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THE MEMPHIS DEPOT
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COVER SHEET

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Memphis Depot
Dunn Field

Disposal Sites Pre-Design Investigation Data Collection Plan

August 2003 (Rev. 2)

CH2MHILL

U.S. Army Engineering and Support Center, Huntsville

U.S. Army Engineering and Support Center, Huntsville
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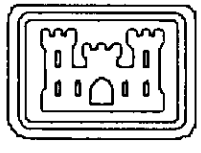
Dunn Field

Disposal Sites Pre-Design Investigation Data Collection Plan

Rev. 2

August 2003

PREPARED FOR



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1.0 Introduction

As part of the Remedial Design (RD) for Dunn Field of the former Memphis Depot, this Disposal Sites Pre-Design Investigation Data Collection Plan was prepared to describe pre-RD sampling and testing. The activities described herein are being carried out to supplement existing chemical and physical data on seventeen (17) former disposal sites on Dunn Field, listed as Priority Level A or B in Table 1-1 of this plan. Information developed for the initial version of the *Dunn Field Feasibility Study* (FS) report (CH2M HILL, February 2003) indicates that there is little data available on the quantity, characteristics, and current status of materials placed within each disposal site beyond that provided by facility records and employee interviews. The additional information collected by this pre-RD effort will be used to support the selected remedy in the Dunn Field Proposed Plan and Record of Decision, and within the RD to optimize the design and cost estimates of the future remedial action at these sites. Those sites listed on Table 1-1 as Level C will have their locations, using northing and easting coordinates, (or other perimeter points) recorded as part of the Resource Conservation and Recovery Act (RCRA) designation and reporting process.

The objectives for the activities described herein are to: (1) define the location and dimensions of each disposal site as compared to existing information on each site; (2) evaluate the chemical and physical characteristics of materials present within the Priority Level A and B disposal sites along with the surrounding soil media; and, (3) as feasible, develop estimates of the physical condition and quantity of potentially hazardous materials present in each Priority Level A and B disposal site.

This plan has been developed by CH2M HILL for the U.S. Army Engineering and Support Center, Huntsville, Alabama (CEHNC) and the Defense Logistics Agency (DLA). Once approved by the Memphis Depot BRAC Cleanup Team (BCT), which consists of personnel from DLA, the U.S. Environmental Protection Agency (EPA), and the State of Tennessee Department of Environment and Conservation (TDEC), the activities described herein will be enacted by the USACE - Mobile remedial action contractor with oversight provided by CEHNC and CH2M HILL. The data collected by this effort will be documented within a comprehensive technical memorandum. The memorandum will include, as a minimum, maps and diagrams of the vertical and horizontal dimensions of the pits, discussion of the pit's contents with supporting photographs, a summary of actions taken, and identification of areas in which all contaminants were removed. This memorandum will be linked to a phase of the RCRA process to allow for a no further action determination and approval if appropriate. The technical memorandum will be included with the Dunn Field RD documents and the Administrative Record.

TABLE 1-1
List of Dunn Field (OU 1) Sites
Rev. 0 Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

