railing, and personnel will wear U.S. Coast Guard (USCG)-approved flotation devices. Operations will be halted if adverse weather conditions are encountered.					X		
Refueling boat	No smoking is allowed. The engine will be turned off prior to refueling.					X		
Collisions of boats	USCG boating regulations (speed, right-of-way, lighting) will be followed. The boating subcontractors are					X		

3.2 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls and work practices are generally to be implemented by the party in control of the site or hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees must, at a minimum, remain aware of hazards affecting them, regardless of who is responsible for controlling the hazards.

Hazard (Refer to SOP, or SHP Section)	Engineering Controls, Administrative Controls, and Work Practices	Tasks						
		General Site Hazards Geophysical Investigation, Civil, and Biologicnl Sampling	Test Pit and Excavation	Drilling, Soil Boring, and Monitoring Well Installation and Abandonment	Groundwater Monitoring Activities	Surface Water and Sediment Sampling Using a Boat	Surface Water and Sediment Sampling from the Shore or Water	Hand Augering
	responsible for providing procedures that address collision of boats prior to conducting work.							
Navigation hazards (rocks, gravel bars, water level changes)	Personnel will familiarize themselves with the work area. The boating subcontractors are responsible for providing procedures that address navigation hazards prior to conducting work.					X		
Injuries from equipment (pinch points, sharp objects)	Equipment, protective equipment (gloves), and warning signs will be used as intended by the manufacturers.					X		
Weather (cold, heat, lightning)	Personnel will wear appropriate clothing and will monitor weather conditions. Operations will be halted if adverse weather conditions are encountered. The boating subcontractors are responsible for providing procedures that address the hazards associated with adverse weather prior to conducting work.					X	X	
Slip, trip, fall hazards resulting from muddy work areas	The buddy system and extreme caution will be used. Work will be conducted from stable areas while remaining as far as possible from the water's edge. If a natural stable surface is not available, construct a sampling platform. If not sampling, remain at least 3 feet from edge of water. Use wood pallets or similar devices in muddy work areas. Have available appropriate rescue equipment.						X	
Tripping, slipping, falling (wet surfaces, inadequate railing)	Personnel will use careful footing. Operations will be halted if adverse weather conditions are encountered.						X	

[1]Decibels on the A-scale.
[2]Underwriters Laboratories Inc.

3.3 PROCEDURES TO LOCATE BURIED UTILITIES

Although the COE will provide maps, each contractor is responsible for identifying buried utilities. A copy of the DDMT utility drawings will be provided prior to drilling activities.

3.4 BIOLOGICAL HAZARDS AND CONTROLS

Hazards	Location and Control Measures
Snakes	When possible, personnel will avoid areas where snakes may be. Personnel must wear long pants and steel-toed, steel-shanked leather or rubber boots. If bitten, seek medical help immediately.
Fire ants	Areas should be observed for fire ant mounds prior to conducting work. If ants are present, sample locations should be moved whenever possible. Personnel must wear long pants and steel-toed, steel-shanked leather or rubber boots. Pants should be tucked into boots when possible.
Bloodborne pathogens (Hepatitis B and HIV)	Personnel must be trained in bloodborne pathogens and have been offered a Hepatitis B vaccination (see CH2M HILL HS-36). If an exposure occurs, the human resources department must be notified immediately. A confidential medical examination and consultation will be offered.

3.5 TICK BITES, LYME DISEASE, AND ROCKY MOUNTAIN SPOTTED FEVER

Check often for tick bites. If bitten, carefully remove tick with tweezers, making certain to remove pincers, being careful not to crush the tick. After removing the tick, wash your hands. Disinfect area, and dress. If the tick resists or cannot be completely removed, seek medical attention.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: rash that looks like a "bulls-eye," with small welt in center, several days to weeks after tick bite. RMSF: Rash comprising red spots under skin, 3 to 10 days after tick bite. For both: chills, fever, headache, fatigue, stiff neck, bone pain. If symptoms appear, seek medical attention.

3.6 RADIOLOGICAL HAZARDS AND CONTROLS

Refer to the CH2M HILL *Corporate Health and Safety Program—Program and Training Manual, Volume 2*, for standards of practice for operating in contaminated areas.

Hazards	Controls
Records indicate that DDMT has a permit for luminescent dials and gauges.	If any of the following conditions are met, the control measures listed below will be followed. **Conditions:** • Working in areas where luminescent dials or gauges have been used or disposed of • Observation of luminescent dials or gauges • Working on landfill areas **Control Measures:** • All personnel will wear thermoluminescent dosimeter (TLD) badges. • Personnel and equipment will be screened for radiation contamination before leaving the work area (see Appendix B, Radiation Self-Monitoring Procedures).
Geophysical logging equipment nuclear source	• If geophysical logging with a nuclear source is required, all protocols and restrictions of the geophysical logging service company will be followed. No untrained personnel will be allowed within the exclusion zone (EZ) established by the service company. Personnel working within the EZ must wear TLD badges.

3.7 HAZARDS POSED BY CHEMICALS BROUGHT ONSITE

Refer to CH2M HILL *Hazard Communication Program Manual*, which is available from the Corporate Human Resources Department in Denver. The Project Manager is to request Material Safety Data Sheets (MSDSs) from the client, or contractors and subcontractors, for chemicals to which CH2M HILL employees are potentially exposed. Appendix C contains MSDSs for the chemicals listed below.

Chemical	Location
Methane	Calibration gas
Hydrogen	Calibration gas
Pentane	Calibration gas
MSA sanitizer	Decontamination compound
Hexane	Decontamination compound
Methanol	Decontamination compound
Alconox	Decontamination compound
Hydrochloric acid	Sample preservative
Nitric acid	Sample preservative
Sulfuric acid	Sample preservative

3.8 CONTAMINANTS OF CONCERN				
Contaminant[a]	PEL, REL, or TLV[b] (ppm)	IDLH[c] (ppm)	Symptoms and Effects of Exposure	PIP[d]
2,4-D	10 mg/m³	100 mg/m³	Weakness, stupor, muscle twitching, dermatitis	NL
Acenaphthene	NL	NL	Eye and skin irritation	NL
Acenaphthylene	NL	NL	No information found in the NIOSH pocket guide	NL
Acetone	250 ppm	2,500 ppm	Eye, nose, and throat irritation, headache, dizziness, and dermatitis	9.69
Aldrin	0.25 mg/m³	Ca[e] (25 mg/m³)	Headache, dizziness, nausea, vomiting	NL[f]
Aluminum	NL	NL	No information found in the NIOSH[a] pocket guide	NL
Antimony and Compounds	0.5 mg/m³	50 mg/m³	Nose, throat, and mouth irritation; coughing; headache; nausea; vomiting; diarrhea; stomach cramps; skin irritation; unable to smell properly	NA[h]
Antracene	0.2 mg/m³	NL	Skin irritation	NL
Arsenic	0.01 mg/m³	Ca (5 mg/m³)	Ulceration of nasal septum, dermatitis, GI disturbances, respiratory irritation	NA
Barium	0.5 mg/m³	1,100 mg/m³	Upper respiratory irritation, muscle spasms, slow pulse, eye and skin irritation, skin burns	NL
Benzene	0.1 ppm	500 ppm	Eye, nose, and respiratory irritation; headache; nausea; dermatitis; fatigue; giddiness	9.24
Benzo(a)anthracene	NL	NL	Experimental carcinogen	NL
Benzo(a)pyrene	0.2 mg/m³	NL	Chronic dermatitis	NL
Benzo(b)fluoranthene	NL	NL	No information found in the NIOSH Pocket Guide	NL
Benzo(g,h,i)perylene	NL	NL	No information found in the NIOSH Pocket Guide	NL
Benzo(k)fluoranthene	NL	NL	No information found in the NIOSH Pocket Guide	NL
Benzoic acid	NL	NL	No information found in the NIOSH Pocket Guide	NL
beta-BHC	NL	NL	No information found in the NIOSH Pocket Guide	NL
bis (2-ethylhexyl) phthalate	5 mg/m³	NL	GI effects, eye and skin irritation	NL
Beryllium	0.002 mg/m³	Ca (4 mg/m³)	Respiratory symptoms, weakness, fatigue, weight loss	NL
Bromoform	0.5 ppm	850 ppm	Eye and respiratory irritation, CNS[i] depression	10.48
2-Butanone (Methyl ethyl ketone, MEK)	200 ppm	3,000 ppm	Eye and nose irritation, headache, dizziness, vomiting	9.54
Butyl benzyl phthalate	NL	NL	No information found in the NIOSH pocket guide	NL
Cadmium	0.1 mg/m³	Ca (9 mg/m³)	Pulmonary edema, coughing, chest tightness, headache, chills, muscle aches, nausea, vomiting, diarrhea	NL
Carbon Disulfide	1 ppm	500 ppm	Dizziness, headache, poor sleep, fatigue, nervousness, eye and skin burns, dermatitis	10.08
Carbon tetrachloride	2 ppm	Ca (200 ppm)	CNS depression, nausea, vomiting, skin irritation	11.47
Chlordane	0.5 mg/m³	Ca (100 ppm)	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremors	NL
Chlorobenzene	10 ppm	1,000 ppm	Skin, eye, and nose irritation; drowsiness; incoordination	9.07
Chloroform	2 ppm	Ca (500 ppm)	Dizziness, mental dullness, nausea, disorientation, headache, fatigue, eye and skin irritation	11.42
Chromium	0.5 mg/m³	NE	Sensitization dermatitis	NL

3.8 CONTAMINANTS OF CONCERN				
Contaminant[a]	PEL, REL, or TLV[b] (ppm)	IDLH[c] (ppm)	Symptoms and Effects of Exposure	PIP[d]
Chromium (Metal)	0.5 mg/m³	250 mg/m³	Histologic fibrosis of lungs	NL
Chrysene	0.2 mg/m³	NL	Carcinogenic	NL
Cobalt (Metal, Dusts, & Fumes)	0.05 mg/m³	20 mg/m³	Coughing, decreased pulmonary function, dermatitis, respiratory hypersensitivity	NA
Copper	0.1 mg/m³	NE	Metal fume fever, chills, muscle ache, nausea, fever, dry throat, coughing, weakness, lassitude, eye and upper respiratory tract irritation	NA
4,4'DDD	NL	NL	No information found in the NIOSH pocket guide	NL
4,4'DDE	NL	NL	No information found in the NIOSH pocket guide	NL
DDT	0.5 mg/m³	Ca 500 mg/m³	Paresthesia tongue, lips, and face; tremors; dizziness; confusion; headache; fatigue; convulsions; eye and skin irritation	NL
delta-BHC	NL	NL	No information listed in the NIOSH Pocket Guide	NL
Dibenzo(a,h)anthracene	NL	NL	Absorbed dermally	NL
Dibenzofuran	NL	NL	Headache, eye irritation, nausea, vomiting	NL
Dibutylphthalate	5 mg/m³	4,000 mg/m³	Upper respiratory tract and stomach irritation	NL
Di-n-octylphthalate	NL	NL	No information found in the NIOSH pocket guide	NL
1,3-Dichlorobenzene	NL	NL	No information listed in the NIOSH Pocket Guide	NL
o-Dichlorobenzene (1,2-Dichlorobenzene)	50 ppm C[e]	200 ppm	Nose and eye irritation	9.06
p-Dichlorobenzene (1,4-Dichlorobenzene)	75 ppm	Ca[f] (150 ppm)	Headache, eye irritation, nausea, vomiting	8.98
1,1-Dichloroethane	100 ppm	3,000 ppm	CNS depression, skin irritation	11.06
1,1-Dichloroethene	NL	NL	No information listed in the NIOSH Pocket Guide	NL
1,2-Dichloroethene	200 ppm	1,000 ppm	Eye and respiratory system irritation, CNS depression	9.66
Dichloromethane	NL	2,300 ppm	No information listed in the NIOSH Pocket Guide	NL
Dieldrin	0.25 mg/m³	Ca (50 mg/m³)	Headache, dizziness, nausea, vomiting, sweating	NL
2,4-Dimethylphenol	NL	NL	No information found in the NIOSH Pocket Guide	NL
Dimethylphthalate	5 mg/m³	2,000 mg/m³	Upper respiratory system irritation, stomach pain	9.64
di-n-Butylphthalate	5 mg/m³	4,000 mg/m³	Eye and upper respiratory system failure	NL
Dioxin	1 x 10⁻⁸ mg/m³[g]	NL	Eye irritation, allergic dermatitis, chloracne, GI disturbance	NL
Endosulfan	0.1 mg/m³	NL	No information found in literature	NL
Endosulfan Sulfate	NL	NL	No information found in the NOSH pocket guide	NL
Endrin	0.1 mg/m³	2 mg/m³	Stupor, headache, dizziness, abdominal discomfort, nausea, vomiting, aggressiveness, confusion, lethargy, weakness	NL
Endrin ketone	NL	NL	No information found in the NIOSH pocket guide	NL
Ethyl benzene	100 ppm	800 ppm	Eye and mucous membrane irritation, headache, dermatitis, narcotic	8.76
Ethylene dichloride (1,2-Dichloroethane)	1 ppm	Ca (50 ppm)	CNS depression, nausea, vomiting, dermatitis, eye irritation	11.05
Fluoranthene	NL	NL	Toxic by ingestion and skin contact	NL

3.8 CONTAMINANTS OF CONCERN				
Contaminant[a]	PEL, REL, or TLV[b] (ppm)	IDLH[c] (ppm)	Symptoms and Effects of Exposure	PIP[d]
Fluorene	NL	NL	Toxic through inhalation, ingestion, dermal contact, and absorption	NL
Heptachlor	0.5 mg/m^3	Ca (35 mg/m^3)	In animals: tremors, convulsions	NL
Heptachlor epoxide	0.5 mg/m^3	NL	Poisonous by ingestion	NL
2-Hexanone (Methyl butyl ketone)	1 ppm	1,600 ppm	Eye and nose irritation, weakness, dermatitis, headache, drowsiness	9.34
Hydrogen Cyanide	5.0 mg/m^3	50 ppm	Asphyxiation and death at high levels, weakness, headache, confusion	NL
Indeno(1,2,3)pyrene	NL	NL	No information found in the NIOSH Pocket Guide	NL
Lead	0.05 mg/m^3	100 mg/m^3	Weakness, lassitude, facial pallor, abdominal pain, constipation	NA[e]
Lindane	0.5 mg/m^3	50 mg/m^3	Eye, nose, throat, and skin irritation; headache; nausea; respiratory difficulty; muscle spasms	NL
Mercury	0.01 mg/m^3	10 mg/m^3	Vision and hearing disturbances, dizziness, nausea, vomiting, diarrhea, constipation, skin burns	NL
Methoxychlor	10 mg/m^3	5,000 mg/m^3	None known in humans	NL
4-Methyl-2-pentanone	NL	NL	Irritation	NL
Methylene chloride (Dichloride Methane)	50 ppm	Ca (2,300 ppm)	Fatigue, weakness, sleepiness, light headedness, numbness and tingling of limbs, nausea, eye and skin irritation	11.32
2-Methylnaphthalene	NL	NL	No information found in literature	NL
2-Methylphenol	NL	NL	No information found in the NIOSH pocket guide	NL
4-Methylphenol	NL	NL	No information found in the NIOSH pocket guide	NL
Naphthalene	10 ppm	250 ppm	Eye irritation, headache, confusion, excitement, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, dermatitis	8.12
Nickel (Metal and other Compounds)	0.015 mg/m^3	Ca (10 mg/m^3)	Headache, vertigo, nausea, vomiting, coughing, weakness	NA
p-Nitroaniline	3 mg/m^3	300 mg/m^3	Dyspnea, irritability, vomiting, diarrhea	8.85
n-Nitrosodiphenylamine	NL	NL	Eye irritation	NL
di-n-Octyl phthalate	NL	NL	No information found in the NIOSH pocket guide	NL
Di-sec Octyl phthalate	5 mg/m^3	Ca (5,000 mg/m^3)	Eye and mucous membrane irritation	NL
PCB (54% Chlorine)	0.001 mg/m^3	Ca (5 mg/m^3)	Eye and skin irritation, acne-form dermatitis	NL
PCB (42% Chlorine)	0.001 mg/m^3	Ca (5 mg/m^3)	Eye irritation, chloracne	NL
Pentachlorophenol (PCP)	0.5 mg/m^3	2.5 mg/m3	Eye, nose, and throat irritation; sneezing; coughing; weakness; sweating; headache; dizziness; nausea; vomiting; chest pain; dermatitis	NL
Phenanthrene	0.2 mg/m^3	NL	Irritation	NL
Phenol	5 ppm	250 ppm	Eye, nose, and throat irritation; weakness; muscle ache; dark urine; dermatitis; convulsions	8.50
Pyrene	0.2 mg/m^3	NL	Irritation	NL
Selenium	0.2 mg/m^3	1 mg/m^3	Eye, nose, and throat irritation; visual disturbance; headache; chills; metallic taste; garlic breath; dermatitis	NL

3.8 CONTAMINANTS OF CONCERN				
Contaminant[a]	PEL, REL, or TLV[b] (ppm)	IDLH[c] (ppm)	Symptoms and Effects of Exposure	PIP[d]
Silver (Metal Dust & Soluble)	0.01 mg/m^3	10 mg/m^3	Blue-gray eyes; nasal septum, throat, skin, and GI irritation	NA
1,1,2,2-Tetrachloroethane	1 ppm	Ca (100 ppm)	Nausea, vomiting, abdominal pain, finger tremors, dermatitis	11.10
Tetrachloroethene	25 ppm	Ca (150 ppm)	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; headache	9.32
Tetrahydrofuran	1 ppm	2,000 ppm	Eye and upper respiratory irritation, nausea, dizziness, headache	9.45
Toluene	100 ppm	500 ppm	Fatigue, weakness, confusion, dizziness, headache, dilated pupils, muscle fatigue, dermatitis	8.82
1,1,1-Trichloroethane (1,1,1-TCA)	350 ppm	700 ppm	Headache, lassitude, CNS depression, poor equilibrium, eye irritation, dermatitis	11.00
1,1,2-Trichloroethane	10 ppm	Ca (100 ppm)	Eye and nose irritation, CNS depression	11.00
Trichloroethene	25 ppm	Ca (100 ppm)	Headache, vertigo, visual disturbance, tremors, nausea, eye irritation, dermatitis	9.45
Trichlorofluoromethane	NL	2,000 ppm	No information listed in the NIOSH Pocket Guide	NL
Vinyl chloride	1 ppm	Ca	Weakness, abdominal pain, GI bleeding	9.99
Xylenes, o & p	100 ppm	900 ppm	Dizziness; excitement; drowsiness; staggering gait; eyes, nose, and throat irritation; nausea; vomiting; dermatitis	8.44 - 8.56
Zinc	NL	NL	Skin and pulmonary system irritation	NA

[a]See Table 3.9 for maximum concentrations detected in each OU.
[b]Lower numerical value of permissible exposure limit (PEL), recommended exposure limit (REL), or threshold limit value (TLV) listed.
[c]Immediately dangerous to life and health.
[d]Photoionization potential.
[e]Carcinogenic.
[f]No limit found in reference materials.
[g]National Institute of Occupational Safety and Health.
[h]Not applicable.
[i]Gastrointestinal.
[j]Central nervous system.
[k]No limit established.
[l]Ceiling.
[m]CH2M HILL exposure limit.

3.9 Maximum Concentrations				
3.9.1 Maximum Concentrations–Operable Unit 1				
Compound	Groundwater (µg/L)	Subsurface Soil (µg/kg)	Surface Soil (µg/kg)	Surface Water (µg/L)
Acenaphthene	–	–	19,000	–
Acenaphthylene	–	–	2,000J	–
Acetone	3,500D	1,100D	120	18J
Anthracene	–	–	21,000	–
Antimony	142N	–	–	–
Arsenic	210	–	35,000	–
Barium	1,900 EPTOX: 58	99,200	–	91B
Benzo(a)anthracene	–	–	81,000	–
Benzo(a)fluoranthene	–	–	68,000D	–
Benzo(a)pyrene	–	–	68,000D	–
Benzo(g,h,i)perylene	–	–	48,000D	–
Benzo(k)fluoranthene	–	–	28,000	–
Benzoic acid	3J	–	–	3BJ
beta-BHC	–	14Z	–	–
bis(2-ethylhexyl) phthalate	13	6,400B	940J	10BJ
2-Butanone	4J	15	19	–
di-n-Butylphthalate	42	210BJ	–	–
Cadmium	12N EPTOX: 20	800	1,600	6
Carbon tetrachloride	77	–	4J	–
alpha-Chlordane	–	–	1,500J	–
Chloroform	33	8,000	–	–
Chromium	340	1,200	32,000	–
Chrysene	–	–	87,000D	–
Copper	910	600	–	18B
1,1-DCA	5	–	–	–
1,2-DCA	3J	–	–	–
1,1-DCE	160	–	–	–
1,2-DCE	1,100D	28	–	–
4,4'-DDT	–	–	170D	–
4,4'-DDE	–	–	160D	–
Dibenzo(a,h)anthracene	–	–	26,000	–
Dibenzofuran	–	–	11,000	–
Dieldrin	–	–	480D	0.13
Ethyl benzene	–	–	2J	–
Fluoranthene	–	51J	220,000D	–

3.9.1 Maximum Concentrations–Operable Unit 1

Compound	Groundwater (µg/L)	Subsurface Soil (µg/kg)	Surface Soil (µg/kg)	Surface Water (µg/L)
Fluorene	–	–	18,000	–
2-Hexanone	–	–	2J	–
Indeno(1,2,3-cd)pyrene	–	–	44,000D	–
Lead	1,000	11,000	459,000	40
Mercury	3.6	–	60	–
Methylene chloride	2J	21B	45B	1BJ
4-Methyl-2-pentanone	8J	–	62	–
2-Methylnaphthalene	–	–	3,600J	–
4-Methylphenol	–	–	300J	–
Naphthalene	–	–	4,800	–
Nickel	602N	700	14,000	–
n-Nitrosodiphenylamine	19BJ	431B	3,200J	5BJ
1,1,2,2-PCA	1,990D	240E	–	–
PCE	–	–	–	–
Phenanthrene	–	–	160,000D	–
Pyrene	–	40J	160,000	–
Selenium	90	–	–	–
Silver	42	–	–	–
1,1,1-TCA	10	–	–	–
1,1,2-TCA	12	–	–	–
TCE	5,100D	4J	–	–
1,1,2,2 Tetrachloroethane	–	240E	–	–
Toluene	–	55	6	–
Total Pesticides	–	2,160	–	–
Total PAHs	–	91	1,054,800	–
Total Xylenes	–	–	14	–
Zinc	1,300	47,200	300,000	140

>:	=	Native analyte >4 times spike added; therefore, acceptance criteria do not apply.
*:	=	Duplicate control not within limits.
Z	=	Matrix interference: compound not positively identifiable.
J	=	Estimated value less than the sample quantitation limit, but greater than zero.
B (Inorganic)	=	Value less than the Contract Required Detection Limit, but greater than the Instrument Detection Limit.
B (Organic)	=	Found in method blank.
D	=	Identified in an analysis at a secondary dilution factor.
–	=	No information available.

3.9.2 Maximum Concentrations–Operable Unit 2		
Compound	Groundwater (µg/L)	Surface Soil (µg/kg)
Acenaphthylene	–	250J
Acetone	4J	200
Aldrin	–	54
alpha-Chlordane	–	25J
Anthracene	–	260J
Antimony	60	26,000
Aroclor-1016	–	140Z
Aroclor-1221	–	95Z
Aroclor-1232	–	550Z
Aroclor-1242	–	200Z
Aroclor-1254	–	10,000D
Arsenic	324*	36,000 EPTOX: 0.008 mg/L
Barium	1,960 EPTOX: 58	409,000 EPTOX: 10 µg/L
Benzo(a)anthracene	–	7,800
Benzo(a)fluoranthene	–	2,800J
Benzo(a)pyrene	–	3,600J
Benzo(g,h,i)perylene	–	1,400J
Benzo(k)fluoranthene	–	4,600
Benzoic acid	–	320J
Benzol(b)fluoranthene	–	70J
Benzyl Alcohol	–	1,000J
alpha-BHC	–	12Z
beta-BHC	–	290Z
delta-BHC	–	11Z
bis(2-ethylhexyl) phthalate	54	8,100B
Butyl benzyl phthalate	–	1,300J
di-n-Butylphthalate	3J	480J
Cadmium	8	23.4
Carbon tetrachloride	5	–
Chloroform	2J	–
Chromium	616	8,680,000 EPTOX: 1.6 mg/L
Chrysene	–	2,500
Copper	1,570	240,000
4,4'-DDD	–	450
4,4'-DDE	–	1,300D
4,4'-DDT	–	7,400D
Dibenzofuran	–	350J
Dieldrin	–	220
Diethylphthalate	–	77J
2,4-Dimethylphenol	–	720J

3.9.2 Maximum Concentrations–Operable Unit 2

Compound	Groundwater (µg/L)	Surface Soil (µg/kg)
Endosulfan-I	–	350
Endrin	–	29
Ethyl benzene	–	9J
Fluoranthene	–	12,000
Fluorene	–	620J
Heptachlor epoxide	–	460
Heptachlor	–	32
Indeno(1,2,3-cd)pyrene	–	1,500J
Lead	334	17,500,000 EPTOX: 1.6 mg/L
Lindane	–	120Z
Mercury	1.7	260
4-Methyl-2-pentanone	–	8J
Methylene chloride	1BJ	36B
2-Methylnaphthalene	–	4,000
2-Methylphenol	–	1,100J
4-Methylphenol	–	500J
Naphthalene	–	1,600J
Nickel	238	53,000
3-Nitroaniline	–	36J
n-Nitrosodiphenylamine	5J	590J
di-n-Octyl phthalate	7J	–
PCE	39	31
Phenanthrene	–	18,000
Phenol	3J	550J
Pyrene	–	13,000
Selenium		15,000
Silver	–	800B
1,1,1-TCA	–	110
TCE	11	2J
Toluene	–	43
Total Xylenes	–	590
Total PCBs	–	10,000
Total PAHs	–	45,030
Total Pesticides		9,360
Zinc	910	22,100,000

>:	=	Native analyte >4 times spike added; therefore, acceptance criteria do not apply.
*:	=	Duplicate control not within limits.
Z	=	Matrix interference; compound not positively identifiable.
J	=	Estimated value less than the sample quantitation limit, but greater than zero.
B (Inorganic)	=	Value less than the Contract Required Detection Limit, but greater than the Instrument Detection Limit.
B (Organic)	=	Found in method blank.
D	=	Identified in an analysis at a secondary dilution factor.
–	=	No information available.

3.9.3 Maximum Concentrations–Operable Unit 3

Compound	Groundwater (µg/L)	Surface Soil (µg/kg)	Sediment (µg/kg)	Surface Water (µg/L)
Acenaphthene	–	200J	140J	–
Acetone	4J	38	170	110
Aluminum	89,900	–	–	–
Anthracene	–	330J	200J	–
Antimony	60	5,000	–	–
Arsenic	50	42,000	23,100	48
Barium	1,960	118,000	110,000	98
Benzo(a)anthracene	0.009	920J	1,100	–
Benzo(a)pyrene	0.004	930J	1,300	–
Benzo(b)fluoranthene	0.005	1,100J	1,800	
Benzo(g,h,i)perylene	–	780J	940	–
Benzo(k)fluoranthene	0.002	1,100J	1,600	–
Benzoic acid	–	–	1,200J	6BJ
bis(2-ethylhexyl) phthalate	9.6	2,700B	760J	2J
2-Butanone	–	–	6J	4J
Butyl benzyl phthalate	–	–	–	3J
di-n-Butylphthalate	–	–	–	3J
Cadmium	18N*	2,000	6,200	19
Carbon tetrachloride	5	–	–	–
Chlordane	–	–	2,090	–
Chlorobenzene	3.16	–	–	–
Chloroform	2J	2J	–	–
Chromium	337	206,000	166,000	20
Chrysene	–	1,200J	1,400	–
Cobalt	156	–	–	–
Copper	268	34,000*	81,000	68
4,4'-DDD	–	–	3,000D	–
4,4'-DDE	–	4,300D	460Z	0.88D
4,4'-DDT	–	4,000D	2,900D	2.2D
delta-BHC		2,500		
Dibenzo(a,h)anthracene	–	–	330J	–
Dieldrin	–	3,800D	–	–
Endosulfan-I	–	–	200Z	0.16Z
Fluoranthene	0.009	2,700	3,000,000	2J
Fluorene	–	160J	150J	–
Heptachlor	–	1,100Z	–	–
Heptachlor epoxide	–	340Z	–	–
Indeno(1,2,3-cd)pyrene	–	700J	900	–
Lead	128	157,000	560,000	295

3.9.3 Maximum Concentrations–Operable Unit 3

Compound	Groundwater (µg/L)	Surface Soil (µg/kg)	Sediment (µg/kg)	Surface Water (µg/L)
Mercury	1.7	98,000N	420	150
Methylene chloride	1BJ	21B	42B	28J
Nickel	125	13,000	22,500	–
n-Nitrosodiphenylamine	5J	340J	280BJ	7BJ
Di-n-Octyl phthalate	3J	–	–	9
PCE	11.2	2J	–	–
Pentachlorophenol	–	–	270J	–
Phenanthrene	–	2,000	1,300	–
Pyrene	–	2,500	2,400	3J
Silver	–	600	–	13
TCE	3J	4J	–	–
Toluene	–	9J	2J	–
Total Xylenes	–	8J	–	1J
Total PAHs	–	13,010	16,500	–
Total Pesticides	–	18,100	–	–
Zinc	408	290,000	801,000	400

>:	=	Native analyte >4 times spike added; therefore, acceptance criteria do not apply.
*:	=	Duplicate control not within limits.
Z	=	Matrix interference; compound not positively identifiable.
J	=	Estimated value less than the sample quantitation limit, but greater than zero.
B (Inorganic)	=	Value less than the Contract Required Detection Limit, but greater than the Instrument Detection Limit.
B (Organic)	=	Found in method blank.
D	=	Identified in an analysis at a secondary dilution factor.
–	=	No information available.

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3.9.4 Maximum Concentrations–Operable Unit 4				
Compound	Groundwater (ug/L)	Subsurface Soil (ug/kg)	Surface Soil (ug/kg)	Surface Water (ug/L)
Acenaphthene	--	--	64000J	--
Acenaphthylene	--	--	1900J	--
Acetone	--	45.00	95.00	110.00
Aldrin	--	--	54.00	--
Aluminum	120,000.00	--	--	--
Anthracene	1.84	--	130,000J	--
Antimony	--	--	27.00	--
Arsenic	324.00	--	33.00	--
Barium	603.00	49.00	6,540.00	42.00
Benzene	--	--	4.00	--
Benzo(a)anthracene	0.035	--	970,000.00	--
Benzo(a)pyrene	0.046	--	450,000.00	--
Benzo(b)fluoranthene	0.063	--	540,000.00	--
Benzo(g,h,i)perylene	0.093	--	360,000.00	--
Benzo(k)fluoranthene	0.029	--	450,000.00	--
Benzoic Acid	--	--	840J	--
alpha-BHC	--	--	9.50	--
delta-BHC	--	--	110.00	--
Bis(2-ethylhelyl)phthalate	54.00	--	2,900.00	--
2-Butanone	--	18.00	8J	4J
Butylbenzylphthalate	--	--	4,700.00	--
Cadmium	11.00	7.00	159	--
Carbon disulfide	--	--	8	--
alpha-Chlordane	--	--	4,000.00	--
gamma-Chlordane	--	--	4,000D	--
Chromium	408.00	6.00	16,200.00	20.00
Chrysene	0.127	--	620,000.00	--
Cobalt	63.20	--	--	--
Copper	322.00	6.00	1,590.00	--
4,4'-DDD	--	--	3,600.00	--
4,4'-DDE	--	--	39,000D	--
4,4'-DDT	--	--	59,000D	--
Dibenzo(a,h)anthracene	0.005	--	160,000.00	--
Dibenzofuran	--	--	24,000.00	--
Dieldrin	0.06	--	4,500D	--
Di-n-butylphthalate	3J	--	--	--
Di-n-octlyphthalate	7J	--	--	--
Endosulfan I	--	--	350	--
Endosulfan Sulfate	--	--	360	--
Endrin ketone	--	--	12,000D	--
Ethylbenzene	--	--	4J	--
Fluoranthene	0.08	--	860,000.00	--
Fluorene	--	--	4,7000J	--
Heptachlor	--	--	120.00	--
Heptachlor epoxide	--	--	250.00	--
HpCDD	--	2,100.00	230.00	--
HpCDF	--	2,800.00	190.00	--

3.9.4 Maximum Concentrations--Operable Unit 4

Compound	Groundwater (ug/L)	Subsurface Soil (ug/kg)	Surface Soil (ug/kg)	Surface Water (ug/L)
HxCDD	--	75.00	17.00	--
HxCDF	--	320.00	53.00	--
Indeno(1,2,3-cd)pyrene	0.02	--	860,000.00	--
Lead	205.00	7.00	7,680.00	--
Mercury	6.80	--	1.30	--
Methoxychlor	--	--	1500J	--
2-Methylnaphthalene	--	--	2,600.00	--
N-Nitrosodiphenylamine	--	44J	580J	--
Naphthalene	1.13	--	4,600.00	--
Nickel	238.00	4.00	367.00	--
OCDD	--	4,600.00	1,600.00	--
OCDF	--	2,300.00	230.00	--
PCDD	--	3.40	2.20	--
PCDF	--	4.00	--	--
PCE	2.39	--	3J	--
PCP	--	--	310J	--
Phenanthrene	0.16	--	620,000.00	--
Phenol	5.90	--	--	--
Pyrene	0.17	--	870,000.00	--
Selenium	--	--	12.00	--
Silver	--	--	9.00	--
1,1,2-TCA	--	--	11.00	--
TCDD	--	0.40	5.60	--
TCDF	--	0.60	0.80	--
TCE	9.00	--	2,100E	--
1,1,2,2 - Tetrachloroethane	--	--	19.00	--
Toluene	--	--	34.00	--
Total Xylenes	--	--	11.00	--
Zinc	910.00	11.60	28,200.00	36.00

3.10 POTENTIAL ROUTES OF EXPOSURE

DERMAL: Contact with potentially contaminated soil and water will be controlled through the use of PPE.	INHALATION: Inhalation of volatile vapors and contaminated dust will be controlled through the use of good work practice, engineering control, and PPE.	OTHER: Incidental ingestion can occur if personnel do not wash their hands and face before eating, drinking, or smoking.

4.0 TRAINING AND MEDICAL SURVEILLANCE

4.1 GENERAL REQUIREMENTS

4.1.1 EMPLOYEE TRAINING REQUIREMENTS

The SSOs will ensure that, before working onsite, all personnel have received the required training for tasks they are assigned to perform. All site personnel will meet the classroom and site-specific training requirements specified in Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(e).

4.1.2 RESPIRATOR SELECTION AND FIT TEST

Prior to site work requiring respiratory protection, the SSOs or the PSOs are responsible for assisting in the selection and fit testing of air purifying respirators to be used by site personnel. Each CH2M HILL employee will carry a card that documents the size, brand, and model number of the air purifying respirator with which each site worker has achieved a successful face seal fit.

4.1.3 MEDICAL SURVEILLANCE REQUIREMENTS

Establishment of a medical surveillance program is essential for the protection of site personnel. The purpose of the program is threefold:

- To establish a baseline record of health against which future changes can be measured
- To identify any underlying illnesses or conditions that might be aggravated by chemical exposures or job activities such as the use of respiratory protective equipment
- To allow recognition of any abnormalities at the earliest opportunity, so that corrective measures can be implemented

All medical monitoring and medical recordkeeping of personnel will comply with the requirements specified by OSHA in 29 CFR 1910.120. All medical surveillance protocols will be reviewed by a licensed physician certified in Occupational Medicine by the American Board of Preventive Medicine or who, by necessary training and experience, is board eligible. Recommended medical examination and screening protocols are described in Appendix D. The content of the medical examination will be determined by the examining physician.

4.1.4 ONSITE BRIEFINGS

The SSOs must conduct a Tailgate Safety Meeting at the beginning of each shift, whenever new personnel arrive at the site, and as site conditions change. The typical Tailgate Safety Meeting will be brief and address safety issues pertaining to the site, incidents that may have occurred previously at the site, incidents and accidents most likely to occur, and engineering or work practice controls necessary to mitigate those hazards. A more detailed tailgate session will be held at the beginning of each week, whenever new personnel arrive at the site, and when new site activities are planned. Potential topics of discussion at these sessions include the following:

- Site hazards
- Protective equipment/clothing
- Emergency procedures
- Hospital/ambulance route
- Standard operating procedures (SOPs)
- Other safety topics that are relevant to the site
- Previous day's incidents concerning site safety

4.1.5 TRAINING DOCUMENTATION

The SSO will maintain a file of completed personal acknowledgements. All site workers must sign and date this document acknowledging that they have read and understand the SSHP and attended the requisite training. A copy of the personal acknowledgement form is contained in Appendix A. In addition, each CH2M HILL employee will carry a card that summarizes their training and medical monitoring status.

4.2 CH2M HILL EMPLOYEES (REFERENCE CHEM HILL SOP HS-01 AND HS-02)

Employees listed below are enrolled in the CH2M HILL chemical protection program (CPP) and meet the medical surveillance, 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training requirements of OSHA 29 CFR1910.120. Employees designated SSOs have received 8 hours of supervisory and 8 hours of instrument training and can serve as SSOs for the level of protection indicated. All employees who are enrolled in CH2M HILL's hazardous waste training and medical surveillance program are required to carry cards that summarize their training and medical status, including SSOs and first aid and cardiopulmonary resuscitation (CPR) status. The cards also provide documentation of respiratory fit testing, including the type and size of respirator the employee is authorized to wear. All field teams using heavy equipment will have an SSO that is certified in first aid and CPR (designated below as FA-CPR). Whenever possible, an SSO with first aid and CPR training will be a member of all field teams. If a team does not have an SSO, the team may not be more than 5 minutes away from an SSO and must be in radio (intrinsically safe in hazardous atmosphere) contact with an SSO with FA-CPR training at all times. The "buddy system" requirements of OSHA 29 CFR1910.120 are to be met at all times.

Employee Name	Office	Responsibility	SSO/FA-CPR
Kelly Crochet	MGM	Task Manager; Project Engineer	FA-CPR
Hunter Sartain	MGM	Task Manager; Project Engineer	FA-CPR
Jason Glasgow	MGM	Sampler	FA-CPR
Waylon Goss	MGM	Field Team Member	
Dan Jacobazzi	MGM	Field Team Member	FA-CPR
Rob Piekarz	MGM	Field Team Member; SSO	Level D SSO; FA-CPR
Philip Stroud	MGM	Field Team Member; SSO	Level B SSO; FA-CPR
Chris Waid	MGM	Field Team Member	FA-CPR
Joel Bowker	ORO	Field Team Member	FA-CPR
David Hammel	ORO	Field Team Member	FA-CPR
Dale Jayne	ORO	Field Team Member	FA-CPR
David King	ORO	Field Team Member; SSO	Level D SSO; FA-CPR
Mike Marable	ORO	Field Team Member; SSO	Level C SSO; FA-CPR
Greg Schaefer	ORO	Field Team Member; SSO	Level C SSO; FA-CPR
Greg Underberg	ORO	Field Team Member	FA
Bob Viens	FGL-ORO	Auditor	–

4.3 HEALTH AND SAFETY AND FIELD TEAM CHAIN-OF-COMMAND AND PROCEDURES

4.3.1 CLIENT

Corps of Engineers, Huntsville Division
John Romeo, P.E.
205/955-5803

4.3.2 CH2M HILL

The SSO is responsible for implementing the SSHP. Questions regarding health and safety should be addressed to the SSO. If the SSO is unable to answer the question or is unresponsive, the PSO should be contacted. Emergency procedures and contacts are listed in Sections 11.0 through 14.0.

4.3.3 SUBCONTRACTOR

Hydrovision
Ram Arora, Ph.D., R.G.
404/454-3285

Toles and Associates
1750 Madison Avenue
Memphis, Tennessee 38104
James H. Toles, President
901/725-6152

5.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) will be required during the course of the fieldwork at DDMT. Selection of this equipment is based primarily on hazard assessment data and work task requirements. The protective ensembles and associated personal protective components are based on the U.S. Environmental Protection Agency's (EPA's) levels of protection B, C, and D. The effectiveness of the PPE program will be continuously evaluated and provisions made for appropriate upgrades or downgrades in equipment, based on hazard assessment and air monitoring results. CH2M HILL SOP HS-07 and HS-08 are written PPE programs in accordance with 29 CFR 1910.120 (g)(5) and the respiratory protection requirements of 29 CFR 1910.134, respectively. Minimum PPE ensembles and specific materials from which the PPE components are constructed for each site activity to be performed by CH2M HILL are detailed by task in Section 5.1.

5.1 PERSONAL PROTECTIVE EQUIPMENT SPECIFICATION BY TASK

Tasks	Level	Body	Foot	Head	Eye	Hand	Respirator
All tasks in areas with dioxin potential: • OU-4 (PCP dip vats and associated sites) • OU-2, 3, and 4 (railroad tracks) and DRMO yard	C[b]	Cotton coveralls. Tyvek coveralls if cotton coveralls cannot be kept clean. Coated Tyvek coveralls or rubber apron if splash potential is present.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with neoprene boot covers.	Hardhat. Hearing protection if working in the vicinity of heavy equipment or if conversations have to be shouted at 3 feet or less.	Full-face respirator	OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile or latex gloves and outer nitrile gloves when touching potentially contaminated materials.	APR full face with organic vapor/acid gas cartridges and dust filters.
The following tasks, if there is no potential for dioxin: • Civil surveying • Geophysical investigation	D (modified)	Long pants and long-sleeved shirt or cotton coveralls.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with neoprene boot covers.	Hardhat.	Safety glasses. Safety goggles or face shield if splash potential is present.	Work gloves. OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile or latex gloves and outer nitrile gloves when touching potential contaminated materials.	None required.
The following tasks, if there is no potential for dioxin: • Surface soil sampling • Drilling and soil boring • Groundwater well installation • Groundwater sampling • Water level measurements	D (modified)	Cotton coveralls. Tyvek coveralls, if cotton coveralls cannot be kept clean. Coated Tyvek coveralls or rubber apron if splash potential is present.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with neoprene boot covers.	Hardhat. Hearing protection if working in vicinity of heavy equipment or if conversations have to be shouted at 3 feet or less.	Safety glasses. Safety goggles or face shield if splash potential is present.	OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile gloves or latex gloves and outer nitrile gloves when touching potentially contaminated materials.	None required.

5.1 PERSONAL PROTECTIVE EQUIPMENT SPECIFICATION BY TASK

Tasks	Level	Body	Feet	Head*	Eye	Hand	Respirator
The following tasks, if action levels are exceeded (see Section 6.0): • Surface soil sampling • Drilling and soil boring • Groundwater well installation • Groundwater sampling • Water level measurements • Trenching, and digging test pits	C**	Tyvek taped to boots and gloves. Coated Tyvek coveralls or rubber apron taped to boots and gloves if splash potential is present.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with neoprene boot covers.	Hardhat. Hearing protection if working in vicinity of heavy equipment or if conversations have to be shouted at 3 feet or less.	Full-face respirator.	OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile gloves or latex gloves and outer nitrile gloves when touching potential contaminated materials.	APR, full face with organic vapor/acid gas cartridges and dust filter.
If action levels are exceeded (see Section 6.0): • Surface soil sampling • Drilling and soil boring • Groundwater well installation • Groundwater sampling • Water level measurements • Trenching, and digging test pits	B**	Saranex taped to boots and gloves.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with neoprene boot covers.	Hardhat. If working in vicinity of heavy equipment or if conversations have to be shouted at 3 feet or less.	Full-face respirator.	OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile or latex gloves and outer nitrile gloves when touching potentially contaminated materials.	Supplied air respirator with a 5-minute escape pack.
Surface water and sediment sampling	D (modified)	Saranex coveralls, rainsuit, or rubber apron.	Steel-toed, steel-shanked neoprene boots or steel-toed, steel-shanked leather boots with latex boot covers.	Hardhat.	Safety glasses. Safety goggles or face shield if splash potential is present.	OU-2: Inner nitrile gloves and outer neoprene gloves when touching potentially contaminated materials. OUs 3 and 4: Inner nitrile gloves or latex gloves and outer nitrile gloves when touching potentially contaminated materials.	None required.

*The SSO shall specify hardhat areas.

**Two-way radios (intrinsically safe in hazardous atmosphere) are required by the COE HASP when Level C or B is used. Personnel must have a medical clearance to wear respirators and have been fit tested within the past year prior to wearing respirator protection. The U.S. Army Corps of Engineers (USACE) PM must be advised of any site conditions that require personnel to upgrade to another level of protection. Boundary monitoring must be completed when work is conducted in Level C or higher. If boundary monitoring results are greater than background levels, engineering controls must be implemented to reduce airborne concentrations. If levels cannot be reduced, work will be stopped until effective control measures can be implemented.

6.0 AIR MONITORING AND SAMPLING SPECIFICATION

Monitoring is an ongoing process essential for the determination of hazard control measures. These measures must be implemented during the site investigation and documentation of personnel exposure. It involves characterization of the chemical, physical, safety, and biological hazards at the site.

Exposure Monitoring/Air Sampling Program. The main objective of air monitoring is to assess the potential inhalation hazard to site personnel. This SSHP describes in detail the air monitoring and sampling protocol that has been developed according to a site hazard analysis and the potential for offsite migration of airborne contaminants for the activities CH2M HILL will be performing. All site monitoring will be conducted by a member of each field crew trained in the use of the instruments. The results will be recorded in a safety logbook.

Organic Vapor Monitoring. Organic vapor levels will be measured upwind of the field activities to assess the background reading. Each specific work site will be continuously monitored (by a member of each field crew trained in the use of the instruments) for the presence of organic vapors in the exclusion zone using appropriate direct read instrumentation as determined by the SSO (see Section 6.1). Perimeter monitoring will be conducted as necessary, based on the site hazard analysis (see Section 6.2). Action levels will be set for upgrades or downgrades in levels of protection; for implementation of engineering controls; for emergency evacuation of onsite personnel; and for prevention and minimization of public exposures to hazards, based on airborne exposure hazards and direct skin contact potentials. All air monitoring results will be compared to action levels to determine the acceptability of current practices and controls and the need for corrective action. The COE project manager will be advised of any site conditions that require personnel to upgrade to another level of protection.

Noise Monitoring. Some site activities may result in significant noise levels. Area and personal noise surveys will be conducted to categorize noise levels. A sound-level meter that is capable of integrating and averaging sound levels throughout the work day will be used to monitor employee exposures to noise levels at operations likely to cause increased noise. Hearing protective devices will be available to employees upon request, and mandatory for employees involved in operations that result in noise levels exceeding the OSHA-permissible exposure levels for noise.