INSTALLATION RESTORATION SITES NUMBER	DSERTS SITE NUMBER[a]	PRIORITY LEVEL[b]	SITE TYPE	SITE DESCRIPTION
Northeast Open Area				
19	19	C	SS	Former Tear Gas Canister Burn Site[c]
20	20	C	SS	Probable Asphalt Burial Site
21	21	C	SS	XXCC-3 Impregnite Burial Site (300,000 Pounds)
50	50	C	SS	Dunn Field Northeastern Quadrant Drainage Ditch
60	60	Remediated[1]	SS	Pistol Range Impact Area/Bullet Stop
62	62	C	SS	Bauxite Storage
65	65	Remediated[1]	RI	Old Pistol Range Building 1184/Temporary Pesticide Storage
Disposal Area				
1	1	Remediated[2]	CWM	Mustard and Lewisite Training Sets Burial Site (1955)
2	2	C	RI	Ammonia Hydroxide (7 Pounds) and Acetic Acid (1-Gallon) Burial Site (1955)
3	3	B	RI	Mixed Chemical Burial Site (Orthotouidine Dihydrochloride) (1955)
4	4	A	RI	POL Burial Site (13, 55-Gallon Drums of Oil, Grease and Paint)
4.1	90	A	RI	POL Burial Site (32, 55-Gallon Drums of Oil, Grease and Thinner)
5	5	C	RI	Methyl Bromide Burial Site A (3 Cubic Feet) (1955)
6	6	C	RI	40,037 Units of Eye Ointment Burial Site (1955)
7	7	A	RI	Nitric Acid Burial Site (1,700 Quart Bottles) (1954)
8	8	A	RI	Methyl Bromide Burial Site B (3,768 1-gallon cans) (1954)
9	9	C	RI	Ashes and Metal Burial Site (Burning Pit Refuse) (1955)
10	10	B	RI	Solid Waste Burial Site (Near MW-10) (Metal, Glass, Trash, etc.)
11	11	B	RI	Trichloroacetic Acid Burial Site (1,433, 1-ounce Bottles) (1965)
12 & 12.1	12	B	RI	Sulfuric Acid and Hydrochloric Acid Burial (1967)
13	13	A	RI	Mixed Chemical Burial (Acid, 900 Pounds, Unnamed Solids, 8,100 Pounds)
14	14	C	RI	Municipal Waste Burial Site B (Near MW-12) (Food, Paper Products)
15	15	B	RI	Sodium Burial Sites (1968)
15.1	91	B	RI	Sodium Phosphate Burial (1968)
15.2	92	B	RI	14 Burial Pits: Na2PO4, Sodium, Acid, Medical Supplies, and Chlorinated Lime
16	16	B	RI	Unknown Acid Burial Site (1969)
16.1	93	B	RI	Acid Burial Site
17	17	B	RI	Mixed Chemical Burial Site C (1969)
18	18	C	Proposed NFA	Plane Crash Residue
22	22	C	Proposed NFA	Hardware Burial Site (Nuts and Bolts)
23	23	C	Proposed NFA	Construction Debris and Food Burial Site
24-A	24	Remediated[2]	CWM	Bomb Casing Burial Site (29 Bomb Casings used to Transport Mustard Agent)
61	61	C	SS	Buried Drain Pipe
63	63	C	Proposed NFA	Aboveground Fluorspar Storage
64	64	C	Proposed NFA	Aboveground Bauxite Storage (1942 to 1972)
66	66	C	RI	Food Supplies
Stockpile Area[d]				
24-B	24	Remediated[2]	CWM	Neutralization Pit for the Contents of the 29 Bomb Casing used to Transport Mustard Agent
62	62	C	SS	Aboveground Bauxite Storage
63	63	C	Proposed NFA	Aboveground Fluorspar Storage
64	64	C	SS	Aboveground Bauxite Storage (1949 to 1972)
--	64[e]	B	--	CC-2 Impregnite Burial Site (86,100 Pounds in 1947)

Notes:

[1] Remedial action for Sites 60/65 (CH2M HILL, 2002) was completed in early 2003 following EE/CA and Action Memorandum.

[2] CWM remedial actions at sites are documented in the Final Chemical Warfare Materiel Investigation/Removal Action Report, dated December 2001 (UXB International, Inc).

SS:	Screening Site
RI:	Remedial Investigation
RA:	Remedial Action
NFA:	No Further Action
CWM:	Chemical Warfare Materiel
Na2PO4:	Sodium Phosphate
POL:	Petroleum, Oil, and Lubricants
XXCC-3/CC-2:	Stabilized/Unstabilized Impregnite for Impregnating Clothing Used to Protect Personnel against the Action of Vesicant-Type Chemical Agents

[a] Defense Site Environmental Restoration Tracking System (DoD Database)

[b] Priority levels were established for Installation Restoration Sites Number/DSERT Site Number Areas where remedial action will be required with some investigatory effort to determine extent of area. Levels are as follows: A - Highest Priority; B - Medium Priority; C - Lowest Priority (no RA likely). Designation is based on described quantity of material, potential hazard to human health and the environment, and form of material (solid or liquid). The site numbers and descriptions for these sites are bold and shaded in this table.

[c] According to the available information, burning in this area dated back to the 1940s and included chloroacetophenone (CN) canisters, fuses, and smokes, in addition to sanitary wastes. Operations were conducted in pits and incorporated the weekly cleanup of residue and garbage in addition to material. The ash was then allegedly buried in the north end of Dunn Field.

[d] According to available information, USATHAMA (1982) Installation Assessment Site 31 is located in the southwest portion of Dunn Field. This site was reportedly used for burning/disposal of smoke pots, CN (tear gas) grenades and souvenir ordnance, which included a 3.2 mortar round. This area was covered by the bauxite storage pile (Site 64). Installation Site 31 was not designated as an IRP site or given a DSERTS site number. However, the site is now included in DSERTS Site 64.

[e] According to an April 15, 2003 email from the Defense Logistics Agency - DDC (New Cumberland) to DDC (Memphis) and CEHNC, DSERTS Site 64 will include the CC-2 Impregnite Burial Site and Installation Assessment Site 31 as a result of the proximity of all three sites and because Site 64 encompasses both of the other two sites.

2.0 Background Information

This section presents information on the current status of Dunn Field as well as the operational history of Dunn Field.

2.1 Status of Dunn Field

Dunn Field is part of the former Defense Depot Memphis, Tennessee (Memphis Depot) facility, under authority of the DLA. A thorough description of the site status and regulatory history of Dunn Field is provided in either the *Dunn Field Remedial Investigation* report (CH2M HILL, July 2002), the *Dunn Field Five -Year Review* (CH2M HILL, January 2003), or the *Dunn Field Feasibility Study* (May 2003). As related to this pre-design investigation, an important recent activity at Dunn Field includes an Engineering Evaluation/Cost Analysis (EE/CA), which was performed in June 1999 to:

- Assess whether chemical warfare materiel (CWM) contamination was migrating from the CWM disposal pits at Dunn Field;
- Analyze risk management alternatives; and
- Recommend feasible CWM remedial alternatives for contaminants found to be present.

The EE/CA included results from:

- Geophysical investigations performed to locate metal objects and areas of disturbed soil and to characterize suspected CWM disposal areas. [The maps displaying the results of these geophysical surveys are found in the EE/CA document as Figures 2-7 through 2-18.]
- Surface soil and groundwater sampling activities collected during installation of the groundwater extraction system at Dunn Field
- Passive soil gas surveys to identify areas where the soil has been impacted by vapors from volatile organic compounds (VOCs).

After completion of the EE/CA, UXB International, under contract with the US Army Corps of Engineers - Huntsville Center, conducted remedial measures from mid-2000 to mid-2001 at Sites 1, 24-A, and 24-B to reduce or eliminate the potential CWM risk posed by these wastes. The CWM remedial actions at these sites are documented in the *Final Chemical Warfare Materiel Investigation/Removal Action Report*, dated December 2001, prepared by UXB International, Inc. The conclusions from this report are as follows:

- Site 1 - This site was suspected of containing chemical agent identification sets (CAIS) containing small quantities of diluted agent and is located in the Disposal Area of Dunn Field. Beginning in May 2000, The entire target area was excavated, but neither CAIS nor sealed cylindrical metal containers (PIGS) were recovered. However, 24 jars labeled as "HS" (sulfur mustard) were recovered, but were determined to be free of CWM. No CWM or CWM contaminated soil was found within the investigation area of Site 1. In

August 2000, the removal action was completed. (The location of the removal action excavations at Site 1 are shown on Figure 4-1.)

- Site 24-A -This site is the confirmed burial location for 29 bomb casings that were used to transport mustard agent from Germany to the U.S. after World War II and is located in the Disposal Area of Dunn Field. No mustard or other CWM was discovered at this site; however, 900 cubic yards of soil contaminated with mustard degradation by-products were transported and disposed offsite. In November 2000, the removal action was completed. (The location of the removal action excavations at Site 1 are shown on Figure 4-1.)
- Site 24-B -This site is the confirmed location of the neutralization pit for the contents of the 29 bomb casings and is located in the Stockpile Area of Dunn Field. Beginning in November 2000, 19 cubic yards of mustard contaminated soil and 14 cubic yards of soil contaminated with mustard degradation by-products were transported and disposed offsite. In March 2001, the removal action was completed. (The location of the removal action excavations at Site 1 are shown on Figure 4-1.)

Beyond the CWM EE/CA and removal action, there has been little intrusive investigation into the former disposal sites and little is known about the materials within each Priority Level A and B disposal site beyond the descriptions provided in Tables 1-1 and 2-1. The RI conducted at Dunn Field was directed away from many of the disposal sites because of concern over the presence of CWM. Therefore, surface and subsurface soil samples were not directly collected at many of these disposal site locations. A pre-RI field review of these sites at Dunn Field, dated January 7, 1997, is presented as Attachment 1.