6.1 AIR MONITORING EQUIPMENT FOR WORKERS (CH2M HILL, 1994, HS-06)

Instrument	Tasks	Action Levels		Frequency	Calibration
CGI: MSA 260 or 261	• All invasive tasks	0-10% LEL 10-25% LEL >25% LEL	No expl.[a] hazard Pot.[b] expl. hazard Expl. hazard; evacuate or vent	Monitor continuously. Record readings every 30 minutes.	Daily
O_2 meter: MSA 260 or 261	• All invasive tasks	>25.0% O_2 20.9% O_2 <19.5% O_2	Expl. hazard; evacuate or vent Normal O_2 O_2 def.[c]; vent or use SCBA	Monitor continuously. Record readings every 30 minutes.	Daily
Flame Ionization Detector (FID): Foxboro OVA-128	The following activities in non-dioxin areas: • Civil surveying • Geophysical investigation • Surface soil sampling • Drilling or soil boring • Groundwater monitoring well installation • Groundwater sampling • Water level measurements • Surface water and sediment sampling	<1 ppm[d,e] 1-10 ppm[d,e] 10-100 ppm[d,e] >100 ppm[d,e]	Level D Level C[f] with organic vapor-acid gas cartridges and dust filters, if no other action levels are exceeded. Level B[f] Stop work; reevaluate	Monitor continuously. Record readings every 30 minutes.	Daily
FID: Foxboro OVA-128	The following activities in dioxin areas: • Civil surveying • Geophysical investigation • Surface soil sampling • Drilling or soil boring • Groundwater monitoring well installation • Groundwater sampling • Water level measurements • Surface water and sediment sampling	<10 ppm[d,e] 10-100 ppm[d,e] >100 ppm[d,e]	Level C[f] with organic vapor-acid gas cartridges and dust filters, if no other action levels are exceeded. Level B[f] Stop work; reevaluate	Monitor continuously. Record readings every 30 minutes.	Daily
Noise Monitor	• All tasks in high noise areas	<85dB(A) 85-12dB(A) >120 dB(A)	No hearing protection required Hearing protection required Stop work	Continuously record readings every hour.	Daily

[a]Explosion.
[b]Potential.
[c]Deficient.
[d]Non-methane readings. Non-methane readings are obtained by taking the difference between readings with and without the charcoal filter.
[e]Above background in breathing zone; sustained for 5 minutes. For toxic chemicals, the immediate concern is worker exposure. Therefore, the location of air monitoring equipment is in the worker breathing zone, regardless of the contaminant specific gravity. When action levels are exceeded in the breathing zone, the source of emissions is also monitored (to account for any contaminant, regardless of specific gravity) periodically (monitor and record every 30 minutes). Background to be determined daily by SSOs.
[f]The U.S. Army Corps of Engineers (USACE) PM must be advised of any site conditions that require personnel to upgrade to another level of protection. Boundary monitoring must be completed when work is conducted in Level C or higher. If boundary monitoring results are greater than background levels, engineering controls must be implemented to reduce airborne concentrations. If levels cannot be reduced, work will be stopped until effective control measures can be implemented.

6.2 PERIMETER MONITORING

Perimeter monitoring will be conducted with an organic vapor monitor (OVA) by a field team member trained in the use of the instrument when breathing zone action levels (see Section 6.1) are exceeded or Level C or a higher level of protection is used. Perimeter monitoring will be conducted at the same frequency as the breathing zone monitoring. The action levels listed below will be followed:

- < Background Continue work
- > Background Implement measures (e.g., ventilation, covering contaminated materials, etc.) to reduce airborne levels, or stop work and re-evaluate.

6.3 CALIBRATION SPECIFICATION

Instrument	Gas	Span	Reading	Method
FID: OVA-128	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 l/m reg T-tubing
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5 % LEL	1.5 l/m reg direct tubing
Noise Monitor	N/A	N/A	N/A	N/A

6.4 AIR SAMPLING

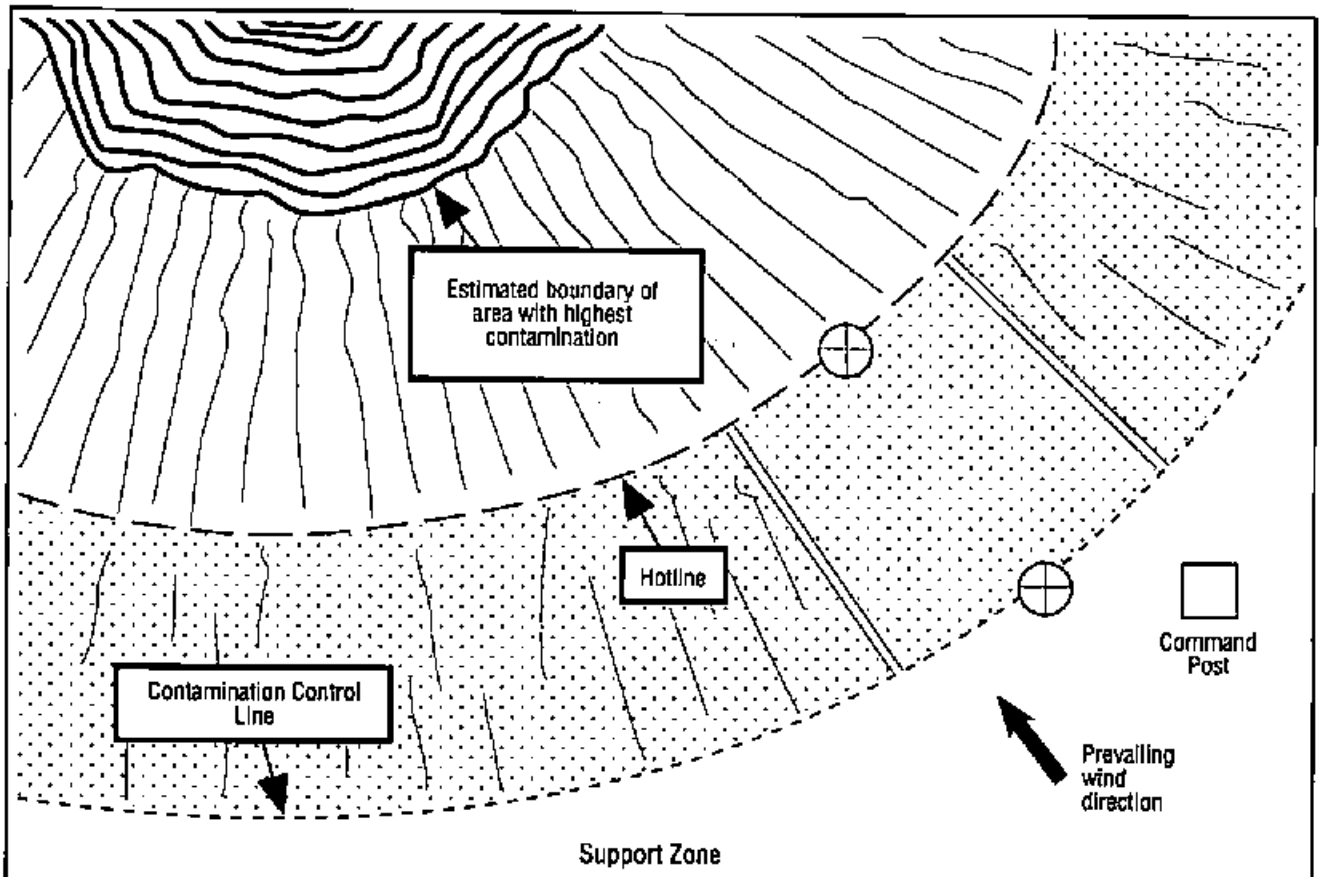
Method and Description: Based on the types and concentration of contaminants, it is not anticipated that air sampling will be required. However, if direct reading instruments indicate an exposure problem or personnel become ill, the PSOs will be contacted to re-evaluate the necessity of air sampling.

7.0 WORK ZONES AND DECONTAMINATION (REFERENCE CHEM HILL SOP HS-15)

7.1 WORK ZONES

Safety procedures for preventing or reducing the migration of contamination require the delineation of zones on the site where prescribed operations occur. Movement of personnel and equipment between zones and onto the site itself will be limited by access control points. After confirming the appropriate level of personal protection for site entry and determining the general wind direction, site work zones (exclusion, contamination reduction, and support) will be established. Delineation of work zones will be based on monitoring results, evaluating potential routes of exposure, and determining the amount of contaminant dispersion in the event of a release. The site will be outlined with surveyor tape and/or stakes to define the work area and to identify the entry and exit points. A typical work zone schematic is presented in Figure 6.

Exclusion Zone. The EZ is defined as the work area where contamination could occur. All personnel entering the EZ must wear the prescribed level of protection. The outer boundary of the EZ will be established by visually surveying the site to determine the distances needed to prevent fire or an explosion from affecting personnel, the physical area necessary to conduct the work operations, and the potential contaminants to be blown from the area. The EZ will be large enough to include all vehicles and equipment needed to do the work. Once the boundary has been determined, it will be defined with continuous



LEGEND

- Contaminated Area
- Exclusion Zone
- Contamination Reduction Zone
- Contamination Reduction Corridor
- Access Control Points

Figure 6
TYPICAL WORK ZONE SCHEMATIC
Defense Depot Memphis, Tennessee

red surveyors' tape and/or stakes. An entry and exit checkpoint must be established at the boundary of the EZ to regulate the flow of personnel and equipment. During subsequent operations, the boundary may be modified and adjusted by the SSO as more information becomes available.

Contamination Reduction Zone. The contamination reduction zone (CRZ) provides a transition between contaminated and clean zones and serves as a buffer to further reduce the probability of the clean zone becoming contaminated or being affected by other existing hazards. It provides additional assurance that the physical transfer of contaminants on personnel, equipment, or through the air is limited by a combination of decontamination and the distance. All personnel assisting with decontamination procedures in the CRZ will be required to wear the same level of protection as prescribed for the exclusion zone.

Contamination Reduction Corridor. Decontamination stations will be established at the boundary between the exclusion and contamination reduction zones. There will be separate stations for personnel and for heavy equipment. Figures 7 and 8 depict the maximum decontamination layout for Levels D and C, respectively. Depending on the task, the sampling location, and air monitoring results, the stations shown in these figures may be consolidated. The exit from the EZ will be through a designated contamination reduction corridor (CRC). The CRC is used to control access into and out of the exclusion zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, overall dimensions of work control zones, and amount of space available. Boundaries will be conspicuously marked, with entry and exit restricted. The inner end of the corridor is the "hot line," the boundary between the exclusion zone and the contamination reduction zone. Personnel exiting the exclusion zone must go through the CRC. Another corridor may be required for the entrance and exit of heavy equipment needing decontamination. The CRC will be dedicated to decontamination activities only.

As operations proceed, the area around the decontamination station may become contaminated, but to a much lesser degree than the EZ. The outer boundary of the CRZ will be far enough away from the EZ so that no levels of atmospheric contamination exist that are dangerous to unprotected personnel. This level will be verified by monitoring the CRZ once per hour using direct read instrumentation during times when air monitoring results in EZ are above background levels. If monitoring results are above background in the CRZ, then the EZ will be expanded to include the area that is above background. The CRZ will be reestablished in an area free of air contaminants.

Support Zone. The support zone (SZ), the outermost part of the site, is considered a noncontaminated, or clean, area. Support equipment (the command post, safety vehicle, and so forth) is located in this area. Normal work clothes are appropriate within this zone. Access to the SZ from the CRZ is through a controlled access point. Re-entrance into the SZ requires decontamination procedures as determined by the PSOs.

The location of the SZ at each site depends on a number of factors, including the following:

- Accessibility—topography, open space available, locations of roads, or other limitations.
- Visibility—SZ must have complete visual access to all activities in the EZ.
- Wind Direction—preferably, the support facilities should be located upwind of the EZ. Shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources—water.

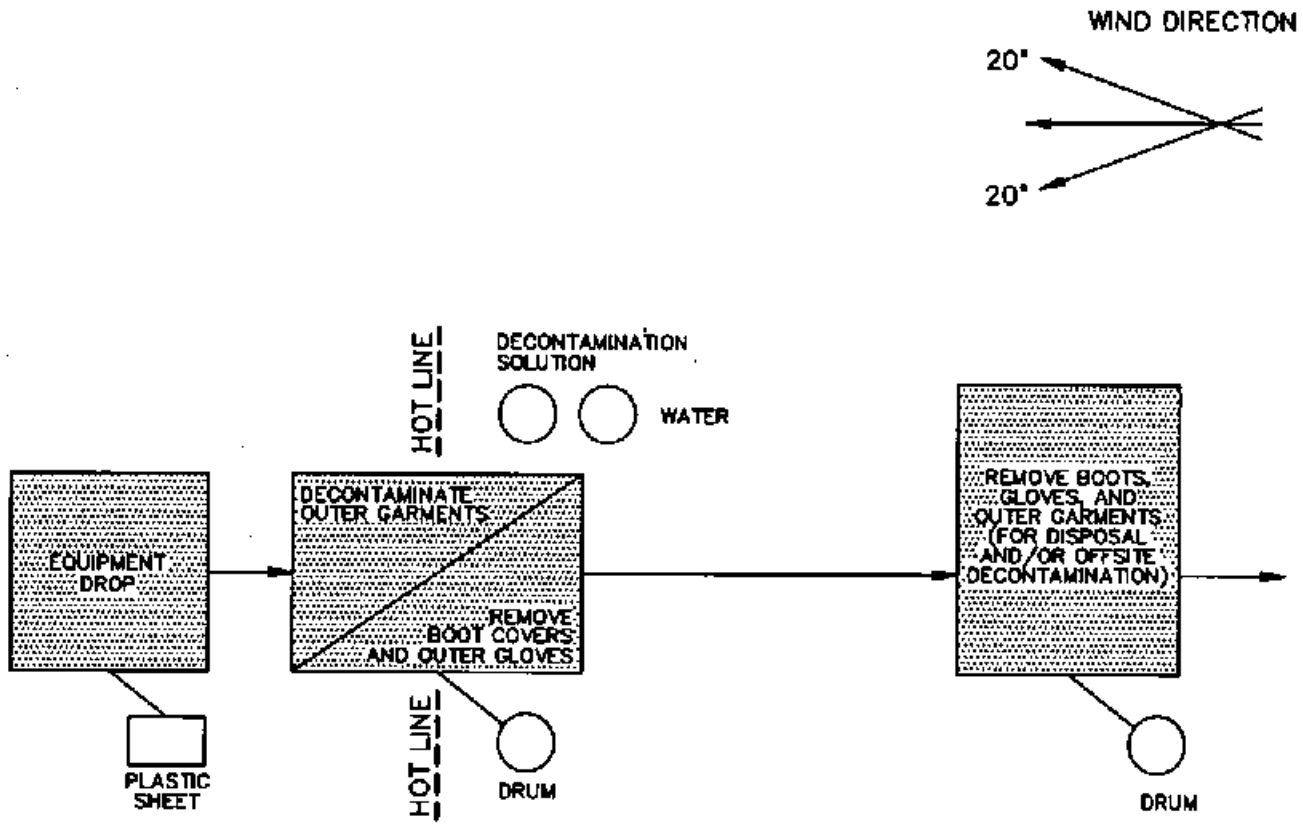


Figure 7

TYPICAL LEVEL D DECONTAMINATION SCHEMATIC

Defense Depot Memphis, Tennessee

CH2M HILL

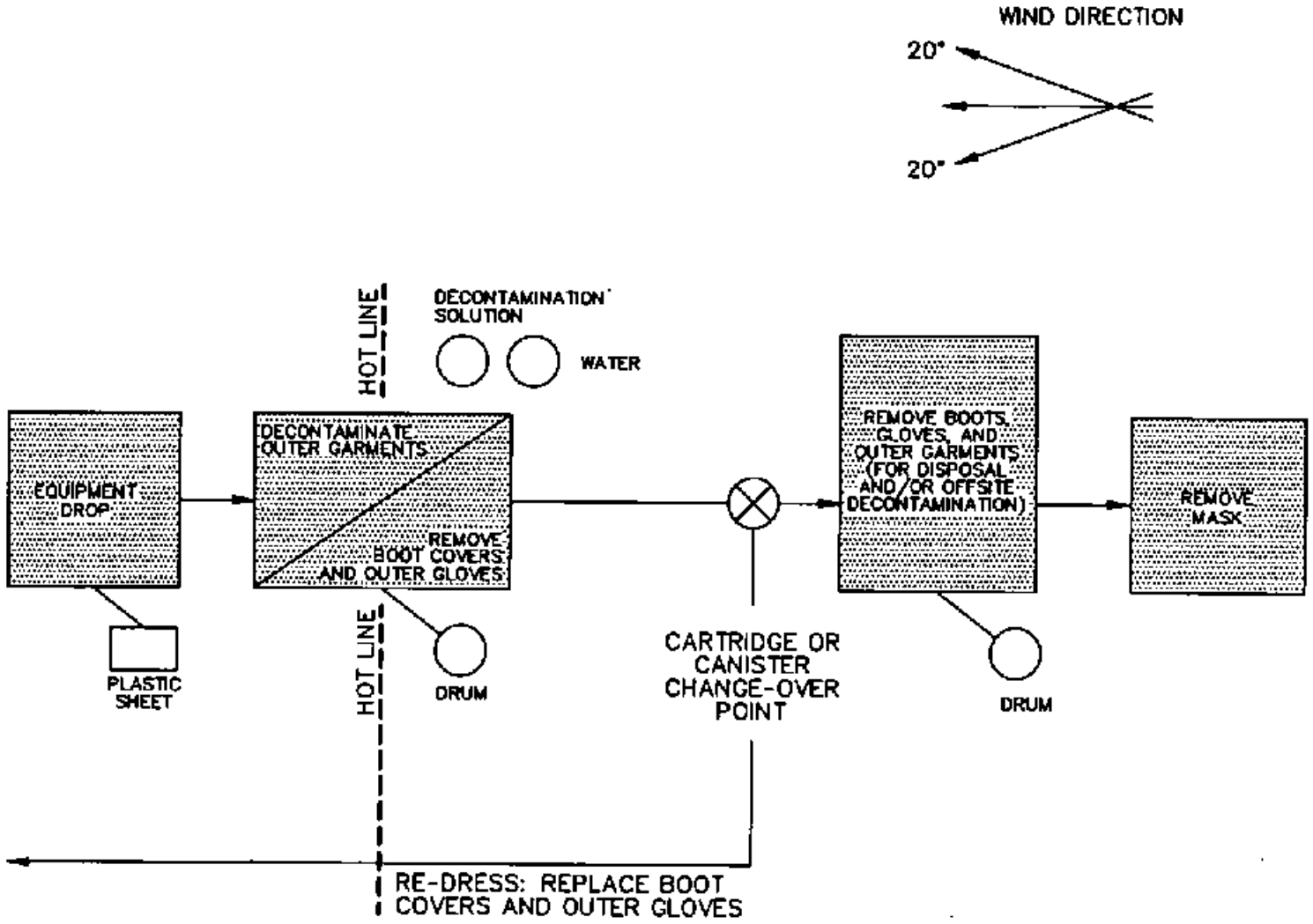


Figure 8

TYPICAL LEVEL C DECONTAMINATION SCHEMATIC

Defense Depot Memphis, Tennessee

CH2M HILL

7.2 DECONTAMINATION PROCEDURES

The establishment of decontamination procedures for personnel and equipment is necessary to prevent the spread of contamination and to protect field personnel. This section generally describes procedures to be used to decontaminate personnel and equipment. It also describes the decontamination procedures to be used in case of a medical emergency. Site-specific decontamination procedures for CH2M HILL's activities are developed according to site hazard assessment, and a worst-case scenario. Initial decontamination procedures will be modified by the SSOs on the basis of actual site conditions, with the approval of the PSOs.

All materials and equipment used for decontamination must be disposed of properly. Disposable clothing, tools, buckets, brushes, and all other equipment that cannot be decontaminated will be secured in containers and labeled. Clothing that will be reused will be secured in plastic bags before being removed from the site.

7.2.1 DECONTAMINATION OF PERSONNEL

Personnel and equipment will be decontaminated upon leaving the EZ unless the SSOs determine that site hazard assessment, monitoring results, and visual inspection of personal protective clothing and equipment indicate that no need exists for decontamination. When decontamination is necessary, it will consist of the following:

- A decontamination station at the "hot line" or in the CRZ will be located where personnel routinely exit the EZ. When exiting the EZ, personnel will remove overboots, chemical-resistant boots, coveralls, and outer gloves only at the specified decontamination station. When in use, air purifying respirators or supplied-air facepieces will be removed next-to-last. Inner gloves, when worn, will be removed last.

- All personal protective clothing that has been removed will remain at the decontamination station pending personnel redonning the clothing. At the conclusion of work in an EZ, all protective equipment must be placed in plastic bags before disposal or transfer offsite.

- Personnel will not be permitted to exit the regulated work area until contaminated clothing and equipment have been removed and employees have washed their hands and face with soap and water.

- All employees will wash their hands and face with soap and water before eating, drinking, smoking, or applying cosmetics. These activities will be restricted to designated rest areas in the SZ.

These procedures are summarized in Section 7.2.4.

7.2.2 EQUIPMENT DECONTAMINATION AND DISPOSAL OF CONTAMINATED MATERIALS

Equipment that may require decontamination includes drill rigs, soil and water sampling devices and containers, and certain protective equipment. Decontamination of sampling equipment is provided in the generic QAPP (CH2M HILL, August 1995). Protective equipment will be decontaminated by the following steps:

1. Rinsing with a solution that is chemically and physically compatible with contaminants.
2. Washing with a soft bristle brush and detergent.
3. Rinsing thoroughly with tap water.
4. Rinsing thoroughly with de-ionized water.
5. Rinsing with methanol.
6. Rinsing thoroughly with organic free water and allowing to air dry as long as possible.

A summary of these procedures is presented in Section 7.2.4.

7.2.3 DECONTAMINATION DURING MEDICAL EMERGENCIES

If prompt life-saving first aid and medical treatment is required, emergency decontamination procedures may be omitted. It is possible that decontamination could aggravate or cause more serious health effects. In any event, life-saving care will be initiated immediately after emergency decontamination. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Chemical-resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual will be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of an ambulance or medical personnel. Outer garments are then removed at the medical facility. The SSO will determine the necessary steps for decontamination in an emergency situation. If possible, onsite response personnel will accompany contaminated victims to the emergency medical facility to advise on matters involving decontamination. No attempt will be made to wash or rinse the victim, unless it is known or suspected that the individual has been contaminated with an extremely toxic or corrosive material that could cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedures will be followed.

7.2.4 DECONTAMINATION SUMMARY (REFERENCE CH2M HILL SOP HS-13)

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse • Glove wash/rinse • Outer glove removal • Body suit removal • Inner glove removal • Respirator removal • Hand wash/rinse • Face wash/rinse • Shower as soon as possible (ASAP)	• Wash/rinse equipment • Solvent rinse equipment • Solvent disposal method: containerized and transported to a Dunn Field holding tank for processing	• Power wash • Steam clean • Water disposal method: containerized and transported to a Dunn Field holding tank for processing

Personnel	Sample Equipment	Heavy Equipment
• PPE disposal method: double-bagged and disposed of in DDMT dumpsters unless it cannot be decontaminated. Equipment that cannot be decontaminated must be containerized and labeled. • Water disposal method: containerized and transported to a Dunn Field holding tank for processing		

8.0 SPILL CONTAINMENT PROCEDURES

- Containers with chemical substances will be secured, and the amount of chemical substances available will be limited. If a spill occurs, sorbent will be used, and the material will be put into containers.
- Purged groundwater will be stored in 55-gallon drums. If a spill occurs, sorbent will be used, and the material will be put into containers.
- If oils or other fluids leak from the heavy equipment, any affected media will be put into containers, and a drip pan will be placed under the equipment.
- Investigation derived wastes (IDW) will be managed in Department of Transportation (DOT)-approved drums, stored onsite temporarily, sampled and analyzed, and disposed of in accordance with applicable regulations (see Section 4.9 of the QAPP).

9.0 CONFINED-SPACE ENTRY

No confined-space entries are anticipated; however, if they become necessary, procedures and a permit meeting USACE EM 385-1-1, 29 CFR 1910.146, and CH2M HILL HS-17 requirements will be developed. The PSO must be contacted to approve confined-space entry procedures and permits before entry into a confined space.

10.0 WORK PROCEDURES

10.1 WORK PRACTICES

- No spark sources within exclusion or decontamination zones.
- Smoking, eating, drinking, or chewing tobacco within 100 ft of the EZ or any potentially contaminated area is prohibited. Smoking and eating areas will be designated by the SSOs.
- Contact with potentially contaminated substances is prohibited. Walking through puddles or pools of liquid, kneeling on the ground or leaning, sitting, or placing equipment on contaminated soil should be avoided.
- Failure to wear proper safety clothing at all times is prohibited. Shirts and steel-toed shoes will be used on the job at all times.

- Personnel onsite will use the "buddy system" and maintain communication or visual contact among team members at all times.
- No contact lenses in exclusion or decontamination zones.
- No facial hair that would interfere with respirator fit if Level C or B is anticipated.
- Site work will be performed during daylight hours whenever possible. Any work conducted during hours of darkness will require enough illumination intensity "to read a newspaper without difficulty."
- Hazard assessment is a continual process; personnel must be aware of their surroundings and constantly be aware of the chemical and physical hazards that are present.
- Personnel in the EZ will be the minimum number necessary to perform work tasks safely and efficiently.
- Team members will be familiar with the physical characteristics of each investigation site, including wind direction, site access, location of communication devices, and safety equipment.
- Before drilling activities, the location of overhead power lines and underground utilities must be established.
- If geophysical logging with a nuclear source is required, all protocols and restrictions of the geophysical logging service company will be followed. No untrained personnel will be allowed within the exclusion zone established by the service company. Personnel working with the exclusion zone must wear ID badges.

10.2 SITE CONTROL MEASURES

- The SSOs must conduct a Tailgate Safety Meeting at the beginning of each shift, whenever new personnel arrive at the site, and as site conditions change to discuss the following: safety issues pertinent to the site, incidents that may have occurred previously at the site, incidents and accidents most likely to occur, and engineering or work practice controls necessary to mitigate those hazards. A more detailed tailgate session will be held at the beginning of each week, whenever new personnel arrive at the site, and when new site activities are planned. Potential topics of discussion at these sessions include site hazards, protective equipment/clothing, emergency procedures, hospital/ambulance route, standard operating procedures, and previous day's incidents concerning site safety.
- Safety briefing attendance and topics will be documented in a logbook and available for review on request.
- The SSOs will conduct daily safety and health inspections, using Appendix E, Job Inspection Checklist. Documentation (including SSO's signature) must be maintained.
- The OSHA job safety poster will be posted in a central and conspicuous location at the site (see Appendix F).
- Wind direction will be determined.
- Support, decontamination, and exclusion zones will be established based on anticipated hazards and the results of direct reading instruments. Work zones will be delineated with flagging, cones, barriers, flashers, or warning signs. The SZ must be upwind of the EZ.
- Decontamination procedures will be established and tested.
- At the entry and exit from each work zone, use access control. The SSO must prevent unauthorized people from entering the EZ and CRZ.
- Only enough personnel necessary to perform the work in a safe and efficient manner will be allowed in the EZ.
- Chemicals will be stored in proper containers.
- MSDSs are available for onsite chemicals to which employees are exposed.

- Onsite communications will be established. These should consist of the following:
  - Line-of-sight/hand signals
  - Air horn
  - Two-way radio (intrinsically safe in hazardous atmosphere) or cellular phone, if available
- When work is planned in areas that are high noise atmospheres, hand signals needed to communicate day-to-day operations must be established during the pre-entry briefing.
- Emergency signals will be established. For example:
  - Grasping throat with hand—EMERGENCY, HELP ME
  - Grasping buddy wrist—LEAVE AREA NOW
  - Thumbs up—OK, UNDERSTOOD
  - Two short blasts on air horn—ALL CLEAR
  - Continuous air horn—EMERGENCY, EVACUATE
- Offsite communications will be established.
- "Buddy" system will be established.
- Procedures for disposal of material generated onsite will be established.
- The SSO will conduct initial air monitoring in appropriate level of protection.
- The SSO will conduct periodic inspections of work practices to determine effectiveness of this plan. Deficiencies will be noted, reported to PSOs, and corrected.

11.0 EMERGENCY RESPONSE PLAN (REFERENCE CHEM HILL SOP HS-12)

11.1 PRE-EMERGENCY PLANNING

The SSOs perform the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency service providers as appropriate.

- Locate nearest telephone to the site and inspect onsite communications.
- Locate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers and route to hospital.
- Post site map marked with location of emergency equipment and supplies.
- Review emergency response plan for applicability to any changed site conditions, alterations in onsite operations, or personnel availability.
- Evaluate capabilities of local response teams.
- Where appropriate and acceptable to the client, inform emergency room/ambulance service and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment and supplies.
- Review emergency procedures with field personnel for personnel injury, exposures, fires, explosions, and chemical and vapor releases.
- Locate onsite emergency equipment and supplies of clean water.
- Verify local emergency contacts, hospital routes, evacuation routes, and assembly points.
- Drive route to hospital.
- At least one person will be certified to render first aid and CPR before field activities are begun, these personnel will also be trained in bloodborne pathogens in accordance with 29 CFR 1910.1030. At least one such person will be onsite during site operations. A first-aid kit will be available at the site for use by trained personnel. An adequate supply of fresh water or a portable emergency eye wash will be available at each work site. Personnel must also have protective equipment such as rubber gloves and rubber mouth inserts.

- Review names of onsite personnel trained in first aid and CPR.
- Review notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin.
- Brief new workers on the emergency response plan.
- When working in the exclusion zone, SSO must have a compressed air horn.

11.2 EMERGENCY EQUIPMENT AND SUPPLIES

The SSOs mark the locations of emergency equipment on the site map and posts the map in the support zone.

- 20-lb ABC fire extinguisher
- Industrial first aid kit (with bloodborne pathogen kit)
- Additional emergency equipment: compressed air horn and portable emergency eye wash or adequate fresh water.

11.3 EMERGENCY MEDICAL TREATMENT

- The SSOs will be in charge during a medical emergency until the ambulance arrives or the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR.
- Call the ambulance and hospital.
- Determine if decontamination will make injury worse (see Section 7.2.3 for decontamination during medical emergencies). If yes, seek medical treatment immediately. If no, remove outer garments if it does not cause delay, interfere with treatment, or aggravate the problem. If outer garments cannot be removed, wrap the individual in plastic, rubber, or a blanket. Do not wash victim unless contaminated with an extremely toxic or corrosive material. For minor injuries, follow normal decontamination procedures.
- Make certain that injured person is accompanied to emergency room.
- Notify the project manager of the injury.
- Notify the PSOs.
- Notify the injured person's human resources department.
- Prepare an incident report (see Appendix G, CH2M HILL Incident Report Form). Submit this to the Corporate Director of Health and Safety (SEA) and Corporate Human Resources Department (DEN) within 48 hours.
- Within 2 working days, all accidents, injuries, and illnesses must be reported to the USACE contracting officer, using the form provided in Appendix H, USACE Incident Report Form.

11.4 EVACUATION

- Evacuation routes will be designated by SSO before beginning work.
- Onsite and offsite assembly points will be designated before beginning work.
- Personnel will exit the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation of the exclusion zone.

- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- The SSO and a "buddy" will remain onsite after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- SSO accounts for all personnel in the onsite assembly zone.
- A person designated by the SSO (prior to work) will account for personnel at the offsite assembly area.
- The SSO is to write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

11.5 EVACUATION ROUTES AND ASSEMBLY POINTS—See Appendix I, DDMT Evacuation Route Map

11.6 EVACUATION SIGNALS

Exclusion Zone	Site
To be identified in an addendum before conducting fieldwork.	Three short blasts on air horn. (The SSOs will carry an air horn.)

12.0 ACCIDENT REPORTING AND RECORDKEEPING

All accidents, injuries, or illnesses occurring onsite will be reported to the COE contracting officer via ENG Form 3394 (see Appendix H) within 2 working days of occurrence. OSHA reporting and recording requirements also will be applicable.

Medical records will be maintained in accordance with requirements of 29 CFR 1910.20. Other records (air monitoring/sampling results, results of site safety inspections, site-specific training records, and tailgate safety meetings) will be recorded in a site safety log by the SSOs.

13.0 EMERGENCY RESPONSE TELEPHONE NUMBERS

SITE ADDRESS: 2163 Airways Blvd. Memphis, TN 38114	**Phone:** 901/775-6372
Police	**Phone:** 911 (emergency) 528-2222 (non-emergency)
Fire	**Phone:** 911 (emergency) 393-7441 (non-emergency)
Ambulance	**Phone:** 911 (emergency)
Security	**Phone:** 901/775-6677
Fire Marshall	**Phone:** 901/775-6745
Spill Team	**Phone:** 901/775-4910
Water, Gas, and Electric: Memphis Light, Gas, and Water Division (MLGW)	**Phone:** 528-4465 (emergency) 523-0711 (non-emergency)
Hospital • Methodist Hospital at Memphis–Central 1265 Union Avenue	**Phone:** 726-7000

Route to Hospital: (See Figure 9)

13.1 GOVERNMENT AGENCIES INVOLVED IN PROJECT

Federal:	EPA Martha Berry	**Phone:** 404/347-5205
State:	Tennessee Department of Conservation and Environment (TDEC) Terry Templeton	**Phone:** 901/423-6600
Local:	Memphis and Shelby County Health Department Barry Moore, City of Memphis–Utilities Department	**Phone:** 901/576-7600

DIRECTIONS TO METHODIST HOSPITAL CENTRAL

Airways Blvd. out of DDMT
Left on Lamar Ave.
Right on Elvis Presley Blvd.
Right on Union Ave. to 65 Union Ave.

Figure 9

ROUTE TO REGIONAL MEDICAL CENTER

Defense Depot Memphis, Tennessee

CH2M HILL

I:\DATA\00 12 / Health & Safety Plan-Corps of Engineers / Route to Med. Ctr. / 8.13.95 / LW

14.0 EMERGENCY CONTACTS

CH2M HILL Medical Consultant

Dr. Elayne F. Theriault
Medical Director
Environmental Medicine Resources, Inc.
Atlanta, Georgia
800/229-3674 or
404/455-0818
(after-hours calls will be returned within 20 minutes)

MGM Occupational Physician

Dr. Kirven Ulmer
334/269-9026

ORO Occupational Physician
Occupational Health Services
615/481-0991

Corporate Director Health and Safety

Name: David Waite/SEA
Phone: 206/453-5000

Site Safety Officer (SSO)

Name: To be identified in an addendum

Project Safety Officers (PSOs)

Name: Mollie Netherland/SEA
Phone: 206/453-5000

Name: Dan Locke/MGM
Phone: 334/271-1444

Regional Manager

Name: Blake Jeffcoat/MGM
Phone: 334/271-1444

Health and Safety Plan Approver, CIH

Name: Bob Nash/SCO
Phone: 714/250-1900

Project Manager

Name: Mark Corey/MGM
Phone: 334/271-1444

Client

Corps of Engineers, Huntsville Division
John Romeo, P.E.
205/895-1461

MGM Human Resources Department

Name: Lacy Gibson
Phone: 334/271-1444

Corporate Human Resources Department

Name: Julie Zimmerman
Phone: 303/771-0952

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured. Notification MUST be made within 24 hours of the injury.

15.0 PLAN APPROVAL

This SSHP has been written for use by CH2M HILL. CH2M HILL claims no responsibility for its use by others, unless specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

PLAN WRITTEN BY: Mollie Netherland **DATE:** March 1994

PLAN APPROVED BY: Robert Nash **DATE:** March 1994

15.1 PLAN AMENDMENTS

DATE: August 1995 **CHANGES MADE BY:** Mollie Netherland

CHANGES TO PLAN:

- Incorporate regulatory agency and COE comments

APPROVED: **DATE:**

15.2 PLAN AMENDMENTS

DATE: CHANGES MADE BY:

CHANGES TO PLAN:

APPROVED: **DATE:**

16.0 ATTACHMENTS TO PLAN

Appendix A: Employee Signoff
Appendix B: Radiation Self-Monitoring Procedures
Appendix C: Applicable MSDSs
Appendix D: Recommended Medical Examination and Screening Protocols
Appendix E: Job Inspection Checklist
Appendix F: OSHA Job Safety Poster
Appendix G: CH2M HILL Incident Report Form
Appendix H: USACE Incident Report Form (ENG Form 3394)
Appendix I: DDMT Evacuation Route Map

Note: Once approved, a copy of this plan should be forwarded to Corporate Heath and Safety in DEN.

Appendix A

Employee Signoff

Appendix A

EMPLOYEE SIGNOFF

As a component of the site safety and health plan (SSHP) designed to provide personnel safety during the remedial investigation activities at the Defense Depot Memphis, Tennessee, you are required to read and understand the SSHP. You are also required to have completed a 40-hour health and safety training course, as specified by OSHA in 29 CFR 1910.120(e); 3 days of on-the-job training; and a course in first aid and emergency response. You have also attended a site safety briefing and had all of your questions answered. When you have fulfilled these requirements, please sign and date this personal acknowledgement.

EMPLOYEE NAME	EMPLOYEE SIGNATURE / DATE

Appendix B

Radiation Self-Monitoring Procedures

CH2M HILL Self-Monitoring Procedure

Self-monitoring for radioactive contamination will be implemented on a case by case basis for locations and activities with low potential for personnel exposure (detectable levels of contamination not expected). These locations and activities may include decontamination pad(s); offsite well sampling and water level measurement activities; well development at certain locations; and other locations and activities as approved. Self-monitoring locations/activities shall be approved by the project Health Physicist or designee prior to implementation.

Self-monitoring will not be utilized in posted areas of known radioactive contamination or areas where it is expected that significant radioactive contamination could be encountered during field activities.

Self-monitoring will only be authorized for those individuals who have completed a self-monitoring training program that includes basic operation of the survey instruments; background/alert/alarm levels; response/notification actions; and documentation of results.

{PRIVATE }	CH2M HILL RADIATION SELF-MONITORING PROCEDURE
1.	Turn Ludlum Model 3 instrument (or equivalent) on and place the switch to the BAT position. The indicator needle should deflect to the full-scale position. If the battery is not fully charged, the instrument should not be used. Contact HP technician or SSC to replace the batteries. **Do not use the instrument if it fails to respond to a battery check.**
2.	Turn the switch to the x 0.1 position and check the instrument background. The background count rate should be approximately 50-100 counts per minute (cpm).
3.	Place the G.M. detector next to the check source attached to the side of the instrument. The count rate should increase until it reaches full scale on the x 0.1 range. If the instrument does not respond to the source, contact the HP technician or SSC. **Do not use the instrument if it fails to respond to a source check.**
4.	Use the same scale setting (x 0.1) for self-monitoring surveys. Survey hands, feet, and personal objects (notebooks, logs, and so forth) by moving the thin-end window G.M. detector slowly over the surface of the object. Be careful to keep the detector within approximately 1/4- to 1/2-in. of the surface, but do not touch the object being surveyed. (Note: The thin window on these instruments is very fragile and can be damaged by contact with small objects such as gravel on boots.) Observe the meter reading while surveying hands, feet, and other objects. If the meter reading exceeds 100 cpm above the background count rate, and the reading is consistent (not erratic), contact the HP technician or SSC for assistance.
5.	Sign the self-monitoring survey logsheet to acknowledge that the survey was completed and no contamination was detected.
6.	The HP technician will maintain records of self-monitoring logsheets.

Appendix C

Applicable MSDSs

118 76

AIR PRODUCTS

GASES GROUP MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT IDENTIFICATION

PRODUCT NAME: "METHANE"
FORMULA: CH_4
SYNONYMS: Methyl Hydride, Marsh Gas
MANUFACTURER: Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195 - 1501

PRODUCT INFORMATION : 1 - 800 - 752 - 1597

MSDS NUMBER: 2M01-4 EFFECTIVE DATE: May 1993 REVISION: 4

SECTION 2: HAZARDOUS COMPONENTS

Methane is packaged as pure product (>99%).

CAS NUMBER: 74-82-8

EXPOSURE LIMITS:

OSHA: None established
ACGIH: Simple Asphyxiant
NIOSH: None established

SECTION 3: HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Methane is a flammable, colorless, odorless, compressed gas packaged in cylinders under high pressure. It poses an immediate fire and explosion hazard when concentrations exceed 5.0%. High concentrations that can cause rapid suffocation are within the flammable range and should not be entered.

EMERGENCY TELEPHONE NUMBERS

800 - 523 - 9374 in Continental U.S. (except PA), Canada and Puerto Rico

800 - 322 - 9092 in Pennsylvania

215 - 481 - 7711 outside U.S.

POTENTIAL HEALTH EFFECTS

INHALATION: Methane is nontoxic. It can, however, reduce the amount of oxygen in the air necessary to support life. Exposure to oxygen-deficient atmospheres (< 19.5 %) may produce dizziness, nausea, vomiting, loss of consciousness, and death. At very low oxygen concentrations (< 12 %) unconsciousness and death may occur without warning.

EYE CONTACT: No harmful affect.

SKIN CONTACT: No harmful affect.

CARCINOGENIC POTENTIAL: Methane is not listed as carcinogen or potential carcinogen by NPT, IARC, or OSHA Subpart Z.

EXPOSURE INFORMATION

ROUTE OF ENTRY: Inhalation.
EFFECT: Asphyxiation (suffocation).
TARGET ORGANS: None
CONDITIONS AGGRAVATED: None

SECTION 4: FIRST AID

INHALATION: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Unconscious persons should be moved to an uncontaminated area, given artificial respiration and supplemental oxygen. Quick removal from contaminated area is most important.

EYE CONTACT: No treatment necessary.

SKIN CONTACT: No treatment necessary.

SECTION 5: FIRE AND EXPLOSION

FLASH POINT	AUTO IGNITION TEMP	FLAMMABLE LIMITS
-306 °F	1076 °F	5.0% - 15%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, or water.

HAZARDOUS COMBUSTION PRODUCTS: None

FIRE FIGHTING PROCEDURES: If possible, without risk, stop the flow of methane then fight fire according to types of materials burning. If possible, move adjacent cylinders away from fire area. If the flow of methane cannot be safely shut off, allow fire to burn itself out. This will avoid possible accumulation and re-ignition of a flammable gas mixture. Cool cylinders with water spray until well after fire is out.

UNUSUAL HAZARDS: Upon exposure to intense heat or flame cylinder may vent rapidly or rupture due to pressure increase.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Evacuate all personnel from affected area. Increase ventilation to release area. Use a flammable gas meter (explosimeter) to monitor concentration. An immediate fire and explosion hazard exists when atmospheric concentrations exceed 5.0%. Use appropriate protective equipment (SCBA and fire resistant suit). Never enter an area where the concentration is within the 20% of the lower flammable limit (1.0%). If the leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in users system, close cylinder valve, vent and purge lines with inert gas before attempting repairs.

SECTION 7: STORAGE AND HANDLING

STORAGE: Cylinders should be stored upright in a well-ventilated, secure area. Storage area temperatures should not exceed 125 °F (52 °C) and should be free of oxidizers and sources of ignition. "No Smoking or Open Flames" signs should be posted in storage area. Storage should be away from heavily traveled areas and emergency exits. Avoid areas where salt or other corrosive materials are present. Valve protection caps and valve outlet seals should remain on cylinders not connected for use. Separate full from empty cylinders. Use a first-in first-out system. Keep good inventory records. Visually inspect stored cylinders on a routine basis, at least weekly, for any indication of leakage or other problems.

HANDLING: Do not drag, roll, or slide cylinder. Use a suitable handtruck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Never apply flame or localized heat directly to any part of the cylinder. Do not allow any part of the cylinder to exceed 125 °F (52 °C). High temperature may cause damage to cylinder and/or premature failure of pressure relief device which will result in the venting of the cylinder contents. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Use a "FULL", "IN USE", and "EMPTY" tag system on cylinders. This will greatly reduce the chances of inadvertently connecting or operating the wrong cylinder.

SPECIAL REQUIREMENTS: Always store and handle compressed gases in accordance with Compressed Gas Association, Inc.(ph.703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder refilled by someone other than the owner, without the owner's written consent, is a violation of federal law.

SECTION 8: PERSONAL PROTECTION / EXPOSURE CONTROL

ENGINEERING CONTROLS: Provide ventilation and/or local exhaust to prevent accumulation of gas concentrations above 1.0%.

RESPIRATORY PROTECTION:

GENERAL USE: None required.

EMERGENCY: Do not enter areas where concentration is greater than 1.0% (20% of LEL). Exposure to concentrations below this level does not require respiratory protection.

SKIN PROTECTION:

GENERAL USE: Leather work gloves and safety shoes for handling cylinders.

EMERGENCY: Leather gloves, fire resistant suit.

EYE PROTECTION: Safety glasses and/or face shield.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless
ODOR: Odorless
VAPOR PRESSURE: Permanent noncondensable gas.
GAS DENSITY: 0.042 lb / cu. ft.@ 70 °F
BOILING POINT: -258.6 °F
FREEZING POINT: -296.45 °F
SOLUBILITY IN WATER: Negligible
SPECIFIC GRAVITY: 0.555 @ 70 °F (air=1)
SPECIFIC VOLUME: 24.06 cu. ft. / lb. @ 70 °F 1 atm.
MOLECULAR WEIGHT: 16.04

SECTION 10: REACTIVITY / STABILITY

CHEMICAL STABILITY: Stable
CONDITIONS TO AVOID: None
INCOMPATIBILITY: Oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS: None
HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Methane is nontoxic and acts as a simple asphyxiant.

SECTION 12: ECOLOGICAL INFORMATION

This product does not contain any Class I or Class II ozone depleting chemicals. This product is not listed as a marine pollutant by DOT (49 CFR).

SECTION 13: DISPOSAL

UNUSED PRODUCT / EMPTY CYLINDER: Return cylinder and unused product to supplier. Do not attempt to dispose of unused product. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

DISPOSAL: Residual product in the system may be burned if a suitable burning unit (flair incinerator) is available on site. This shall be done in accordance with federal, state, and local regulations. Wastes containing this material may be classified by EPA as hazardous waste by characteristic (i.e., Ignitability, Corrosivity, Toxicity, Reactivity). Waste streams must be characterized by the user to meet federal, state, and local requirements. If classified as hazardous waste this material will have a CERCLA reportable quantity (RQ) of 100 pounds (D001 Ignitable).

SECTION 14: TRANSPORTATION

118 80

DOT HAZARD CLASS: 2.1

DOT SHIPPING LABEL: Flammable Gas

DOT SHIPPING NAME: Methane

IDENTIFICATION NUMBER: UN 1971

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a well ventilated truck. Never transport in passenger compartment of a vehicle. Always ensure valve is closed, and valve outlet seal and protective cap are in place before shipping cylinder.

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 requires notification to the National Response Center of a release of quantities of hazardous substances equal to or greater than the reportable quantities (RQ's) in 40 CFR 302.4.

CERCLA REPORTABLE QUANTITY: NONE (see Section 13).

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT OF 1986

SECTION 302: Requires emergency planning based on threshold planning quantities (TPQ's) and release reporting based on reportable quantities (RQ's) of EPA's extremely hazardous substances (40 CFR 355).

Extremely Hazardous Substances in product are: NONE

SECTIONS 311 / 312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes. The hazard classes for this product are:

HEALTH: Immediate

PHYSICAL: High Pressure
Flammability

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372. This information must be included in all MSDS's that are copied and distributed for this material.

Components present which could require reporting under Section 313: NONE

TOXIC SUBSTANCE CONTROL ACT (TSCA): Methane is listed on the TSCA inventory.

STATE REGULATIONS

CALIFORNIA:

Proposition 65: This product does NOT contain any listed substances which the State of California requires warning under this statute.

SCAQMD Rule: VOC = 24.06 cu. ft. / lb

SECTION 16: SUPPLEMENTAL INFORMATION

HAZARD RATINGS:

	HEALTH	FLAMMABILITY	REACTIVITY	SPECIAL
NFPA:	0	4	0	SA
HMIS:	0	4	0	

REVISION INFORMATION: New format

Material Safety Data Sheet

Tel. (215) 481-4911 · TWX 510-661-3086
Telecopy (215) 481-5900
CABLE-AIRPROD · TELEX 847416

118 82

EMERGENCY PHONE: 800—523-8374	IN PENNSYLVANIA: 800—322-8092	
ISSUE DATE: Issued: 13 April 1977 REVISIONS: Rev: 1 March 1990	TRADE NAME AND SYNONYMS Hydrogen, or Liquid Hydrogen (in cryogenic liquid state)	CHEMICAL NAME AND SYNONYMS Hydrogen
	FORMULA H_2 MW: 2.016	CHEMICAL FAMILY Flammable Gas CAS #1333-74-0

HEALTH HAZARD DATA

EXPOSURE LIMITS

Hydrogen is a simple asphyxiant and has no threshold limit value (TLV). Hydrogen is not listed as a carcinogen by NTP, IARC, or OSHA.