Information does exist on the disposal sites, however, this information is primarily hand-drawn maps, anecdotal evidence from former employee interview records, and records of materials handled at the Main Installation (MI) portion of the Memphis Depot contained within the *Archives Search Report* (ASR) (CEHNC, January 1995). A technical memorandum, dated February 3, 2003, discusses the disposal sites in relation to the potential presence of conventional ordnance and explosives (OE) at Dunn Field and is included as Attachment 2. Since submittal of the February 3, 2003 memorandum, CEHNC has developed a risk analysis of encountering OE and CWM at Dunn Field. The risk analysis has shown that there is low potential of encountering OE and CWM at Dunn Field. This action has led to development of a Statement of Clearance and Determination of Applicability. The Statement of Clearance is presented as Attachment 5.

2.2 Operational History of Dunn Field

The Memphis Depot originated in the early 1940s. Its initial mission was to provide stock control, storage, and maintenance services for the Army Engineer, Chemical, and Quartermaster Corps (Memphis Depot Caretaker, 1998). From 1963 until closure in September 1997, the facility served as a major field installation for the DLA for shipping and receiving a variety of materials (U.S. Army Toxic and Hazardous Materials Agency [USATHAMA], 1982). Additional information on the operational history of the Memphis Depot and use of Dunn Field can be found in the *Dunn Field Five-Year Review* (CH2M HILL, January 2003) and the *Dunn Field Feasibility Study* (CH2M HILL, May 2003).

Disposal activities at Dunn Field began in July 1946 when 29 mustard-filled German bomb casings were destroyed and buried (Sites 24-A and 24-B). During the early to mid-1950s, Chemical Agent Identification Sets (CAIS) were allegedly disposed of and buried at Dunn Field at Site 1 in the Disposal Area portion of Dunn Field. The CAIS allegedly contained small glass ampoules of diluted mustard, lewisite (a vesicant chemical agent), chloropicrin, and phosgene, which were stored in sealed cylindrical metal containers (PIGS). CAIS stocks found to be leaking or broken during periodic inspection were reportedly buried at Dunn Field (USATHAMA, 1982). In March 2001, a removal action was completed, which involved removal of all known CWM from Dunn Field. Section 1.3.4 of the Dunn Field RI (CH2M HILL, 2002) presents additional information on the CWM at Dunn Field.

According to information provided by USATHAMA (1982) and USACE (1995), the remains of destroyed (burned or detonated) explosive ordnance (OE) were also buried in pits in what is known as the Disposal and Stockpile Areas of Dunn Field. Reports indicate that the OE consisted of a 3.2-inch mortar round, smoke pots, chloroacetophenone (CN) canisters, and hand grenades (smoke) and "souvenir ordnance". Additional information on the potential presence of this OE can be found in Section 1 of the Dunn Field FS and also in Attachments 2 and 5.

In addition to that described above, other chemicals associated with the use of chemical agents such as Decontaminating Agent Non-Corrosive (DANC) were buried in Dunn Field. The decontaminant DANC disposed of at Dunn Field is an organic N-chloroamide compound in solution with 1,1,2,2-tetrachloroethane (PCA). DANC typically contained 90 percent to 95 percent 1,1,2,2-PCA (also known as acetylene tetrachloride). A mixture similar to DANC formulations (S-210 suspension formulation) contained tetrachloroethene (PCE). Use and disposal of chlorinated lime, super tropical bleach (STB) and calcium hypochlorite (HTH) is documented at Dunn Field. Food stocks, paints/thinners, petroleum/oil/lubricants (POL), acids, herbicides, mixed chemicals, and medical waste were also destroyed or buried in pits and trenches at Dunn Field (USACE, 1995). These are the sources for the chlorinated volatile organic compounds (and their degradation products) found in the soil and groundwater in and beneath Dunn Field. These include 1,1,2,2-PCA, trichloroethane (TCA), PCE, trichloroethene (TCE), dichlorothenes (DCE), vinyl chloride, carbon tetrachloride and chloroform. Table 1-1 lists and describes the priority level sites at Dunn Field.

2.3 Pre-RD Sampling and Testing Justification

During development of the RI report for Dunn Field, the dearth of specific data surrounding the contents of the disposal sites on Dunn Field lead to concerns over whether there should be a supplemental investigation to develop data on the location and type of material present within these sites. These concerns were brought to the BCT and discussed via a telephone conference call on February 11, 2002. The draft meeting notes from that conference call, dated February 14, 2002, are presented as Attachment 3. During the discussion, the BCT agreed that to keep the RI/FS process moving forward, the information concerning the disposal sites would be included in each document and remedial action objectives would be developed within the FS. The BCT also prioritized each site according to quantity of material within each site, potential hazards of the material, and form of the material (solid

versus liquid). This conference call resulted in development of Table 1-1 with the three priority levels for the disposal sites.

Since the conference call of February 14, 2002, another site was added to the list as a potential disposal site. Installation Assessment Site 31, a former material burn area, was placed on the list because of concerns over potential burial of various materials and limited amount of sampling that has occurred in or around Site 31. According to available maps, Site 31 is located approximately 150 east-southeast of Site 24-B and is approximately 280 feet long and 75 feet wide.

After the RI was completed and during the FS documentation process, cost estimates and basic design requirements were developed for each site media to be remediated as part of future remedial action at Dunn Field. Review of information about the Priority Level disposal sites for these purposes indicated that there was little data that could be used to produce definitive cost and design information. As a result, a very conservative estimate was made in the Dunn Field FS report that at least 75% of the sites would contain materials considered hazardous and would require remediation. The strong need for additional information lead the BCT to decide during the September 2002 BCT Meeting that a pre-design investigation would be conducted to obtain information pertinent to the future remedial action of the Priority Level A and B sites. Attachment 4, dated September 24, 2002, presents the minutes from this BCT Meeting.

In addition, the BCT has determined that those sites listed on Table 1-1 as Priority Level C will have the coordinates of each corner (or other perimeter points) recorded as part of the RCRA designation and reporting process.

TABLE 2-1
Burial Pit Descriptions and History
Rev 0 Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

IRP Site Number[1]	Site Description and History
Disposal Area	
3	This site reportedly contains about 3,000 quarts of various chemicals, plus 5 cubic feet of orthotoludine dihydrochlonde buried in 1955. As a result, toxicity potential is unknown based on the description of "various chemicals"
4	Site 4 is a trench containing approximately 13 drums of oil, grease, and paint thinner that were disposed of in the mid-1950's. These materials are considered to be both potentially toxic and highly mobile. Since the drums were placed 50 years ago, they may have corroded and may no longer be intact
4 1	This site is similar to Site 4, except that it contains approximately 32 drums of oil, grease, or thinners that were disposed of in the mid-1950's. These materials are considered to be both potentially toxic and highly mobile. Since the drums were placed 50 years ago, they may have corroded and may no longer be intact.
7	Site reportedly consists of a trench containing approximately 1,700 quart bottles of nitric acid from 1954. Nitric acid is considered to have low toxicity, but could cause a low pH in the area, or mobilize metals, or both.
8	This site is an excavation containing approximately 3,768 cans of methyl bromide (bromomethane) from 1954. The hazard is similar to that of Site 5, but the quantity is significantly greater and that makes this a higher priority site The disposal excavation is estimated to be approximately 45 feet by 45 feet at the surface and the reported burial depth is 7 feet (It should noted, that no bromomethane was detected in the surface soil or subsurface soil on Dunn Field where tested during the RI [>250 samples]. Bromomethane was detected in 5 monitoring wells [MW-13, -69, -70, -76 & -77] in 2001 at low estimated concentrations ranging from 0.2J ug/L to 0 6J ug/L No bromomethane was detected in the recovery wells. Bromomethane was not detected in groundwater samples prior to 2001 [a total of >500 groundwater samples] There is no federal or state drinking water standard for bromomethane in groundwater.)
10	This a solid waste burial site containing metal, cans, ash, broken glass, and other similar material was last used in 1955. Information indicates the waste was located in a zone from 3.5 to 10 feet below the ground surface Materials descriptions suggest that the burial site contains little organic matter. The site is not expected to contain hazardous materials, but the actual contents of the buried material is unknown
11	This site is an excavation containing 11 gallons of the herbicide trichloroacetic acid in 1,433 1-ounce bottles buried in 1965 This is a reportedly unstable chemical, with a transient influence on pH and with low toxicity.
12/12 1	Sites 12 and 12.1 consists of 3 trenches containing a total of 30 pallets of sulfuric and hydrochlonc acid buried in 1967 These below-grade materials are not expected to be extremely toxic, but could affect the pH in the local area and cause metals to become more mobile
13	This site contains approximately 32 cubic yards of mixed chemicals, acid and detergents, plus approximately 8,100 pounds of solids.
15/15 1/ 15.2	These sites comprise an area containing 14 discrete trenches with sodium salt, sodium phosphate, chlorinated lime, acid wastes, and various medical supplies buried in 1968. Sodium salts and lime materials are typically not considered to be hazardous materials; however, the contents are not clearly identified.