SYMPTOMS IF INGESTED, CONTACTED WITH SKIN, OR VAPOR INHALED

Hydrogen is nontoxic and classified as a simple asphyxiant. Symptoms of anoxia occur only when gas concentrations are within the flammable range and the mixture has not ignited. DO NOT ENTER AREAS WITHIN THE FLAMMABLE RANGE DUE TO THE IMMEDIATE FIRE AND EXPLOSION HAZARD. Contact of skin with liquid hydrogen or cold gas vapors can cause cryogenic (extreme low temperature) burns and freeze tissues.

TOXICOLOGICAL PROPERTIES

Hydrogen is nontoxic and classified as a simple asphyxiant, but is extremely flammable. The amount of hydrogen gas necessary to reduce oxygen concentrations below life support levels is well within the flammable range. Do not enter areas containing flammable mixtures due to the immediate fire and explosion hazard.

RECOMMENDED FIRST AID TREATMENT

If cryogenic liquid or cold boil-off gas contacts worker's skin or eyes, frozen tissues should be flooded or soaked with tepid water (105-115F; 41-46C). DO NOT USE HOT WATER. Cryogenic burns which result in blistering or deeper tissue freezing should be seen promptly by a physician. First degree burns (reddening only, as sunburn), or second degree burns (blistering) which are the result of fire exposure and are localized to a portion of an extremity or other small area of the body may be immersed in cool water for 10-20 minutes to relieve pain. Do NOT immerse the whole body in a cold bath. All thermal injuries except the most minor and localized burns should be referred promptly for medical care. Burned areas should be covered with the cleanest available material, such as a clean sheet, prior to transport. Do NOT use burn ointments or greasy materials on burns which show more than localized reddening. Persons suffering from lack of oxygen should be moved to areas with normal atmosphere. Assisted respiration and supplemental oxygen should be given if the victim is not breathing.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	AUTO IGNITION TEMP	FLAMMABLE LIMITS	LEL	UEL
N/A (gas at normal temperatures)	932F (500C)	in air @1 atm	4.0%	74.2%

EXTINGUISHING MEDIA

Dry chemical, carbon dioxide, or Halon

ELECTRICAL CLASSIFICATION

GROUP: Class I, Group B

SPECIAL FIRE FIGHTING PROCEDURES

Shut off source of hydrogen. When possible, allow fire to burn itself out. Spray water on adjoining equipment to keep it cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hydrogen can burn with almost an invisible flame of low thermal radiation. People have unknowingly walked into hydrogen flames. Easily ignited; minimum ignition energy is low (0.2MJ) and flammable range is wide. Flame propagates at rapid rate. Potential explosion hazard from reignition if fire is extinguished without shutting off hydrogen source. Hydrogen gas is bouyant and can accumulate in the upper sections of enclosed spaces.

PHYSICAL DATA

BOILING POINT (°F)	FREEZING POINT (°F)
@ 1 atm –423.0F (–252.8C)	@ 1 atm –434.5F (–259.2C)
VAPOR PRESSURE (psia)	**SOLUBILITY IN WATER**
N/A	@ 68F (20C), 1 atm 1.82% by volume

VAPOR DENSITY (lb/cu ft)	SPECIFIC GRAVITY (AIR = 1)	LIQUID DENSITY (lb/cu ft)	SPECIFIC GRAVITY (H_2O = 1)
@ 68F (20C), 1 atm 0.005229	@ 68F (20C), 1 atm 0.0696	@ boiling point, 1 atm 4.432	@ boiling point, 1 atm 0.0710

APPEARANCE AND ODOR

Both liquid and gaseous hydrogen are colorless and odorless.

Printed in U.S.A. 310—406 (Rev. 3/90)

REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		Sources of ignition, sparks, flames, hot objects.
	STABLE	X	

118 83

COMPATIBILITY (Materials to Avoid)
Oxidizing materials. Some steels are susceptible to hydrogen attack or embrittlement at high temperature and pressure.

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	None

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
DO NOT ENTER areas containing flammable mixtures of hydrogen in air. Avoid contact of skin with liquid hydrogen or cold boil-off gas. Ventilate enclosed areas to prevent formation of flammable or oxygen-deficient atmospheres. See "VENTILATION" below. Eliminate all potential sources of ignition. Move a leaking compressed gas cylinder out of doors if leak is small. Consult Air Products for additional assistance.

WASTE DISPOSAL METHOD
Do not attempt to dispose of residual gaseous hydrogen in cylinders. Return cylinders to Air Products with positive residual pressure, cylinder valves tightly closed, and valve cap in place. Do not dispose of liquid hydrogen — contact Air Products for assistance.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify Type)

VENTILATION	LOCAL EXHAUST	SPECIAL
Natural or mechanical where gas or vapor is present.	As necessary	Mechanical ventilation must meet National Electric Code (NEC) requirements for Class I, Group B.
	MECHANICAL (General)	OTHER
	As necessary	Only as necessary

PROTECTIVE GLOVES
(Liquid) Loose-fitting of impermeable materials, such as leather. Leather work gloves are recommended when handling compressed gas cylinders.

EYE PROTECTION
Safety glasses are recommended when handling compressed gas cylinders. Use safety glasses or goggles when handling liquid.

OTHER PROTECTIVE EQUIPMENT

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Hydrogen, or Hydrogen, Compressed; (Liquid) Hydrogen, refrigerated liquid.
DOT Hazard Class: Flammable Gas.
DOT Shipping Label: Flammable Gas.
I.D. Number: UN 1049 (Hydrogen or Hydrogen, Compressed); UN 1966 (Liquid Hydrogen).

SPECIAL HANDLING RECOMMENDATIONS
Prevent contact of liquid hydrogen with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Compressed gas cylinders contain hydrogen at extremely high pressure and should be handled with care. Use a pressure-reducing regulator when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent back flow into storage container. Avoid dragging, rolling, or sliding cylinders, even for a short distance. Use a suitable hand truck. For additional handling recommendations on compressed gas cylinders, consult Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Store liquid containers and cylinders in well-ventilated areas. Keep cylinders away from sources of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Segregate full and empty cylinders. Storage areas should be free of combustible material. Avoid exposure to areas where salt or other corrosive chemicals are present. Cylinder storage of hydrogen should be segregated from oxidizers such as oxygen, fluorine, etc. See Compressed Gas Association Pamphlet P-1 for additional storage recommendations.

SPECIAL PACKAGING RECOMMENDATIONS
Gaseous hydrogen containers meet DOT specifications or American Society of Mechanical Engineers (ASME) codes. Liquid hydrogen is stored in vacuum-insulated containers meeting DOT specifications or ASME codes.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Liquid hydrogen in exposed piping can actually cause air to condense and liquefy. The nitrogen in this liquid can evaporate more rapidly, leaving an oxygen enriched liquid behind. Utilize oxygen-compatible insulating materials and minimize exposed piping surface areas. Use only metals and materials compatible with extremely low temperatures. Avoid use of carbon steel and other metals which become brittle at low temperatures. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder filled without the written permission of the owner is a violation of Federal Law. The atmosphere in areas in which hydrogen gas may be vented and collect should be tested with a portable or continuous flammable gas analyzer.

* Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation handling, storage or use of this product which may be reflected in this data sheet. The customer should review these regulations to ensure that s/he is in full compliance.

118 84

American Burdick & Jackson
Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

PENTANE

emergency telephone no. 312/973-3600 (American Scientific Products)
chemtrec telephone no. 800/424-9300
information telephone no. 616/726-3171 (American Burdick & Jackson)

I. Identification

chemical name Pentane — molecular weight 72.15
chemical family Aliphatic Hydrocarbon — formula C_5H_{12}
synonyms n-Pentane
DOT proper shipping name Pentane
DOT hazard class Flammable Liquid
DOT identification no. UN1265 — CAS no. 109-66-0

II. Physical and Chemical Data

boiling point, 760mm Hg. 36.07°C — freezing point -129.7°C — evaporation rate (BuAc=1) ca 29
vapor pressure at 20°C 420 mm Hg — vapor density (air = 1) 2.5 — solubility in water @ 20°C 0.04%
% volatiles by volume ca 100 — specific gravity (H_2O = 1) @ 20°C 0.626 — stability Stable
hazardous polymerization Not expected to occur.
appearance and odor Clear, colorless liquid with a mild hydrocarbon odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.
materials to avoid Strong oxidizing agents.
hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

flash point, (test method) -40°C (Tag closed cup) — auto ignition temperature 296°C
flammable limits in air % by volume: lower limit 1.5 — upper limit 7.8
unusual fire and explosion hazards Very volatile and extremely flammable.
extinguishing media Carbon dioxide, dry chemical or foam.
special fire fighting procedures Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers.

IV. Hazardous Components

	%	TLV	CAS no.
Pentane	ca 100	600 ppm	109-66-0

V. Health Hazards

Occupational Exposure Limits

OSHA	8-hour PEL	-	1000 ppm
	Ceiling	-	not listed
	Peak	-	not listed
ACGIH	TLV-TWA	-	600 ppm
	TLV-STEL (15-min)	-	750 ppm
NIOSH	TLV-TWA	-	120 ppm
	TLV-C	-	610 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH	5,000 ppm

Odor Threshold

NIOSH	2.2 ppm
OHS	10 ppm
NSC	not listed

Primary Routes of Entry

Pentane may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause dizziness, headache, nausea, and narcosis.

Eye Contact: Liquid and high vapor concentration can be irritating.

Skin Contact: Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract discomfort.

Effects of Overexposure

Pentane is a mild eye and mucous membrane irritant, primary skin irritant, and central nervous system depressant. Acute exposure irritates the eyes and respiratory tract. Extreme concentrations can produce drowsiness and other signs of narcosis. Chronic exposure can cause dermatitis.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals susceptible to dermatitis.

Emergency First Aid

Inhalation:	Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.
Eye Contact:	Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.
Skin Contact:	Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.
Ingestion:	Call local Poison Control Center for assistance. Contact physician immediately. Aspiration Hazard - Do not induce vomiting.

VI. Safety Measures and Equipment

Ventilation:	Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
Respiratory:	Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
Eyes:	Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
Skin:	Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or Buna-N offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to pentane may require additional protective equipment.

Storage: Pentane should be protected from temperature extremes and direct sunlight. Proper storage of pentane must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, pentane should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Waste Disposal: Dispose of pentane as an EPA hazardous waste. Hazardous waste number: D001(Ignitable).

Revision Date: 6/85

KEY

ca	Approximately	STEL	Short Term Exposure Level
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average
PEL	Permissable Exposure Level	BuAc	Butyl Acetate

NSC National Safety Council ("Fundamentals of Industrial Hygiene", 1983)
OHS Occupational Health Services ("Hazardline")

MATERIAL SAFETY DATA SHEET

(Essentially Similar to Form OSHA-20)

MSA P/N 34337

118 -88

SECTION I

PRODUCT NAME	MSA CLEANER-SANITIZER II		
MANUFACTURER	Mine Safety Appliances Company 600 Penn Center Boulevard Pittsburgh, PA 15235	FORMULA CODE	8599-03
		COMPLETED BY	L. P. Dewosky
		TITLE	Mgr. Product Safet
EMERGENCY PHONE NO.	412-273-5500	DATE	6/9/83

SECTION II - INGREDIENTS

	CAS NUMBER	WEIGHT,
ACTIVE INGREDIENTS:		54.7
SODIUM CARBONATE	497-19-8	42.2
TRISODIUM PHOSPHATE	7601-54-9	10.0
ALKYL (C14, 50%; C12, 40%; C16, 10%) DIMETHYL BENZYL AMMONIUM CHLORIDES	139-08-2	2.5
INERT INGREDIENTS:		45.3
SODIUM TRIPOLYPHOSPHATE	7758-29-4	
SODIUM BICARBONATE	144-55-8	
WATER	7732-18-5	
ISOMERIC LINEAR ALCOHOLS (C11-C15) POLYETHOXY ETHANOLS	68131-40-8*	
ETHANOL	64-17-5	
ISOBORNYL ACETATE	125-12-2	

SECTION III - PHYSICAL DATA

BOILING POINT (° F.)	NA	SPECIFIC GRAVITY (H_2O = 1)	0.8
VAPOR PRESSURE (mm Hg.)	NA	%VOLATILE BY VOLUME	NA
VAPOR DENSITY (AIR = 1)	NA	EVAPORATION RATE (_____ = 1)	NA
SOLUBILITY IN WATER	20%	pH 1% AQUEOUS SOLUTION	9.5 - 10.5
APPEARANCE AND ODOR	FRAGRANT BLEND OF WHITE POWDERS		

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT (Method used)	NO FLASH TO 240 F	FLAMMABLE LIMITS	Lel NA	Uel NA	
EXTINGUISHING MEDIA	WATER SPRAY (FOG), FOAM, DRY CHEMICAL, CARBON DIOXIDE				
SPECIAL FIRE FIGHTING PROCEDURES	BLANKET FIRE WITH EXTINGUISHING MEDIUM				
UNUSUAL FIRE AND	PRODUCT IS NONREACTIVE AND DOES NOT READILY SUPPORT				

SKIN CONTACT WITH POWDER MAY CAUSE BURNS. FLUSH APPECTED AREA WITH CLEAN WATER.
EYE CONTACT WITH POWDER MAY CAUSE CORNEAL BURNS. AVOID RUBBING EYES BECAUSE WATER INSOLUBLE PARTICLES MAY SCRATCH CORNEA. IMMEDIATELY FLUSH EYES WITH CLEAN WATER WHILE HOLDING EYELIDS APART. CONTINUE FLUSHING FOR AT LEAST 15 MINUTES OR UNTIL IRRITATION SUBSIDES. CONSULT PHYSICIAN AS SOON AS POSSIBLE.
INHALATION OF A LARGE ENOUGH QUANTITY TO POSE A SIGNIFICANT HEALTH HAZARD IS IMPROBABLE.
INGESTION OF POWDER IS HARMFUL OR FATAL. SHOULD INGESTION OCCUR, DRINK MILK, RAW EGG WHITE, OR GELATIN SOLUTION, OR LARGE QUANTITIES OF WATER. AVOID ALCOHOL. CONSULT PHYSICIAN AS SOON AS POSSIBLE.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID	NONE
	STABLE	X		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID	NONE
	WILL NOT OCCUR	X		
HAZARDOUS DECOMPOSITION PRODUCTS	UNDETERMINED			
INCOMPATIBILITY (MATERIALS TO AVOID)	OXIDIZING AGENTS SOAP AND ANIONIC SURFACTANTS DEACTIVATE GERMICIDE			

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN CASE MATERIAL RELEASED OR SPILLED	SWEEP UP
WASTE DISPOSAL METHOD	REMOVE TO SANITARY LANDFILL AWAY FROM WATER SUPPLIES DESTROY EMPTY CONTAINERS

SECTION VIII - SPECIAL PROTECTION INFORMATION

SPECIAL RESPIRATORY PROTECTION	NOT REQUIRED
SPECIAL SKIN PROTECTION	NOT REQUIRED
SPECIAL EYE PROTECTION	NOT REQUIRED

SECTION IX - SPECIAL PRECAUTIONS

SPECIAL HANDLING PRECAUTIONS	NOT REQUIRED
SPECIAL STORAGE PRECAUTIONS	NOT REQUIRED.
OTHER SPECIAL PRECAUTIONS	NOT REQUIRED

HEXANES

118 90

Material Safety Data Sheet

Mallinckrodt Specialty Chemicals Co.
P.O. Box 800
Paris, Kentucky 40362 Emergency Telephone Number
314-539-1600

Effective Date: 11-09-92 Supersedes 09-06-91

PRODUCT IDENTIFICATION:

Synonyms: n-Hexane

Formula CAS No.: 110-54-3 Molecular Weight: 86.18

Hazardous Ingredients: Chemical Formula: CH3(CH2)4CH3
n-Hexane
3-Methylpentane

PRECAUTIONARY MEASURES

DANGER! EXTREMELY FLAMMABLE. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. MAY CAUSE IRRITATION.

Keep away from heat, sparks and flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.

EMERGENCY FIRST AID

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

Physical Data SECTION 1

Appearance: Clear, colorless solution.

Odor: Odorless.

Solubility: Insoluble in water.

Boiling Point: ca. 68 C (154 F). Vapor Density (Air=1):3.0

Melting Point: ca. -95 C (-139 F) Vapor Pressure (mm Hg):124 @ 20 C (68 F)

Specific Gravity: ca. 0.7 Evaporation Rate:No information

found.

118 91

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Fire and Explosion Information	SECTION 2
Fire:	Extremely Flammable. Dangerous fire hazard when exposed to heat or flame. Flashpoint: -22 to -26 C (-7 to -15 F). Autoignition temperature: 240-260 C (464-500 F). Flammable limits in air, % by volume: lel: 1.1; uel: 7.5.
Explosion:	Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion.
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:	In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Use chemical safety goggles. Contact lenses should not be worn when working with this material. Vapors can flow along surfaces to distant ignition source and flash back.

Reactivity Data	SECTION 3
Stability:	Stable under ordinary conditions of use and storage. Heat will contribute to instability.
Hazardous Decomposition Products:	Toxic gases and vapors may be released if involved in a fire.
Hazardous Polymerization:	This substance does not polymerize.
Incompatibilities:	Strong oxidizers.

Leak/Spill Disposal Information SECTION 4

Ventilate area of leak or spill. Remove all sources of ignition. Clean-up personnel require protective clothing and respiratory protection from vapors. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect as hazardous waste and atomize in a suitable RCRA approved combustion chamber, or absorb with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility. Do not flush to sewer!
Reportable Quantity (RQ)(CWA/CERCLA) : 1 lb.
Ensure compliance with local, state and federal regulations.

Health Hazard Information SECTION 5

118 92

A. Exposure/Health Effects

Inhalation:	Mild irritant to the respiratory tract. Overexposure may cause lightheadedness, nausea, and blurred vision. Greater exposure may cause unconsciousness and death.
Ingestion:	May cause abdominal pain, nausea. Other symptoms parallel inhalation. Aspiration into the lungs can produce severe lung damage.
Skin Contact:	May cause redness, irritation.
Eye Contact:	Vapors may cause irritation. Splashes may cause redness and pain.
Chronic Exposure:	Chronic inhalation may cause peripheral nerve disorders.
Aggravation of Pre-existing Conditions:	Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:	Aspiration hazard. If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.
Skin Exposure:	Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Exposure:	Wash eyes with plenty of water for at least 15 minutes. If irritation develops, get medical attention.

C. TOXICITY (RTECS, 1992)

Hexane: Oral rat LD50: 28710 mg/kg. Irritation eye rabbit 10 mg mild Investigated as a tumorigen, mutagen and reproductive effector.

Occupational Control Measures SECTION 6

Airborne Exposure Limits:	n-Hexane [110-54-3]: -OSHA Permissible Exposure Limit (PEL): 50 ppm (TWA) -ACGIH Threshold Limit Value (TLV): 50 ppm (TWA)
Ventilation System:	A system of local and/or general exhaust is recommended to keep employee exposures below the

Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators (NIOSH Approved): If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to 100 times the TLV or the maximum use concentration specified by the respirator supplier, whichever is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection: Gloves and lab coat, apron or coveralls.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

Storage and Special Information SECTION 7

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere).Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment.

HEXAN

Addendum to Material Safety Data Sheet

REGULATORY STATUS

Hazard Categories for SARA
Section 311/312 Reporting

Acute	Chronic	Fire	Pressure	Reactive

X X X 118 94

Product or Components of Product:	SARA EHS Sec. 302 RQ	TPQ	SARA Sec. 313 Chemicals Name List	Chemical Category	CERCLA Sec.103 RQ lbs	RCRA Sec. 261.33
HEXANES						
Hexane (110-54-3) > 95%	No	No	No	No	No	No
3-Methylpentane (96-14-0) < 1.2%	No	No	No	No	No	No

SARA Section 302 EHS RQ:
Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.

SARA Section 302 EHS TPQ:
Threshold Planning Quantity of Extremely Hazardous substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.

SARA Section 313 Chemicals:
Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.

CERCLA Sec. 103:
Comprehensive Enviromental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4

RCRA:
Resource Conservation and Reclamation Act. Commercial chemical product wastes designated as acute hazards and toxic under 40 CFR 261.33

HEXAN HEXANES

ASHLAND CHEMICAL COMPANY
DIVISION OF ASHLAND OIL, INC.
P.O. BOX 2219, COLUMBUS, OHIO 43216
(614) 889-3333

118 95

METHANOL

THIS MSDS COMPLIES WITH 29 CFR 1910.1200 (THE HAZARD COMMUNICATION STANDARD)

24-HOUR EMERGENCY TELEPHONE: 1-800-ASHLAND OR 1-800-274-5263

****

PRODUCT NAME: METHANOL
CAS NUMBER: 67-56-1

DATA SHEET NO: 0001447-005.003
PREPARED: 08/17/94
SUPERSEDES: 05/25/94
PRINT DATE: 10/11/94

SECTION I-PRODUCT IDENTIFICATION

GENERAL OR GENERIC ID: ALCOHOL

SECTION II-COMPONENTS

IF PRESENT, IARC, NTP AND OSHA CARCINOGENS AND CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 ARE IDENTIFIED IN THIS SECTION.
SEE DEFINITION PAGE FOR CLARIFICATION

INGREDIENT		PERCENT	NOTE
METHYL ALCOHOL		100	(1)
CAS #: 67-56-1	PEL: 200 PPM - SKIN	TLV: 200 PPM - SKIN	

(1): SKIN ABSORPTION MAY CONTRIBUTE TO THE OVERALL ABSORPTION OF THIS MATERIAL. APPROPRIATE MEASURES SHOULD BE TAKEN TO PREVENT ABSORPTION SO THAT THE TLV AND/OR PEL ARE NOT INVALIDATED. SEE SECTION V.
OSHA/ACGIH SHORT TERM EXPOSURE LIMIT (STEL) FOR METHYL ALCOHOL IS 250 PPM. NIOSH RECOMMENDS A LIMIT OF 200 PPM, 8-HOUR TWA; 800 PPM 15-MINUTE CEILING.
THIS CHEMICAL IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF SARA TITLE III.

CONTINUED ON PAGE: 2

SECTION III-PHYSICAL DATA

PROPERTY	REFINEMENT	MEASUREMENT
BOILING POINT	FOR PRODUCT	147.00 DEG F (63.88 DEG C) @ 760.00 MMHG
VAPOR PRESSURE	FOR PRODUCT	97.68 MMHG @ 68.00 DEG F (20.00 DEG C)
SPECIFIC VAPOR DENSITY	AIR = 1	1.11
SPECIFIC GRAVITY		.793 @ 68.00 DEG F (20.00 DEG C)
PERCENT VOLATILES		100.00%
EVAPORATION RATE	(N-BUTYL ACETATE = 1)	5.91
APPEARANCE		CLEAR, APHA COLOR 5 MAX
STATE		LIQUID
FORM		NEAT

SECTION IV-FIRE AND EXPLOSION INFORMATION

FLASH POINT(TCC) 54.0 DEG F
(12.2 DEG C)

EXPLOSIVE LIMIT (PRODUCT) LOWER - 6.0%

EXTINGUISHING MEDIA: ALCOHOL FOAM OR CARBON DIOXIDE OR DRY CHEMICAL

HAZARDOUS DECOMPOSITION PRODUCTS: MAY FORM TOXIC MATERIALS:, CARBON DIOXIDE AND CARBON MONOXIDE, VARIOUS HYDROCARBONS, ETC.

FIREFIGHTING PROCEDURES: WEAR SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN THE POSITIVE PRESSURE DEMAND MODE WHEN FIGHTING FIRES.

SPECIAL FIRE & EXPLOSION HAZARDS: VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR MAY BE MOVED BY VENTILATION AND IGNITED BY PILOT LIGHTS, OTHER FLAMES, SPARKS, HEATERS, SMOKING, ELECTRIC MOTORS, STATIC DISCHARGE, OR OTHER IGNITION SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING POINT.

CONTINUED ON PAGE: 3

SECTION IV-FIRE AND EXPLOSION INFORMATION (CONTINUED)

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) CAN IGNITE EXPLOSIVELY.
ALL FIVE GALLON PAILS AND LARGER METAL CONTAINERS INCLUDING TANK CARS AND TANK TRUCKS SHOULD BE GROUNDED AND/OR BONDED WHEN MATERIAL IS TRANSFERRED.

NFPA CODES: HEALTH- 1 FLAMMABILITY- 3 REACTIVITY- 0

SECTION V-HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LIMIT 200 PPM - SKIN
THRESHOLD LIMIT VALUE 200 PPM - SKIN
SEE SECTION II

EFFECTS OF ACUTE OVEREXPOSURE:

EYES - EXPOSURE CAUSES EYE IRRITATION. SYMPTOMS MAY INCLUDE STINGING, TEARING, REDNESS, AND SWELLING.
BREATHING - EXCESSIVE INHALATION OF VAPORS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, CENTRAL NERVOUS SYSTEM EFFECTS INCLUDING DIZZINESS, WEAKNESS, FATIGUE, NAUSEA, HEADACHE AND POSSIBLE UNCONSCIOUSNESS, AND EVEN DEATH.
SWALLOWING - CAN CAUSE GASTROINTESTINAL IRRITATION, NAUSEA, VOMITING, DIARRHEA, BLINDNESS AND DEATH.
SKIN - EXPOSURE MAY CAUSE MILD SKIN IRRITATION. PROLONGED OR REPEATED EXPOSURE MAY DRY THE SKIN. SYMPTOMS MAY INCLUDE REDNESS, BURNING, DRYING AND CRACKING, AND SKIN BURNS. PRE-EXISTING SKIN DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL.

FIRST AID:

IF ON SKIN: THOROUGHLY WASH EXPOSED AREA WITH SOAP AND WATER. REMOVE CONTAMINATED CLOTHING. LAUNDER CONTAMINATED CLOTHING BEFORE RE-USE. REMOVE CONTAMINATED SHOES PROMPTLY. DISCARD SHOES SATURATED WITH THIS PRODUCT.
IF IN EYES: FLUSH WITH LARGE AMOUNTS OF WATER, LIFTING UPPER AND LOWER LIDS OCCASIONALLY, GET MEDICAL ATTENTION.
IF SWALLOWED: IMMEDIATELY DRINK TWO GLASSES OF WATER AND INDUCE VOMITING BY EITHER GIVING IPECAC SYRUP OR BY PLACING FINGER AT BACK OF THROAT. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. GET MEDICAL ATTENTION IMMEDIATELY.
NOTE TO PHYSICIANS: THIS PRODUCT CONTAINS METHANOL. METHANOL IS METABOLIZED TO FORMALDEHYDE AND FORMIC ACID. THESE METABOLITES MAY CAUSE METABOLIC ACIDOSIS, VISUAL DISTURBANCES AND BLINDNESS. SINCE METABOLISM IS REQUIRED FOR THESE TOXIC SYMPTOMS, THEIR ONSET MAY BE DELAYED FROM 6 TO 30 HOURS FOLLOWING INGESTION. ETHANOL COMPETES FOR THE SAME METABOLIC PATHWAY AND HAS BEEN USED AS AN ANTIDOTE. METHANOL IS EFFECTIVELY REMOVED BY HEMODIALYSIS.

CONTINUED ON PAGE: 4

SECTION V-HEALTH HAZARD DATA (CONTINUED)

IF BREATHED: IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION.

PRIMARY ROUTE(S) OF ENTRY:

INHALATION, SKIN ABSORPTION, SKIN CONTACT

EFFECTS OF CHRONIC OVEREXPOSURE:

OVEREXPOSURE TO THIS MATERIAL (OR ITS COMPONENTS) HAS BEEN SUGGESTED AS A CAUSE OF THE FOLLOWING EFFECTS IN LABORATORY ANIMALS, AND MAY AGGRAVATE PRE-EXISTING DISORDERS OF THESE ORGANS IN HUMANS:, LIVER ABNORMALITIES, KIDNEY DAMAGE, EYE DAMAGE, LUNG DAMAGE, BRAIN DAMAGE, NERVOUS SYSTEM DAMAGE
OVEREXPOSURE TO THIS MATERIAL (OR ITS COMPONENTS) HAS BEEN SUGGESTED AS A CAUSE OF THE FOLLOWING EFFECTS IN HUMANS, AND MAY AGGRAVATE PRE-EXISTING DISORDERS OF THESE ORGANS:, EYE DAMAGE

SECTION VI-REACTIVITY DATA

HAZARDOUS POLYMERIZATION: CANNOT OCCUR
STABILITY: STABLE
INCOMPATIBILITY: AVOID CONTACT WITH:, STRONG OXIDIZING AGENTS

SECTION VII-SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

SMALL SPILL: ELIMINATE ALL SOURCES OF IGNITION SUCH AS FLARES, FLAMES (INCLUDING PILOT LIGHTS), AND ELECTRICAL SPARKS.
ABSORB LIQUID ON VERMICULITE, FLOOR ABSORBENT, OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD.
LARGE SPILL: ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE. PREVENT FROM ENTERING DRAINS, SEWERS, STREAMS OR OTHER BODIES OF WATER.PREVENT FROM SPREADING. IF RUNOFF OCCURS, NOTIFY AUTHORITIES AS REQUIRED. PUMP OR VACUUM TRANSFER SPILLED PRODUCT TO CLEAN CONTAINERS FOR RECOVERY. ABSORB UNRECOVERABLE PRODUCT.TRANSFER CONTAMINATED ABSORBENT, SOIL AND OTHER MATERIALS TO CONTAINERS FOR DISPOSAL.

CONTINUED ON PAGE: 5

SECTION VII-SPILL OR LEAK PROCEDURES (CONTINUED)

PREVENT RUN-OFF TO SEWERS, STREAMS OR OTHER BODIES OF WATER. IF RUN-OFF OCCURS, NOTIFY PROPER AUTHORITIES AS REQUIRED, THAT A SPILL HAS OCCURED.

WASTE DISPOSAL METHOD:

SMALL SPILL: ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. DISPOSE OF REMAINING MATERIAL IN ACCORDANCE WITH APPLICABLE REGULATIONS.
LARGE SPILL: DESTROY BY LIQUID INCINERATION.
CONTAMINATED ABSORBENT MAY BE DEPOSITED IN A LANDFILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII-PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: IF WORKPLACE EXPOSURE LIMIT(S) OF PRODUCT OR ANY COMPONENT IS EXCEEDED (SEE SECTION II), A NIOSH/MSHA APPROVED AIR SUPPLIED RESPIRATOR IS ADVISED IN ABSENCE OF PROPER ENVIRONMENTAL CONTROL. OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MSHA RESPIRATORS (NEGATIVE PRESSURE TYPE) UNDER SPECIFIED CONDITIONS (SEE YOUR INDUSTRIAL HYGIENIST). ENGINEERING OR ADMINISTRATIVE CONTROLS SHOULD BE IMPLEMENTED TO REDUCE EXPOSURE.
VENTILATION: PROVIDE SUFFICIENT MECHANICAL (GENERAL AND/OR LOCAL EXHAUST) VENTILATION TO MAINTAIN EXPOSURE BELOW TLV(S).
PROTECTIVE GLOVES: WEAR RESISTANT GLOVES SUCH AS:, NEOPRENE
EYE PROTECTION: CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES. CONSULT YOUR SAFETY REPRESENTATIVE.
OTHER PROTECTIVE EQUIPMENT: TO PREVENT REPEATED OR PROLONGED SKIN CONTACT, WEAR IMPERVIOUS CLOTHING AND BOOTS.

SECTION IX-SPECIAL PRECAUTIONS OR OTHER COMMENTS

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED.SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPOR, LIQUID, AND/OR SOLID), ALL HAZARD PRECAUTIONS GIVEN IN THE DATA SHEET MUST BE OBSERVED.
CONTAINS METHANOL.
CANNOT BE MADE NON-POISONOUS.
ALUMINUM MAY FORM AN OXIDE SCALE ON PROLONGED EXPOSURE TO METHANOL.
THE INFORMATION ACCUMULATED HEREIN IS BELIEVED TO BE ACCURATE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH THE COMPANY OR NOT. RECIPIENTS ARE ADVISED TO CONFIRM IN ADVANCE OF NEED THAT THE INFORMATION IS CURRENT, APPLICABLE, AND SUITABLE TO THEIR CIRCUMSTANCES.

LAST PAGE----------LAST PAGE

MATERIAL SAFETY DATA SHEET
LIQUI-NOX™

Manufactured by:
ALCONOX, INC.
9 EAST 40TH STREET
NEW YORK, NY 10016

TELEPHONE NUMBER FOR EMERGENCY: CHEM-TEL 1-800-255-3924
TELEPHONE NUMBER FOR INFORMATION: (212) 532-4040

SECTION I: IDENTIFICATION

Product Name (As appears on Label):	LIQUI-NOX™
CAS Registry Number:	NOT APPLICABLE
Date Prepared:	JULY 29, 1993
Chemical Family:	ANIONIC LIQUID DETERGENT

SECTION II: HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

THERE ARE NO HAZARDOUS INGREDIENTS IN LIQUI-NOX AS DEFINED BY THE OSHA STANDARD 29 CFR 1910 SUBPART Z, THE HAZARDOUS SUBSTANCE LIST.

SECTION III: PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	214°F
Vapor Pressure (mm Hg):	NO DATA
Vapor Density (AIR =1):	NO DATA
Specific Gravity (Water=1):	1.075
Melting Point:	NOT APPLICABLE
Evaporation Rate (Butyl Acetate = 1):	SLOWER
Solubility in Water:	COMPLETELY SOLUBLE IN ALL PROPORTIONS
Appearance:	YELLOW LIQUID, NEARLY ODORLESS

SECTION IV: FIRE AND EXPLOSION DATA

Flash Point:	NONE (CLEVELAND OPEN CUP)
Flammable Limits:	NOT APPLICABLE LEL: NO DATA UEL: NO DATA
Extinguishing Media:	WATER, DRY CHEMICALS, CO_2, FOAM
Special Firefighting Procedures:	SELF-CONTAINED POSITIVE PRESSURE BREATHING APPARATUS AND PROTECTIVE CLOTHING SHOULD B WORN FIGHTING FIRES INVOLVING CHEMICALS.
Unusual Fire and Explosion Hazards:	NONE.

National Fire Protection Association 704 Labeling:
Degree of Hazard: 0 = Insignificant, 1 = slight, 2 = moderate, 3 = high, 4 = extreme

RED (FIRE):	0
BLUE (HEALTH):	0
YELLOW (REACTIVITY):	0
WHITE (SPECIAL):	0

SECTION V: REACTIVITY DATA

Stability:	STABLE
Conditions to Avoid:	NONE
Incompatibility (Materials to Avoid):	OXIDIZING OR ALKALINE SOLUTIONS.
Hazardous Decomposition or Byproducts:	MAY RELEASE SO_2 ON BURNING.

SECTION VI: HEALTH HAZARD DATA

Routes of Entry: Inhalation?: NO Skin: YES Ingestion: YES

Health Hazards (Acute and Chronic: SKIN CONTACT MAY PROVE LOCALLY IRRITATING, CAUSING DRYING AND/OR CHAPPING. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP?: NO IARC Monographs?: NO OSHA Regulated?: NO

Signs and Symptoms of Exposure: PROLONGED SKIN CONTACT MAY CAUSE DRYING AND/OR CHAPPING.

Medical Conditions Generally Aggravated by Exposure: NOT ESTABLISHED. UNNECESSARY EXPOSURE TO THIS PRODUCT OR ANY INDUSTRIAL CHEMICAL SHOULD BE AVOIDED.

Emergency and First Aid Procedures:
Eyes - IMMEDIATELY FLUSH WITH WATER FOR AT LEAST 15 MINUTES
Skin - FLUSH WITH PLENTY OF WATER
Ingestion - DRINK LARGE QUANTITIES OF WATER OR MILK.
SEE A PHYSICIAN FOR DISCOMFORT.

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled: MATERIAL FOAMS PROFUSELY. FOR SMALL SPILLS RECOVER AS MUCH AS POSSIBLE WITH ABSORBENT MATERIAL AND FLUSH REMAINDER TO SEWER. MATERIAL IS BIODEGRADABLE.

Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL ORDNANCES FOR DETERGENT PRODUCTS

Precautions to be Taken in Storing and Handling: NO SPECIAL PRECAUTIONS IN STORING. USE PROTECTIVE EQUIPMENT WHEN HANDLING UNDILUTE MATERIAL.

Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

VIII: CONTROL MEASURES

Respiratory Protection (Specify Type):	NOT REQUIRED
Ventilation: - Local Exhaust:	NORMAL
- Special:	NOT REQUIRED
- Mechanical:	NOT REQUIRED
- Other:	NOT REQUIRED
Protective Gloves:	IMPERVIOUS GLOVES ARE RECOMMENDED.
Eye protection:	GOGGLES AND/OR SPLASH SHIELDS ARE RECOMMENDED.
Other Protective Clothing or Equipment:	NOT REQUIRED
Work/Hygienic Practices:	NO SPECIAL PRACTICES REQUIRED.

MATERIAL SAFETY DATA SHEET

118 102

EAGLE PICHER

HYDROCHLORIC ACID, SOLUTION
CAS#: 7647-01-0 (p.1)

EMERGENCY TELEPHONE: 800-535-5053 INFOTRAC (24 hours)

DATE PREPARED: August 25, 1992

DATE REVISED: September 15, 1995

SECTION I

MANUFACTURER'S NAME	Eagle-Picher Industries, Inc. Environmental Science and Technology
ADDRESS	200 B. J. Tunnell Blvd. Miami, Oklahoma 74354
EMERGENCY TELEPHONE NUMBER	(800) 535-5053 InfoTrac (24 hours)
INFORMATION TELEPHONE NUMBER	(918) 540-1507
FAX NUMBER	(918) 542-3223
CHEMICAL NAME AND SYNONYMS	Hydrochloric acid, Solution; Muriatic acid
TRADE NAME AND SYNONYMS	Hydrogen chloride, Chlorohydric acid
CAS#	7647-01-0
CHEMICAL FAMILY	Chloride
FORMULA	HCl

SECTION II - HAZARDOUS INGREDIENTS/TOXICITY DATA

COMPONENTS	CAS #	ACGIH TLV	OSHA PEL	% (optional)
Hydrochloric acid	7647-01-0	5ppm CL	5ppm CL	

TOXICITY DATA: ihl-hmn LCLo: 1300ppm/30m, inl-hmn LCLo: 3000ppm/5m, ihl-rat LC50: 3124ppm/1h, orl-rat LD50: 900mg/kg.

SECTION III - PHYSICAL DATA

BOILING PT.	53°C (127°F)
MELTING PT	N/A
VAPOR PRESSURE (mmHg)	190 @ 25°C
VAPOR DENSITY (air=1)	@ 1.3
SOLUBILITY IN WATER: 100%, slight evolution of heat.	
SPECIFIC GRAVITY	1.18
FORMULA WT	36.47
%VOLATILE BY VOLUME	Unknown
EVAPORATION RATE	Unknown
APPEARANCE AND ODOR: Colorless, fuming liquid.	

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT: N/A

FLAMMABLE LIMITS: N/A LEL: N/A UEL: N/A

EXTINGUISHING MEDIA: Non-combustible. Use extinguishing media appropriate to surrounding fire conditions.

SPECIAL FIRE FIGHTING PROCEDURES: Fire fighters should wear proper protective equipment and self-contained breathing apparatus with full face piece in positive pressure mode. DO NOT GET WATER INSIDE CONTAINERS!

UNUSUAL FIRE AND EXPLOSION HAZARDS: Will produce toxic fumes of hydrogen chloride gas in contact with water, and hydrogen gas upon contact with metal.

MATERIAL SAFETY DATA

118 103

EAGLE PICHER

HYDROCHLORIC ACID; SOLUTION
CAS#: 7647-01-0 (p.2)

EMERGENCY TELEPHONE: 800-535-5053 INFOTRAC (24 hours)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV): ACGIH, OSHA Ceiling Limit: 5 ppm.
HEALTH HAZARDS: May be fatal by inhalation, ingestion or skin absorption. High concentrations may be destructive to tissue of mucous membranes, upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of inflammation, spasm, and edema of larynx and bronchi, chemical pneumonitis and pulmonary edema.
EFFECTS OF OVEREXPOSURE: Burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

EMERGENCY FIRST AID PROCEDURES

INHALATION: Remove to fresh air. If breathing, giving oxygen. If not breathing, give artificial respiration. Call a physician.
EYE CONTACT: Immediately flush eyes with copious amounts of water for at least 15 minutes.
SKIN CONTACT: Immediately flush skin with copious amounts of water for at least 15 minutes while removing clothing.
INGESTION: Call physician immediately. If conscious, give water.

SECTION VI - REACTIVITY DATA

STABILITY: [X] STABLE [ ] UNSTABLE CONDITIONS TO AVOID: Heat, moisture.
INCOMPATIBILITY: Bases, amines, alkali metals, copper, copper alloys, aluminum.
HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride gas.
HAZARDOUS POLYMERIZATION : [ ] MAY OCCUR [X] WILL NOT OCCUR

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Evacuate area. Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves. Cover spill with dry lime, sand, or soda ash. Place in covered containers using non-sparking tools. Transport outdoors. Ventilate area and wash spill site after pick-up is complete.
WASTE DISPOSAL METHOD: For small quantities, cautiously add to a large quantity of stirred excess of water and adjust pH to 7 (neutral). Separate any insoluble solids and package for hazardous waste disposal. Flush aqueous solution down the drain with plenty of water. Hydrolysis may generate heat and fumes which can be controlled by rate of addition. Follow all Federal, State, and Local regulations.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep tightly closed, store in a cool, dry place. Wear chemical resistant gloves and avoid breathing vapor. Do not get on skin or in eyes.

SECTION VIII - SPECIAL PRECAUTIONS

RESPIRATORY PROTECTION: NIOSH/MSHA approved respirator.
PROTECTIVE GLOVES: Chemical resistant. EYE PROTECTION: Safety goggles/face shield.
OTHER PROTECTIVE EQUIPMENT: Lab coat or apron.
VENTILATION:
LOCAL EXHAUST: Acceptable MECHANICAL EXHAUST: Required SPECIAL: Chem. fume hood.

PRECAUTIONS: POISON! CORROSIVE! Avoid all contact. Avoid breathing vapor. Avoid prolonged or repeated exposure. Wash thoroughly after handling.

NITRIC ACID, 70%

118 104

Material Safety Data Sheet

Mallinckrodt Specialty Chemicals Co.
P.O. Box 800
Paris, Kentucky 40362 Emergency Telephone Number
314-539-1600

Effective Date: 04-06-89 Supersedes 10-21-86

PRODUCT IDENTIFICATION:

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 70%

Formula CAS No.: 7697-37-2 Molecular Weight: 63.00

Hazardous Ingredients: Nitric acid Chemical Formula: HNO3

PRECAUTIONARY MEASURES

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

Physical Data SECTION 1

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122 C (252 F) Vapor Density (Air=1):2-3 approximately

Melting Point: -34 C (-29 F) Vapor Pressure (mm Hg):62 @ 20 C (68 F)

Specific Gravity: 1.41

Evaporation Rate: No information found.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: Oxidizer

Fire and Explosion Information — SECTION 2

Fire:	Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:	Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.
Fire Extinguishing Media:	If involved in a fire, use water spray.
Special Information:	Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Reactivity Data — SECTION 3

Stability:	Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:	When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:	Will not occur.
Incompatibilities:	A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Leak/Spill Disposal Information — SECTION 4

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors. Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer with excess water. Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite) and dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances

118 106

allow. Provide forced ventilation to dissipate fumes.
Reportable Quantity (RQ)(CWA/CERCLA) : 1000 lbs.
Ensure compliance with local, state and federal regulations.

Health Hazard Information — SECTION 5

A. Exposure/Health Effects

Inhalation:	Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:	Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:	Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:	Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.
Chronic Exposure:	Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:	Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:	DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Exposure:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Exposure:	Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY (RTECS, 1986)

Inhalation (Rat) LC50: 244 ppm (NO2)/30M

118 107

Occupational Control Measures SECTION 6

Airborne Exposure Limits:	-OSHA Permissible Exposure Limit (PEL): 2 ppm (TWA), 4 ppm (STEL) -ACGIH Threshold Limit Value (TLV): 2 ppm (TWA); 4 ppm (STEL)
Ventilation System:	A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.
Personal Respirators (NIOSH Approved)	If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and cannisters that contain oxidizable materials, such as activated charcoal.
Skin Protection:	Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.
Eye Protection:	Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

Storage and Special Information SECTION 7

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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NITRA

Addendum to Material Safety Data Sheet

REGULATORY STATUS

This Addendum Must Not Be

Detached from the MSDS
Identifies SARA 313 substance(s)

118 108

Any copying or redistribution of the MSDS
must include a copy of this addendum

Hazard Categories for SARA
Section 311/312 Reporting

Acute	Chronic	Fire	Pressure	Reactive
X	X			X

Product or Components of Product:	SARA EHS Sec. 302 RQ	TPQ	SARA Sec. 313 Chemicals Name List	Chemical Category	CERCLA Sec.103 RQ lbs	RCRA Sec. 261.33
NITRIC ACID, 70% (7697-37-2)	1000	1,000	Yes	No	No	No

SARA Section 302 EHS RQ:
Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.

SARA Section 302 EHS TPQ:
Threshold Planning Quantity of Extremely Hazardous substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.

SARA Section 313 Chemicals:
Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.

CERCLA Sec. 103:
Comprehensive Enviromental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4

RCRA:
Resource Conservation and Reclamation Act. Commercial chemical product wastes designated as acute hazards and toxic under 40 CFR 261.33

NITRA . NITRIC ACID, 70%

M A T E R I A L S A F E T Y D A T A S H E E T

EM SCIENCE
A DIVISION OF EM INDUSTRIES
111 WOODCREST
CHERRY HILL, N.J. 08034-0395

PREPARATION DATE .....: JAN 26, '88

INFORMATION PHONE NUMBER.:
(609) 354-9200
CHEMTREC EMERGENCY NUMBER:
1-800-424-9300

NFPA HAZARD RATINGS

HEALTH ....: 3	FLAMMABILITY ...: 0
REACTIVITY : 2	SPECIAL HAZARDS.: W

SECTION I - GENERAL INFORMATION

CATALOG NUMBER(S): SX1242 SX1244 SX1244I SX1244PC SX1244Y
714
CHEMICAL NAME....: SULFURIC ACID
TRADE NAME.....: OIL OF VITRIOL
C.A.S. NUMBER....: 7664-93-9
CHEMICAL FAMILY..: MINERAL ACID
FORMULA.....: H2SO4
MOLECULAR WEIGHT.: 98.08
DOT SHIPPING NAME: SULFURIC ACID
DOT NUMBER.....: UN1830

SECTION II - HAZARDOUS INGREDIENTS

NONE OTHER THAN SPECIFIC PRODUCT.