TABLE 2-1
Burial Pit Descriptions and History
Rev. 0 Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

IRP Site Number[1]	Site Description and History
16/16 1	These site are disposal areas containing unknown acid materials. Records indicate disposal of just one pallet of an unknown acid. Depending upon the quantity, this acid could adversely affect the local pH and groundwater.
17	This site contains an unknown quantity of herbicides, medical supplies, and cleaning compounds buried in . The depth of the disposal trench is estimated at 8 feet.
Stockpile Area	
-	This site is documented as containing 86,100 pounds of CC-2 (impregnite) buried in a 6- to 8-foot deep, 8-foot wide, and 40-foot long trench in the west-southwest portion of the Stockpile Area.[2]

IRP Installation Restoration Site

[1]According to available information, USATHAMA (1982) Installation Assessment Site 31 is located in the southwest portion of Dunn Field and measures approximately 285-ft by 72-ft This site was reportedly used for burning/disposal of smoke pots, CN (tear gas) grenades and souvenir ordnance, which included a 3 2 mortar round This area was covered by the bauxite storage pile (Site 64) Installation Site 31 was not designated as an IRP site or given a Defense Sites Environmental Restoration Tracking System (DSERTS) site number

[2]According to an April 15, 2003 email from the Defense Logistics Agency - DDC (New Cumberland) to DDC (Memphis) and CEHNC, DSERTS Site 64 will include the CC-2 Impregnite Burial Site and Installation Assessment Site 31 as a result of the proximity of all three sites and because Site 64 encompasses both of the other two sites

3.0 Activities of the Pre-Design Investigation

The objectives of the investigation are to complete the following steps and collect the resulting information and data:

- Complete an initial land survey of the location of each Priority Level A and B disposal site based upon available maps and previous investigation data. Use the initial land survey as a basis for a geophysical survey and trenching. Complete a second land survey across each disposal sites disturbed during this investigation, if information developed during the investigation indicates that the currently mapped areas are significantly different.
- Conduct a geophysical survey, including electromagnetic (EM), and total field magnetics, and ground-penetrating radar (GPR) (as a refinement tool for identified pits/trenches/anomalies) across the surveyed location of the disposal sites. The data from this survey will be used to estimate location and depths contents of the disposal sites.
- Conduct trenching across the length of each site (depending upon the overall size of each location) to collect soil samples, leachate test samples from residual waste material (where possible), photographs, and visual observations of the material present in each site. Information from this effort will supply chemical and physical characteristics of the waste material, if present, and will allow estimates of the physical condition and quantity of potential hazardous materials.
- Incorporate the findings into a Technical Memorandum (TM) that will be part of the Dunn Field Disposal Sites RD submittal package; the data will be used to optimize cost estimates and design requirements for eventual remedial actions at each site.

3.1 Assumptions and Limitations of the Investigation

The following assumptions and limitations apply to the procedures proposed during the field effort:

- The identified locations of all Priority Level A and B sites listed on Table 1-1 will be initially surveyed in the field, based upon available maps and other geographical information from the Memphis Depot information repository. Available maps are typically either not available electronically or do not have a geographical coordinate basis Since there is no definitive location data, there is opportunity for the survey team to place the location of a disposal site askew of the original area.
- Geophysical surveys will be based upon the general surveyed location of each disposal site. The data will be used to define the approximate metallic content within each disposal site, disturbed (backfill) versus non-disturbed (native) soil, and the approximate depth of each pit. It should be noted that the data cannot be used to define the potential hazardous characteristics of the material contained within a location.

- The total depth of each disposal site is assumed to be ten (10) feet from ground surface unless geophysical data collected indicates a greater depth may be possible.
- Since there are many unknowns associated with each disposal site, intrusive activities will be conducted in Health and Safety Level B until the bottom of each trench is reached or until field monitoring indicates that no hazardous atmospheres are present at each location. Restricted zones will be established and maintained at each disposal site until work is completed at each location.
- All material removed during trenching and sampling will be returned to the trench and the ground cover made to resemble pre-existing conditions. Exceptions to this include all material removed from disposal sites less than 10 feet wide and 10 feet long, which may be stored within onsite rolloff boxes and/or overpack containers and characterized for disposal purposes. Also, for these locations, samples will be collected from the floor and each wall of each pit to define contaminant levels and potential need for additional excavation.
- All trenches will be excavated across the length of a disposal site in 6-inch lifts. For those locations with a square configuration, trenching will cross the site according to easiest access. The number of trenches across a site will depend upon the size of the surveyed area.
- Any material found within a trench, which is revealed to be an intact container, even if leaking, will not be removed from a disposal site that is greater than 10 feet wide and 10 feet long. If the container is found anywhere above the bottom of an excavation, efforts will be made to complete a trench by excavating over the location of the container. If multiple containers are found within a trench, effort will be made to determine the depth of the mass of containers from ground surface through excavation over and/or the mass; however, the containers will not be removed via the trenching process.
- Based on the information provided in Attachment 2, certain portions of Dunn Field, especially the area referred to as the Disposal Area and the southwestern corner of the Stockpile Area, may be regarded as a low potential OE site. Since submittal of Attachment 2, CEHNC has developed a risk analysis of encountering OE and CWM at Dunn Field. The risk analysis has shown that there is low potential of encountering OE and CWM at Dunn Field. This action has led to development of a Statement of Clearance and Determination of Applicability. The Statement of Clearance is presented as Attachment 5.

4.0 Investigation Design and Procedures

This section describes the activities and procedures required to complete the disposal sites investigation. References to other appropriate documents or attachments are made where necessary. Activities described in Section 3.0 will be conducted to complete the investigation and ascertain physical and chemical characteristics of the selected disposal sites. These activities include initial and post-investigation land surveying of each site to define the location, geophysical surveying of the sites to define type of material within and aerial extent of the former disposal pits, and completion of exploratory trenching and sampling. Health and safety activities are a critical element of this investigation and important aspects of the plan for this project are described in Section 4.3.

4.1 Land Surveying

Available maps and other important information describing the location of the Priority Level A and B disposal sites will be provided to a professional land surveyor registered in the State of Tennessee so that the surveyor can translate this information and stake the locations on Dunn Field based on the known northing and easting coordinates. Figure 4-1 provides a base map for each disposal site as well as northing and easting coordinates of the corners of each site. For those sites that do not have corners, at least four points are provided. The coordinates should be used by the surveyor to initially locate each site in the field. Since some of the locations are approximate on available maps, discussions between the surveyor and personnel knowledgeable of Dunn Field history will be required to best locate target areas. Field oversight of the surveyor may also be required to provide for additional control over the locating of the disposal sites. The surveyor will be required to physically place stakes or flags into the ground at the corners or perimeter area of each site. The stakes or flags will be high enough so that they may be seen by persons mowing the grass at Dunn Field.

The final product from the surveyor will include an electronic copy of the list of the relevant data points on a northing and easting basis as well as a map on a 1:50 scale.

4.2 Geophysical Surveying

EM 31 and total field magnetics will be used to survey the area within the boundaries of each disposal site as established by the land survey. Specifically, the magnetic and electromagnetic equipment used during the survey will include a Scintrex SM-4 Smart Mag cesium vapor magnetometer, and a Scintrex Envi Mag proton precession magnetometer. A GPR survey will also be used across the edges of disposal sites where not defined by the prior geophysical surveys. A Geonics EM-31 terrian conductivity meter will be used to conduct these surveys.

The geophysical survey grid lines will be established along either of the longest axes of each disposal site, and on either of the outside perimeters of each disposal site. Additional lines will be set 10 feet past the approximate edge of each disposal site so that if the survey is not

completely on top of the disposal site, there will be coverage over each site. Once the initial line is laid out, each line afterwards along the longest axis will be set at 5-foot centers across the site. The persons conducting the geophysical survey will also have to establish their own control stations along the survey grid lines.

Along each survey line, EM readings will be collected and evaluated to best assess excavation parameters. Evaluation of the EM survey and results of the total field magnetics of each site will be downloaded and plotted as part of the data evaluation process while in the field to ensure that control is maintained on a real-time basis. If the assumed pit boundary is reached and anomalies are still present, the survey will continue to verify the location of all anomalies.

GPR equipment will be used as a "polishing" step to refine the magnetic data and to aid in distinguishing the edges of the disposal sites and to distinguish backfill versus non-native soils. The GPR unit will be placed in continuous operation mode and pulled along the length of each grid line. The data collected will be downloaded and plotted as part of the data evaluation process while in the field to ensure that control is maintained on a real-time basis. If the assumed pit boundary is reached and anomalies are still present, the survey will continue to verify the location of all anomalies.

Previous geophysical surveys conducted on Dunn Field will be used as a basis for the site-specific surveys. The previous surveys will be used as a comparison tool to define if results of the surveys are similar and, if different, the reasons behind the differences. Reports documenting previous surveys include:

- Simms, J.E., March 1994. *Electromagnetic and Magnetic Surveys at Dunn Field, Defense Depot Memphis, Tennessee.* Technical Report GL-94-8, USACE-Waterways Experiment Station, 60p.
- OHM Remediation Services Corp., January 1998. *Technical Memorandum: Results of the Geophysical Investigation, Dunn Field, Defense Depot, Memphis, Tennessee.*
- OHM Remediation Services Corp., February 1998. *Technical Memorandum: Results of the Expanded Geophysical Investigation, Dunn Field, Defense Depot, Memphis, Tennessee.*
- Parsons Engineering-Science, Inc., June 1999. *Final Engineering Evaluation/Cost Analysis for the Removal of Chemical Warfare Materiel, Former Defense Distribution Center – Memphis, Tennessee.* Prepared for UASCE-Huntsville.

4.3 Health and Safety Procedures

The Site-Specific Health and Safety Plan (SSHASP) will be revised, as necessary, to include a description of the tasks included in the disposal site sampling effort and the restrictions and hazards associated with working in Level B equipment. The SSHASP should also refer to information presented in this plan as further guidance for the activities to be completed during the Pre-Design investigation. The establishment of work zones should be completed prior to any intrusive activities. Activities will be conducted in accordance with 29 CFR 1910 and Engineering Manual 385-1-1, UASCE Safety and Health Requirements Manual as well as EP 75-1-2.

4.3.1 Ambient Air Monitoring during Site Operations

All operations at the site should include air monitoring that includes instrumentation capable of detecting explosive vapors (i.e., combustible gas indicators), oxygen content, dust levels, and organic vapors. Determining the hazards associated with each site that could effect all site personnel is the primary goal of establishing the monitoring. The table below should be used as a guide to establish the site- specific monitoring and response protocol.

TABLE 4-1
Onsite Hazard Responses Using Monitoring Instruments

Hazard Type	Instrumentation	Response
Atmosphere in any location capable of containing or generating a combustible concentration of gases.	Combustible gas meter (Combustible Gas Indicator [CGI])	Response of the meter in excess of 25% of the lower explosive limit (LEL) initiates immediate evacuation of the site.
Atmosphere is deficient in oxygen or location is capable of containing or generating an oxygen deficiency either by depleting or displacement.	Oxygen or O_2 meter Can be combined with above as CGI/02 meter.	Any reading less than 19 5% oxygen will result in use of self-contained breathing apparatus (SCBA) or project specific Level B activities
Respiratory effect is dangerous or harmful to personnel; irritation to mucus membranes or other portions of the body.	Monitoring is necessary with both a photoionization detector (PID) and a flame ionization detector (FID). Other organic vapors detectors may also be appropriate	Response above 1 ppm will require use of Level B protection to be maintained Response levels above 10 ppm will cause reassessment of site protection protocol.
Escape of acid vapors from excavated trenches due to exposure. Respiratory effect is dangerous or harmful to personnel, irritation to mucus membranes or other portions of the body.	Draeger tubes to define type of contaminant. Tubes include: O-Toludine, methyl bromide, trichloroacetic acid, hydrogen chloride, and chloroform	Response of tube indicates release Follow up with additional measurements to ensure that area is clear before downgrading to different safety level. Complete documentation of measurements.
Dust levels above normal vision levels or perceived hazard from dust emitted by excavation activities.	Monitor on site activities with proper equipment (i e., Mini-Ram).	If activities result in excess dust generation, reduce levels using suppression methods or reassess excavation approach.
Visual observation of ordnance and explosives (OE)	Visually monitor on site intrusive activities.	If OE is observed on site or in pits, remove individuals from area and await instructions from USACE representatives

Monitoring equipment will be selected for reliability and ruggedness as all monitoring equipment will be set within or around the excavation equipment as well as outside these areas. Final monitoring locations will be determined on site, however, at a minimum, there will be two monitoring instruments of each type used on site in upgradient and downgradient locations. Use of the appropriate monitoring instruments and collecting measurements will be continuous before, during, and immediately after each excavation activity. Measurements will be recorded at frequent intervals within field logbooks,