SECTION III- PHYSICAL DATA

BOILING POINT (C 760 MM HG).: 290+C
MELTING POINT (C).....: @ -10C
SPECIFIC GRAVITY(H2O = 1)....: 1.844*
VAPOR PRESSURE..(MM HG).....: 1 146C
PERCENT VOLATILE BY VOL (%)..: N/A
VAPOR DENSITY (AIR=1).....: N/A
EVAPORATION RATE (BUAC=1)....: <1
SOLUBILITY IN WATER (%).....: MISCIBLE
APPEARANCE AND ODOR.....: CLEAR, COLORLESS VISCOUS LIQUID;
SHARP ODOR

SECTION IV - FIRE & EXPLOSION HAZARD DATA

FLASH POINT (F).....: NONCOMBUSTIBLE
FLAMMABLE LIMITS LEL %.: N/A
FLAMMABLE LIMITS UEL %.: N/A
EXTINGUISHING MEDIA....:
DRY CHEMICAL OR SAND; DO NOT USE WATER OR FOAM
FIRE FIGHTING PROC.....:
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING.
FIRE & EXPL. HAZARDS...:
REACTS WITH MOST METALS TO FORM EXPLOSIVE HYDROGEN GAS WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR. MAY IGNITE COMBUSTIBLE MATERIAL ON CONTAC

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....: 1 MG/CU.M.
TOXICITY DATA.....:
-ORL-RAT LD50: 2140 MG/KG IHL-GPG LC50: 18 MG/CU.M.
SYMPTOMS OF EXPOSURE .....:
CAUSES SEVERE BURNS ON CONTACT WITH ANY BODY TISSUE.
POSSIBLY FATAL BY INHALATION OR INGESTION.
INHALATION OF MIST MAY DAMAGE RESPIRATORY TRACT AND LUNGS.
MEDICAL COND. AGGRAVATED BY EXP: RESPIRATORY CONDITIONS
ROUTES OF ENTRY.....: INHALATION, INGESTION OR SKIN CONTACT.
CARCINOGENICITY.....:
THE MATERIAL IS NOT LISTED AS A CANCER CAUSING AGENT.
EMERGENCY FIRST AID.....:
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE
INGESTION: DO NOT INDUCE VOMITING; DILUTE BY GIVING MILK OR WATER IF CONSCIOUS; GET MEDICAL ATTENTION IMMEDIATELY
SKIN: FLUSH THOROUGHLY WITH WATER; REMOVE ALL CONTAMINATED CLOTHING AND SHOES; GET IMMEDIATE MEDICAL ATTENTION
EYES: FLUSH WITH WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER & LOWER LIDS OCCASIONALLY; CONTINUE FLUSHING WHILE WAITING FOR MEDICAL HELP
INHALATION: REMOVE TO FRESH AIR; GET IMMEDIATE MEDICAL ASSISTANCE

SECTION VI - REACTIVITY DATA

STABILITY.....: YES
CONDITIONS TO AVOID .....:
-ADDING WATER TO ACID CAN CAUSE VIOLENT, EXOTHERMIC REACTION, POSSIBLY CAUSING FIRE. CAN REACT VIOLENTLY WITH ALKALIES.
MATERIALS TO AVOID.....: (X) WATER ( ) ACIDS
(X) BASES ( ) CORROSIVES (X) OXIDIZERS
(X) OTHER: REDUCING AGENTS, METAL POWDERS, CARBIDES, ACETIC ACID, COMBUSTIBLE MATERIAL

HAZARDOUS POLYMERIZATION.: DOES NOT OCCUR
HAZARDOUS DECOMPOSITION..: SOX, HYDROGEN (IN PRESENCE OF METALS)

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE:
COVER WITH SAND; NEUTRALIZE WITH SODA ASH OR LIME
TAKE UP AND CONTAINERIZE FOR PROPER DISPOSAL.
WASTE DISPOSAL: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:
MATERIAL MUST BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR WITH ADEQUATE VENTILATION
PROTECTIVE GLOVES (NATURAL RUBBER, NEOPRENE OR EQUIVALENT) MUST BE WORN TO PREVENT SKIN CONTACT
PROTECTIVE CLOTHING (NATURAL RUBBER, NEOPRENE OR EQUIVALENT) SHOULD BE WORN WHEN HANDLING THIS MATERIAL
SAFETY GLASSES WITH SIDE SHIELDS MUST BE WORN AT ALL TIMES
NIOSH-APPROVED RESPIRATOR SHOULD BE WORN IN THE ABSENCE OF ADEQUATE VENTILATION.

SECTION IX - SPECIAL PRECAUTIONS

HANDLING & STORAGE ....:
-KEEP CONTAINER CLOSED AND PROTECTED AGAINST PHYSICAL DAMAGE
KEEP UPRIGHT; SEPARATE FROM ALL INCOMPATIBLE MATERIALS, COMBUSTIBLE MATERIALS AND OXIDIZING AGENTS
WHEN DILUTING: ADD ACID TO WATER; NEVER ADD WATER TO ACID
DO NOT BREATHE VAPOR.
DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING
RETAINED RESIDUE MAY MAKE EMPTY CONTAINERS HAZARDOUS; USE CAUTION!
WORK/HYGIENIC PRACTICES: WASH THOROUGHLY AFTER HANDLING. DO NOT TAKE INTERNALLY. EYE WASH AND SAFETY EQUIPMENT SHOULD BE READILY AVAILABLE.

SECTION X - OTHER INFORMATION

COMMENTS.....:
60/60F
REVISION HISTORY.....: 08/01/81, 8/84, 4/17/86, 12/6/86, 6/19/88, 10/27/88
N/A = NOT AVAILABLE:

Appendix D

Recommended Medical Examination and Screening Protocols

Appendix D

Medical Surveillance Program Requirements Recommended Protocol

Baseline Health Assessment

Personnel who will work at a suspected hazardous substance site will be provided with a baseline health assessment. This assessment will investigate existing conditions that would predispose personnel to illness from exposure to hazardous substances, or to the physical demands of using personal protective equipment. This assessment should include, but not be limited to, the following items:

- Work history
- Family history
- Laboratory analyses
- Medical history
- Physical examination
- Pulmonary function tests
- Eye and ear examination

Criteria for the Baseline Health Assessment

Medical monitoring will include occupational, medical, and family histories; a screening physical examination; basic blood and urine laboratory test; pulmonary function tests; ear and eye examination; and a physician's evaluation.

Basic Blood and Urine Laboratory Tests

Blood Tests

Onsite personnel will receive a basic panel of blood counts and chemistries to evaluate blood-forming, kidney, liver, endocrine, and metabolic functions. The following blood tests are considered the minimum desirable:

- White blood cell count, differential cell count, and platelet estimate
- Hemoglobin and/or hematocrit
- Albumin, globulin, and total protein
- Total bilirubin
- Serum glutamic oxalacetic transaminase (SGOT)
- Lactic dehydrogenase (LDH)
- Inorganic phosphate
- Alkaline phosphatase
- Calcium

- Phosphorus
- Uric acid
- Creatinine
- Urea nitrogen
- Cholesterol
- Glucose

Urine Tests

Onsite personnel will have a routine urinalysis that includes the following:

- Specific gravity
- Microscopic examination
- Acetone
- Albumin
- pH
- Protein
- Glucose

Pulmonary Function Tests

Pulmonary function testing is a requirement of the baseline medical examination. At a minimum, the tests will include lung ventilation evaluations of forced expiratory volume in one second (FEB1) and forced vital capacity (FVC).

X-ray

X-ray exams should be obtained only when clinically indicated by other testing procedures such as pulmonary function testing. A chest x-ray, when required, should be a standard 14 x 17 inch posterior-anterior (P-A) exposure. However, no chest x-ray should be obtained if the employee has had one within the past 3 years. That record will be obtained from the former examining physician, radiologist, or hospital. All films must be read or reviewed by a board-certified radiologist or other competent medical specialist.

Electrocardiogram

An electrocardiogram will be included in the baseline examination only when deemed necessary by the examining physician. It will be of the standard 12-lead resting type and interpreted by an internist or cardiologist.

Vision and Hearing Testing

Vision testing that measures refraction, depth perception, and color vision should be administered by a qualified technician or physician. Audiometric testing will be performed at 500, 1,000, 2,000, 3,000, 4,000, and 6,000 hertz pure tones in an approved booth (29 CFR, Part 1910.95) by a qualified technician, and the results read by a certified audiologist or a physician familiar with audiometric evaluation.

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Appendix E

Job Inspection Checklist

HEALTH AND SAFETY CHECKLIST

118 117

Standard of Practice HS-18

1.0 THE BASICS

A checklist provides a simple format to verify the work is being performed in compliance with health and safety standards. A site-specific checklist may be developed, adding or subcontracting to the example checklist.

1.1 THE LAW

Some OSHA standards (e.g., hazardous waste operations and construction job sites) require frequent and regular jobsite safety inspections. The project manager should identify applicable standards and determine if health and safety inspections are required.

2.0 INSPECTION CHECKLIST

A checklist is a method of organizing and documenting a jobsite inspection.

When preparing the checklist, verify applicable federal, state,and local regulations.

The person responsible for preparing safety and health inspection checklists should identify the areas that make up the workplace; determine what activities, equipment, and facilities require inspection; and identify potential hazards.

For CH2M HILL, this would typically be only those areas where CH2M HILL has direct control over the work.

The frequency of inspections should be based on the type of work performed, equipment used, materials, and potential hazards. Inspections are required daily, weekly, monthly, or annually depending on what is required by the regulations. For example, OSHA crane standards require inspections prior to each use (at least daily) and more thorough inspections annually.

The person responsible for making inspections must be identified. A person experienced at making inspections should be more familiar with the standards and should not need as much detail in the checklist as an inexperienced inspector.

Individuals required to make inspections must be knowledgeable about the requirements and the areas they are inspecting. Personnel making inspections should be instructed not to rely solely on the checklists because of the possibility of overlooking unique hazards.

All inspection checklists should include identity of the project, date, time, name, and signature of inspector. Including this information on the checklist reinforces the importance of the inspection.

Any form and contents of a completed checklist used to assist with safety audits of work controlled by CH2M HILL are considered confidential, and must not be given to clients (or Owners), contractors, or subcontractors. The checklist of items such as those found in Attachment 1 should **NOT** be used to perform periodic safety audits on work controlled by a contractor. The only exception to this rule could be where the scope of our consulting agreement specifically includes monitoring work conditions for public safety and exposure and for strategic clients. In

2.0 INSPECTION CHECKLIST, CONT.

these cases, we need to carefully review our consulting agreement and verify the appropriate indemnity and limitation of liability clauses are included. In addition, only qualified personnel should be used to perform these inspections.

On sites where work is performed and controlled by others, checklists could also be used to assist our site staff in the recognition of hazards. Used in this manner, the health and safety plan for the site, prepared by the party controlling the work, is the primary document for working around and mitigating the hazard.

A procedure for taking action to correct hazards should be established. Inspections are an effective way of identifying unsafe conditions and unsafe acts; however, when corrective action is not taken quickly, the inspection process is not taken seriously.

3.0 ATTACHMENTS

Attachment 1: Jobsite Safety Inspection Checklist

ATTACHMENT 1

CH2MHILL

JOBSITE SAFETY INSPECTION CHECKLIST

Note: The following jobsite safety inspection checklist is to be used only at locations where CH2M HILL controls the work. It is not to be used at locations where others control the work.

Project Name/Number _____ Others _____

Location _____ Project Manager _____

Date _____ Inspector _____

This checklist has been divided into two basic sections. The first section (A - Y) can be applicable to any jobsite, while the second section (Z) is applicable more to hazardous waste sites. There may be some duplication between Sections A - Y and Z.

Check "Yes" For Items Complete	Yes	No	N/A
A. JOBSITE OFFICE			
1. Posters and safety signs in place:			
a. OSHA safety poster	☐	☐	☐
b. OSHA Form 200	☐	☐	☐
c. Emergency Telephone Number Form	☐	☐	☐
d. Workers Compensation Form	☐	☐	☐
2. First-aid kit:			
a. Fully stocked/sufficient supply	☐	☐	☐
b. First-aid administered by a person with a valid certificate	☐	☐	☐
3. Accident/injury reporting:			
a. Employees briefed	☐	☐	☐
b. Forms available	☐	☐	☐
c. All injuries and illnesses reported and logged	☐	☐	☐
d. Accidents investigated and properly followed up to prevent reoccurrences	☐	☐	☐
e. Accident reports and logs submitted promptly as required	☐	☐	☐
4. Job safety rules and regulations available/posted	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
B. HAZARD COMMUNICATION			
1. Employee training:			
a. Employees' signed training certificates on file	☐	☐	☐
2. MSDSs:			
a. MSDSs on file	☐	☐	☐
b. Log assigned to competent person	☐	☐	☐
c. Log complete and up to date	☐	☐	☐
3. Written program on file	☐	☐	☐
C. EMPLOYEE TRAINING			
1. Safety indoctrination held for new employees	☐	☐	☐
2. Sufficient instruction given in recognition and avoidance of job hazards; unsafe conditions; and job rules, regulations, and procedures	☐	☐	☐
3. Sufficient instruction in proper use and maintenance of tools, equipment, and PPE	☐	☐	☐
4. Employees instructed to report unsafe or hazardous conditions to proper job supervisor	☐	☐	☐
5. Employees instructed to promptly report injury, illness, and accidents involving damage to equipment and materials	☐	☐	☐
D. JOBSITE LOGISTICS AND LAYOUT			
1. Traffic routes around construction areas:			
a. Warning signs, flagging in place	☐	☐	☐
b. Crane swing flagged	☐	☐	☐
2. Utility ditches:			
a. Flagged or barricaded	☐	☐	☐
3. Trucks and heavy equipment:			
a. Good mechanical conditions	☐	☐	☐
b. Backup signals working	☐	☐	☐
c. Seat belts installed and used	☐	☐	☐
4. Motor graders and other earth movers:			
a. Good mechanical conditions	☐	☐	☐
b. Backup signals working	☐	☐	☐
c. Seat belts installed and used	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
E. PUBLIC PROTECTION			
1. Warning signs in place around site	☐	☐	☐
2. After-hours hazards:			
a. Open ditches protected	☐	☐	☐
b. Drop-offs protected	☐	☐	☐
c. Ladders lowered	☐	☐	☐
3. Hazard lights	☐	☐	☐
F. HOUSEKEEPING			
1. Material storage yard:	☐	☐	☐
a. Stacked neatly and properly	☐	☐	☐
b. Aisles, walkways, roads clear	☐	☐	☐
2. Check work areas for:	☐	☐	☐
a. Loose and waste materials	☐	☐	☐
b. Vicinity of ladders, stairs, ramps, and machinery	☐	☐	☐
c. Empty bottles, containers, papers, trash, bands, brick-bats, etc.	☐	☐	☐
d. Trash cans, dumpsters available and emptied regularly	☐	☐	☐
e. Trash chutes and surrounding areas clear	☐	☐	☐
f. Nails, boards, debris removed	☐	☐	☐
g. Trash receptacles provided for drinking cups	☐	☐	☐
G. PERSONAL PROTECTIVE EQUIPMENT (PPE)			
1. Hard hats	☐	☐	☐
2. Safety shoes/boots	☐	☐	☐
3. Eye/face protection	☐	☐	☐
4. Safety belts/lanyards	☐	☐	☐
5. Ear protection	☐	☐	☐
a. Noise level areas of 90 dBA and above identified	☐	☐	☐
b. Signs notifying personnel of "Hearing Protection Required" posted as required	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
6. Specialized equipment	☐	☐	☐
a. Gloves	☐	☐	☐
b. Respirators	☐	☐	☐
c. Chemical-resistant clothing	☐	☐	☐
7. Tools	☐	☐	☐
a. Handles in good shape	☐	☐	☐
b. Tool guards in place	☐	☐	☐
H. SANITATION			
1. Temporary toilets:	☐	☐	☐
a. Serviced regularly	☐	☐	☐
b. Sufficient Quantity (20 or fewer employees—1 required; 20 or more employees—1 toilet and 1 urinal per 40 workers)	☐	☐	☐
2. Potable water:	☐	☐	☐
a. Tightly closed containers	☐	☐	☐
b. Equipped with tap	☐	☐	☐
c. Paper cups available	☐	☐	☐
d. Containers labeled "Drinking Water"	☐	☐	☐
I. FLOOR AND WALL OPENINGS - GUARDS			
1. All floor openings with a drop of more than 4 feet covered or guarded by standard railing and toe board	☐	☐	☐
2. Wall openings with a drop of more than 4 feet guarded as required	☐	☐	☐
3. All open-sided floors, walkways, platforms, ramps, and runways with a drop of more than 4 to 6 feet guarded with standard railing and toe-board as required	☐	☐	☐
4. All stairs with four or more risers provided with railings	☐	☐	☐
5. Railing, posts, and wall opening barriers able to withstand force of at least 200 pounds	☐	☐	☐
6. Floor coverings built to withstand two times the intended load	☐	☐	☐
7. Screens used between the board top rail where needed to prevent material from falling	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
J. PORTABLE LADDERS (straight, extension, and step)			
1. Inspected and in good conditions (not painted)	☐	☐	☐
2. Ladders must not be tied or fastened together unless specifically designed for such a use	☐	☐	☐
3. Properly secured top and bottom	☐	☐	☐
4. All straight and extension ladders equipped with safety shoes and/or blocked off in use	☐	☐	☐
5. Rails extend at least 36 inches above landing or work platform	☐	☐	☐
6. Step ladders fully open when in use	☐	☐	☐
7. Metal ladders not used around electrical hazards	☐	☐	☐
8. Defective ladders tagged and removed from the work area	☐	☐	☐
9. Properly maintained and stored	☐	☐	☐
10. Ladder areas barricaded where required	☐	☐	☐
K. SCAFFOLDING			
1. Erected under proper supervision	☐	☐	☐
2. All structural members adequate for use	☐	☐	☐
3. All connections adequate, pins, crossbracing provided and support plumb	☐	☐	☐
4. Proper footings provided (sound, rigid, and secured)	☐	☐	☐
5. Safely tied into structure	☐	☐	☐
6. Access ladder or safe equivalent provided and used	☐	☐	☐
7. Defective and damaged parts, planks, etc., removed from service	☐	☐	☐
8. Ladders and working areas kept free of debris, ice, snow, chemicals, and grease	☐	☐	☐
9. Complete platform, planks, close together and overlapped by at least 12 inches or secured by wire or proper cleating	☐	☐	☐
10. Guard rails, mid-rails, and toe boards installed on all open sides of platforms 10 feet and over in height (applies to both maintenance and construction)	☐	☐	☐
11. Frequent inspections made	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
L. ELECTRICAL			
1. Cords/devices have current inspection color code tape installed	☐	☐	☐
2. Frayed cords, broken plugs fixed	☐	☐	☐
3. Temporary wiring:			
a. Panels secured and GFCIs working	☐	☐	☐
b. Away from vehicle pathways	☐	☐	☐
c. Out of water/moisture	☐	☐	☐
d. No broken receptacles found	☐	☐	☐
e. Sufficient outlets for all crafts	☐	☐	☐
4. Temporary lighting with cages	☐	☐	☐
5. Assured equipment grounding conductor program in place, if not using GFCIs	☐	☐	☐
6. Lock-out or tag-out system used when necessary	☐	☐	☐
7. Electrical dangers posted and guarded	☐	☐	☐
8. Fire hazards checked, proper extinguishers available	☐	☐	☐
M. TEMPORARY HEATERS			
1. Equipped with pilot and automatic shutoff valve to prevent flow of fuel if flame goes out	☐	☐	☐
2. Installed, serviced, and relocated only by authorized employees	☐	☐	☐
3. Frequently checked to ascertain safe conditions and clearance from combustible and flammable material	☐	☐	☐
4. Sufficiently ventilated	☐	☐	☐
N. FIRE PROTECTION			
1. Office fire extinguisher in working order and inspected regularly	☐	☐	☐
2. One extinguisher, 2A rating, for each 3,000 square feet of protected area	☐	☐	☐
3. One extinguisher or more, 2A rating, on each floor, adjacent to each stairway	☐	☐	☐
4. Trash, paper, other combustibles picked up	☐	☐	☐
5. Welders/roofers have extinguishers nearby	☐	☐	☐
6. Fire alarm available/fire evacuation plan	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
7. "No Smoking" signs posted and enforced where necessary	☐	☐	☐
8. Supervisors and employees trained in proper use of extinguishers	☐	☐	☐
O. MATERIAL STORAGE AND HANDLING			
1. Neat storage area, clear passageways	☐	☐	☐
2. Materials spotted to minimize rehandling and reduce transport distances	☐	☐	☐
3. Power equipment used to handle heavy or awkward loads	☐	☐	☐
4. Stacks on firm footing and all tier stacked materials secured against sudden movement	☐	☐	☐
5. Storage platforms, skids, bins, shelves, etc. in good repair	☐	☐	☐
6. Protruding nails and wires removed and rugged metal edges protected before material is handled	☐	☐	☐
7. Lifting weights known before handling	☐	☐	☐
8. Employees using proper lifting methods, picking up loads correctly	☐	☐	☐
9. Proper number of employees for each operation, physically suited for task	☐	☐	☐
10. Tag lines used to control loads	☐	☐	☐
11. Protection provided against falling hazards	☐	☐	☐
12. Dust protection observed	☐	☐	☐
13. Extinguishers or other fire protection available	☐	☐	☐
14. Combustibles, flammable, and other unrelated materials separated and clearly identified	☐	☐	☐
15. "No Smoking" signs posted where necessary	☐	☐	☐
16. Safe loading limits observed for indoor storage	☐	☐	☐
P. DEMOLITION WORK			
1. Operations planned ahead	☐	☐	☐
2. Safety work permit required and necessary blinding of lines, etc., accomplished	☐	☐	☐
3. Adjacent structures shored or braced	☐	☐	☐
4. Electrical, water, sewer, steam lines cut off, locked out, or tagged	☐	☐	☐
5. Area roped off or barricaded	☐	☐	☐

Revision: 01
Date: 01/01/94

HEALTH AND SAFETY CHECKLIST

Check "Yes" For Items Complete	Yes	No	N/A
6. Proper safety, danger, and warning signs provided and used	☐	☐	☐
7. Adequate lighting and ventilation provided where necessary	☐	☐	☐
8. Material chutes used	☐	☐	☐
9. Adequate safe access provided	☐	☐	☐
10. Clear operating space provided for equipment and vehicles	☐	☐	☐
11. Overhead protection provided where required	☐	☐	☐
12. Proper fire extinguishing equipment in place	☐	☐	☐
13. Full clothing, serviceable shoes, and adequate PPE (hard hats, goggles, gloves, safety belts, respirators, ear plugs or muffs, etc.) provided	☐	☐	☐
14. Regular supervision maintained	☐	☐	☐
15. Safe housekeeping, welding, rigging, and scaffolding practices observed	☐	☐	☐
Q. CONCRETE CONSTRUCTION			
1. Forms properly installed and braced	☐	☐	☐
2. Adequate shoring used, plumbed and cross-braced	☐	☐	☐
3. Shoring remains in place until strength is attained	☐	☐	☐
4. Proper curing period and procedures observed	☐	☐	☐
5. Heating devices checked, necessary permits obtained	☐	☐	☐
6. Mixing and transport equipment supported and traffic planned and routed	☐	☐	☐
7. Adequate runways, walkways guarded, etc.	☐	☐	☐
8. Employees wear full clothing, serviceable shoes, long sleeve shirts	☐	☐	☐
9. Hard hats, gloves, boots, plus goggles and respirators provided for protection from cement dust	☐	☐	☐
10. Protruding nails and stripped form material removed from area	☐	☐	☐
11. Good housekeeping and safe hoisting and scaffolding practices observed	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
R. STEEL ERECTION			
1. Safety nets used, if required	☐	☐	☐
2. Hard hats, eye protection, safety belts, serviceable shoes, gloves, and full clothing used	☐	☐	☐
3. Tag lines used for hoisting tools and material	☐	☐	☐
4. Fire hazards checked at rivet force and welding operations	☐	☐	☐
5. Ladders, stairs, or other safe access provided	☐	☐	☐
6. Hoisting apparatus checked	☐	☐	☐
7. Good housekeeping, welding, and rigging practices observed	☐	☐	☐
S. MASONRY WORK			
1. Proper scaffolding erected	☐	☐	☐
2. Masonry saws properly equipped	☐	☐	☐
3. Hard hats, eye and face protection, and dust respirators provided	☐	☐	☐
4. Good housekeeping and rigging practices observed	☐	☐	☐
T. EXCAVATION, SHORING, AND TRENCHING			
1. Prior installation, gas lines, conduit, etc., located	☐	☐	☐
2. Atmospheric conditions tested where necessary	☐	☐	☐
3. Adjacent structures shored	☐	☐	☐
4. Land shored and sheathed as needed for soil and depth	☐	☐	☐
5. Roads and sidewalks supported and protected	☐	☐	☐
6. Banks more than 5 feet shored or sloped to angle or repose	☐	☐	☐
7. Adequate barriers and lighting provided at night where required	☐	☐	☐
8. Materials at least 2 feet away from edge of excavations	☐	☐	☐
9. Equipment at safe distance from edge	☐	☐	☐
10. Water controlled	☐	☐	☐
11. Ladders or stairs provided as required (trenches 4 feet deep or greater require ladder for every 25 feet of lateral travel)	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
12. Equipment ramps adequate, slope not too steep	☐	☐	☐
13. Frequent inspections made	☐	☐	☐
14. Full clothing, serviceable shoes and hard hats, goggles, gloves, respirators, boots provided as needed	☐	☐	☐
U. FLAMMABLE AND COMBUSTIBLE LIQUIDS			
1. All containers clearly marked to show contents (gas cylinders, cans, drums, fuel tanks, etc.)	☐	☐	☐
2. Proper storage practices observed:			
a. Storage areas enclosed or protected from heat and mobile equipment exposure	☐	☐	☐
b. Fire hazards checked	☐	☐	☐
c. Sufficient fire extinguishers	☐	☐	☐
d. UL approved safety cans used for 1 to 5 gallons of flammable liquids	☐	☐	☐
e. Approved cabinet for indoor storage of liquids in excess of 25-gallon, but not more than 120-gallon storage	☐	☐	☐
f. Sign labeled "Flammable - Keep Fire Away" posted on cabinet	☐	☐	☐
3. Drums and tanks used for outdoor dispensing and fueling purposes:			
a. Located at least 25 feet from buildings and work areas	☐	☐	☐
b. Bonded, grounded, and equipped with self-venting bungs and self-closing faucets	☐	☐	☐
c. Identified and restricted from smoking or other heat sources; "No Smoking" signs posted	☐	☐	☐
d. Diked and drainage provided for spills	☐	☐	☐
e. Protected from traffic and kept free of weeds,debris, etc.	☐	☐	☐
f. Engines of vehicles and other combustion equipment shut off when being fueled.	☐	☐	☐
V. FLAMMABLE GAS (Oxygen/Acetylene)			
1. Cylinders:			
a. Away from heat	☐	☐	☐
b. Stored upright (secured)	☐	☐	☐
c. Valves closed on empty cylinders	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
d. Valve protection caps in place if cylinder not in use	☐	☐	☐
e. Valve key wrench available	☐	☐	☐
f. Portable rack with bottles secured	☐	☐	☐
g. Never drag or slide bottles	☐	☐	☐
h. Designated storage area	☐	☐	☐
i. "No Smoking" signs posted	☐	☐	☐
j. Oxygen bottles stored 20 feet from acetylene bottles or 1/2-hour fire barrier installed between them	☐	☐	☐
2. Gauges/valves/hoses:			
a. Good condition	☐	☐	☐
b. Fire arresters installed (both hoses)	☐	☐	☐
3. Eye protection available	☐	☐	☐
4. Ventilation adequate	☐	☐	☐
5. When in use, gas lines properly located to prevent tripping and falling hazard	☐	☐	☐
6. All burning torches bled and free of oxygen and acetylene and/or other gases during lunch breaks and other extended periods of time	☐	☐	☐
W. WELDING OPERATIONS			
1. Performed by qualified personnel	☐	☐	☐
2. Screens, shields, or eye protection provided and used to protect employees from welding operation	☐	☐	☐
3. Employees wear sufficient clothing and PPE	☐	☐	☐
4. Equipment checked before use and in operative conditions	☐	☐	☐
5. Electrical equipment grounded	☐	☐	☐
6. Power cables protected and in good repair	☐	☐	☐
7. Power cables properly located to prevent tripping and falling hazards	☐	☐	☐
8. Dry chemical fire extinguisher within 30 feet	☐	☐	☐
9. Exposed combustible materials removed to safe location or properly protected from sparks and slag	☐	☐	☐
10. Valid hot work permit required or provided	☐	☐	☐
11. Overhead protection provided where required	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
12. "Danger - No Smoking, Matches or Open Lights" signs posted when required	☐	☐	☐
13. Adequate lighting and ventilation provided	☐	☐	☐
14. Machines turned off at end of shift or when not in use for extended periods.	☐	☐	☐
X. HOISTS			
1. Material hoists:			
a. Designed by licensed professional engineer	☐	☐	☐
b. With tower enclosed for full height on all sides with 1/2-inch by 18-inch gauge screen mesh, except for landing access	☐	☐	☐
c. With tower not enclosed, hoist platform or car shall be totally enclosed on all sides for the full height between floor and overhead covering with 1/2-inch x 14-inch gauge mesh	☐	☐	☐
d. Operation rules poster "No Riders Allowed" posted	☐	☐	☐
e. Hoisting entrances guarded by substantial gate or bars	☐	☐	☐
f. Vertical gates of sufficient height to prevent anyone from looking over them into shaft	☐	☐	☐
g. Competent person assigned to inspect daily	☐	☐	☐
h. Weekly inspections logged	☐	☐	☐
j. Annual inspection available	☐	☐	☐
k. Fire extinguisher in place and inspected	☐	☐	☐
l. Load chart posted	☐	☐	☐
2. Personnel hoists:			
a. Hoisting doors at least 6 feet, 6 inches high with vision panel of solid construction	☐	☐	☐
b. Machinery and control equipment lighting and protection from weather	☐	☐	☐
c. Double-planked stock overhead protection for operator	☐	☐	☐
d. Operator on duty	☐	☐	☐
e. Electrically released, spring or weight-applied brake in working order	☐	☐	☐
f. Hoist thoroughly inspected each day	☐	☐	☐
g. Not used to carry personnel until inspected and tested	☐	☐	☐

Check "Yes" For Items Complete	Yes	No	N/A
Y. BLASTING			
1. Qualifications and credentials checked	☐	☐	☐
2. Jobsite meeting held	☐	☐	☐
3. All signs, warning signals, PPE in place	☐	☐	☐
4. Nonessentials removed from area	☐	☐	☐
5. Radio transmissions limited	☐	☐	☐
6. Blasting mats in place	☐	☐	☐
7. Blasting log maintained	☐	☐	☐
Z. HAZARDOUS WASTE			
Certification and Training of CH2M HILL Personnel			
1. Medical exam within last 12 months	☐	☐	☐
2. 40-hour initial training, 3 days supervised field activities, 8-hour annual refresher	☐	☐	☐
3. First aid and CPR certification	☐	☐	☐
4. Quantitatively fit tested	☐	☐	☐
5. Attend pre-entry safety meeting	☐	☐	☐
6. Site Safety Coordinator with appropriate training	☐	☐	☐
Certification and Training of Subcontractor Personnel			
1. Medical exam within last 12 months	☐	☐	☐
2. 40 hour initial training, 3 days supervised field activities, 8 hour annual refresher	☐	☐	☐
3. First aid and CPR certification	☐	☐	☐
4. Quantitatively fit tested	☐	☐	☐
5. Attend pre-entry safety meeting	☐	☐	☐
Site Safety Documentation			
1. Site safety plan (SSP) prepared and approved	☐	☐	☐
2. SSP onsite	☐	☐	☐
3. All personnel onsite identified in SSP	☐	☐	☐
4. Documentation of safety briefing	☐	☐	☐
5. Hospital map posted	☐	☐	☐
6. Phone numbers posted	☐	☐	☐
7. Emergency vehicle identified	☐	☐	☐

Revision: 01
Date: 01/01/94

HEALTH AND SAFETY CHECKLIST

Check "Yes" For Items Complete	Yes	No	N/A
8. Material Safety Data Sheets (MSDSs) onsite	☐	☐	☐
9. Work zones delineated (How?_____)	☐	☐	☐
10. Wind direction flags in use	☐	☐	☐
11. Documentation of calibration of monitoring equipment in clean environment	☐	☐	☐
12. Monitoring conducted and recorded as specified in SSP (Frequency?_____)	☐	☐	☐
13. Monitoring for heat/cold stress	☐	☐	☐
14. Buddy system in use	☐	☐	☐
15. Decontamination procedures established as specified in SSP	☐	☐	☐
16. No eating, drinking, or smoking in exclusion and contamination reduction zones	☐	☐	☐
17. Toilet facilities provided	☐	☐	☐
18. 533 Forms completed	☐	☐	☐
19. No contact lenses	☐	☐	☐
20. Work conducted during daylight hours only	☐	☐	☐
21. Emergency equipment available as specified in SSP (What?_____)	☐	☐	☐
Safety Briefing			
1. All personnel attended (including new personnel)	☐	☐	☐
2. Documentation of meetings	☐	☐	☐
3. Chemical hazards and toxicology reviewed	☐	☐	☐
4. Physical hazards reviewed	☐	☐	☐
5. Biological hazards reviewed	☐	☐	☐
6. Heat/cold stress information reviewed	☐	☐	☐
7. Air monitoring requirements	☐	☐	☐
8. Levels of protection reviewed	☐	☐	☐
9. Work zones reviewed	☐	☐	☐
10. Decontamination procedures reviewed	☐	☐	☐
11. Emergency response procedures reviewed	☐	☐	☐
12. Site communications	☐	☐	☐

HEALTH AND SAFETY CHECKLIST

Revision: 01
Date: 01/01/94

Check "Yes" For Items Complete	Yes	No	N/A
Personal Protective Equipment (PPE)			
1. Levels of protection being worn as specified in SSP	☐	☐	☐
2. All appropriate PPE available onsite	☐	☐	☐
3. Hard hats being worn	☐	☐	☐
4. Appropriate hand protection being used (What?_____)	☐	☐	☐
5. Appropriate body protection being used (What?_____)	☐	☐	☐
6. Appropriate eye protection being used (What?_____)	☐	☐	☐
7. Appropriate ear protection being used	☐	☐	☐
8. Appropriate respirator protection being used	☐	☐	☐
9. Respirators donned correctly	☐	☐	☐
10. TLD badges being used	☐	☐	☐
11. If air purifying respirators (APRs) are being used, correct cartridges (Type?_____)	☐	☐	☐
12. If self contained breathing apparatuses (SCBAs) are being used, is grade D air being used	☐	☐	☐
13. If SCBAs are being used, are cylinders stored correctly	☐	☐	☐
14. If personal protective equipment (PPE) is not onsite, prepared to halt work	☐	☐	☐
15. Disposal methods in place for disposable PPE	☐	☐	☐
Decontamination Procedures			
1. Decontamination procedure established as specified in the SSP	☐	☐	☐
2. Decontamination zone clearly defined	☐	☐	☐
3. PPE properly decontaminated (How?_____)	☐	☐	☐
4. Sampling equipment properly decontaminated (How?_____)	☐	☐	☐
5. Monitoring equipment properly decontaminated (How?_____)	☐	☐	☐
6. Heavy equipment properly decontaminated (How?_____)	☐	☐	☐
7. Samples properly decontaminated (How?_____)	☐	☐	☐
8. Decontamination fluids appropriately disposed of	☐	☐	☐

Appendix F

OSHA Job Safety Poster

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1988 (Revised)
OSHA 2203

Ann McLaughlin, Secretary of Labor

U.S. Department of Labor

Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

GPO : 1988 0 - 219-667

Appendix G

CH2M HILL Incident Report Form

Revision: 01
Date: 01/01/94

INJURY AND ILLNESS REPORTING

Attachment 1

CH2MHILL *ACCIDENT REPORT*

DATE: _____

NOTE: *TO BE COMPLETED ONLY FOR REPRESENTATIVES OF CH2M HILL, INC.*

PROJECT: _____ PROJECT NO. _____

INJURED EMPLOYEE: _____ EMPLOYEE NO. _____

DATE INJURED: _____ TIME _____ A.M. P.M.

DATE REPORTED: _____ LAST DAY WORKED: _____

DID EMPLOYEE RETURN TO WORK: _____ DATE RETURNED: _____

WHERE ACCIDENT OCCURRED: _____

WITNESSES: _____

WORK PERFORMING WHEN INJURED: _____

KIND AND EXTENT OF INJURY: _____

NAME - ADDRESS OF DOCTOR - HOSPITAL: _____

DESCRIPTION OF ACCIDENT: _____

WAS THERE EQUIPMENT MALFUNCTION? ☐ YES ☐ NO

DESCRIBE DAMAGE TO EQUIPMENT OR PROPERTY: _____

UNSAFE CONDITION OR ACT CAUSING ACCIDENT: _____

ACTION TAKEN TO PREVENT SIMILAR ACCIDENT: _____

ADDITIONAL RECOMMENDATIONS OR ACTION: _____

SUPERVISOR: _____

☐ PHOTO(S) TAKEN

(7.1) FORM 308

Appendix H

USACE Incident Report Form (ENG Form 3394)

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2 PERSONAL DATA

a. NAME (Last/First/MI) | b. AGE | c. SEX ☐ MALE ☐ FEMALE | d. SOCIAL SECURITY NUMBER ___ ___ ___ / ___ ___ / ___ ___ ___ ___ | e. GRADE

f. JOB SERIES/TITLE

g. DUTY STATUS AT TIME OF ACCIDENT
☐ ON DUTY ☐ TDY ☐ OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER
☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL
☐ TEMPORARY ☐ STUDENT
☐ OTHER (Specify) _____

3 GENERAL INFORMATION

a. DATE OF ACCIDENT (month/day/year) ___ / ___ / ___ | b. TIME OF ACCIDENT (Military time) | c. EXACT LOCATION OF ACCIDENT | d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER _____
☐ CIVIL WORKS ☐ MILITARY
☐ OTHER (Specify) _____

f. TYPE OF CONTRACT
☐ CONSTRUCTION ☐ SERVICE
☐ A/E ☐ DREDGE
☐ OTHER (Specify) _____

g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ SUPERFUND ☐ DERP
☐ IRP ☐ OTHER (Specify) _____

4 CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see instructions)

a. CONSTRUCTION ACTIVITY _____ (CODE) #

b. TYPE OF CONSTRUCTION EQUIPMENT _____ (CODE) #

5 INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items a, f & g - see instructions)

a. SEVERITY OF ILLNESS / INJURY _____ (CODE) # | b. ESTIMATED DAYS LOST | c. ESTIMATED DAYS HOSPITALIZED | d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED
PRIMARY _____ (CODE) #
SECONDARY _____ (CODE) #

f. NATURE OF ILLNESS / INJURY _____ (CODE) #

g. TYPE AND SOURCE OF INJURY/ILLNESS
TYPE _____ (CODE) #
SOURCE _____ (CODE) #

6 PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)

a. ACTIVITY AT TIME OF ACCIDENT _____ (CODE) #

b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7 MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE
☐☐ TRUCK ☐☐ OTHER (Specify) _____

b. TYPE OF COLLISION
☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END
☐ BROADSIDE ☐ ROLL OVER ☐ BACKING
☐ OTHER (Specify) _____

c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
(1) FRONT SEAT			
(2) REAR SEAT			

8 PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9 VESSEL / FLOATING PLANT ACCIDENT (Fill in line and corresponding code number in box from list - see instructions)

a. TYPE OF VESSEL/FLOATING PLANT _____ (CODE) #

b. TYPE OF COLLISON/MISHAP _____ (CODE) #

10 ACCIDENT DESCRIPTION (Use additional paper, if necessary)

11 CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. *(Explain YES answers in item 13)*	YES	NO
DESIGN: Was design of facility,workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc.,contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust,fumes,mists,vapors or physical agents, such as, noise,radiation,etc.,contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting,such as, lifting of/ice furniture,carrying,stooping,etc.,contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion,was drugs or alcohol a factor to the accident?	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12 TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	/ / *(Month) (Day) (Year)*

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a DIRECT CAUSE

b INDIRECT CAUSE(S)

14 ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15 DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a BEGINNING *(Month/Day/Year)* / / b. ANTICIPATED COMPLETION *(Month/Day/Year)* / /

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____	___ / ___ / ___		
CONTRACTOR _____	___ / ___ / ___		

16 MANAGEMENT REVIEW *(1st)*

a ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17 MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc)*

a. ☐ CONCUR b ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18 SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19 COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

GENERAL. Complete a separate report for each person who was *injured, caused, or contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1— ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE — Make no entry.

(3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE — Make no entry.

INSTRUCTIONS FOR SECTION 2— PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE — For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc..

g. DUTY STATUS — Mark the appropriate box.

(1) ON DUTY — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident.

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of accident.

b. TIME OF ACCIDENT — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME — Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR — Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 05-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION	14. ELECTRICAL
2. SITE PREPARATION	15. SCAFFOLDING/ACCESS
3. EXCAVATION/TRENCHING	16. MECHANICAL
4. GRADING (EARTHWORK)	17. PAINTING
5. PIPING/UTILITIES	18. EQUIPMENT/MAINTENANCE
6. FOUNDATION	19. TUNNELING
7. FORMING	20. WAREHOUSING/STORAGE
8. CONCRETE PLACEMENT	21. PAVING
9. STEEL ERECTION	22. FENCING
10. ROOFING	23. SIGNING
11. FRAMING	24. LANDSCAPING/IRRIGATION
12. MASONRY	25. INSULATION
13. CARPENTRY	26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT — Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER	13. DUMP TRUCK (OFF HIGHWAY)
2. DRAGLINE	14. TRUCK (OTHER)
3. CRANE (ON VESSEL/BARGE)	15. FORKLIFT
4. CRANE (TRACKED)	16. BACKHOE
5. CRANE (RUBBER TIRE)	17. FRONT-END LOADER
6. CRANE (VEHICLE MOUNTED)	18. PILE DRIVER
7. CRANE (TOWER)	19. TRACTOR (UTILITY)
8. SHOVEL	20. MANLIFT
9. SCRAPER	21. DOZER
10. PUMP TRUCK (CONCRETE)	22. DRILL RIG
11. TRUCK (CONCRETE/TRANSIT MIXER)	23. COMPACTOR/VIBRATORY ROLLER
12. DUMP TRUCK (HIGHWAY)	24. OTHER

INSTRUCTIONS FOR SECTION 5 — INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	PERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA	RECORDABLE FIRST AID CASE
NRI	NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST — Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED — Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY — Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED — Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL: OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. The nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
[redacted]MATIC INJURY OR [redacted]BILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TO	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)

*A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated [redacted]sures to conditions of the work environment over a long period of [redacted]. For practical purposes, an occupational illness/disease or [redacted]ity is any reported condition which does not meet the definition of traumatic injury or disability as described above.

ENERAL NATURE ITEGORY	CODE	NATURE OF INJURY NAME
ON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
ESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
IOLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC – OTHER
ABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle.
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
[illegible]	WEATHER (ICE, RAIN, HEAT, ETC.)
[illegible]	FIRE, FLAME, SMOKE (NOT TOBACCO)
[illegible]	NOISE
[illegible]	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
[illegible]	DUST, VAPOR, ETC.
[illegible]	DUST (SILICA, COAL, ETC.)
[illegible]	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
[illegible]	OTHER ANIMAL
[illegible]	PLANT
[illegible]	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT — Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank, dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED — If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7 — MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE — Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION — Mark appropriate box.

c. SEAT BELT — Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 — PROPERTY/ MATERIAL INVOLVED

a. NAME OF ITEM — Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP — Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)

c. $ AMOUNT OF DAMAGE — Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9—VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/ floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL—Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12—TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING—Mark the appropriate box that best indicates the type of training: (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING—Enter the month, day, and year of the last *formal* training completed that covered the activity-task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

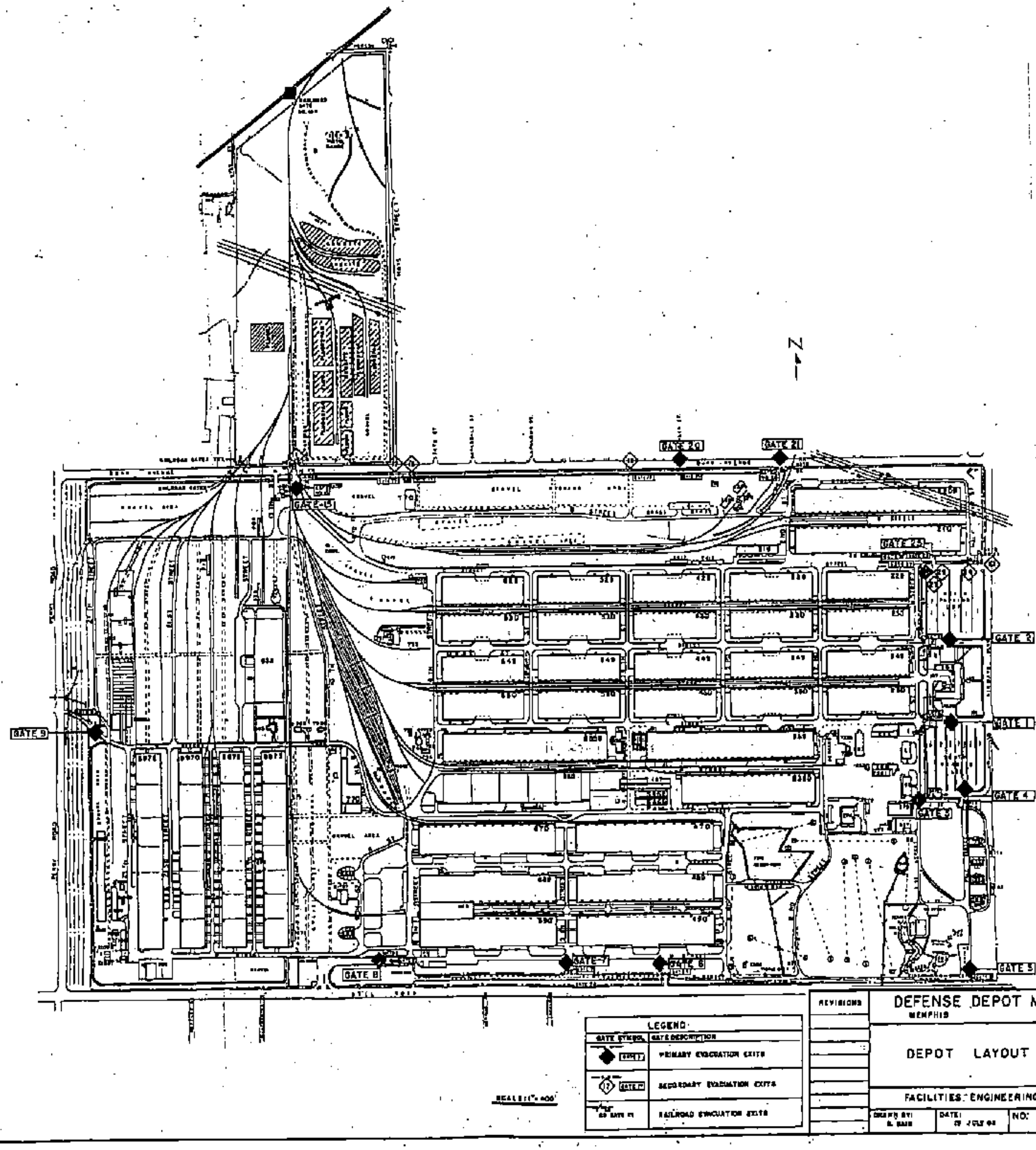
3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Hearth Office. Signature authority shall not be delegated.

Appendix I

DDMT Evacuation Route Map


N
GATE 20
GATE 21
GATE 25
GATE 9
GATE 2
GATE 1
GATE 4
GATE 3
GATE 8
GATE 7
GATE 6
GATE 5
LEGEND
GATE SYMBOL
GATE DESCRIPTION
PRIMARY EVACUATION EXITS
SECONDARY EVACUATION EXITS
RAILROAD EVACUATION EXITS
REVISIONS
DEFENSE DEPOT MEMPHIS
MEMPHIS TENNESSEE
DEPOT LAYOUT PLAN
FACILITIES ENGINEERING DIVISION
DRAWN BY
DATE
NO. 11-46

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE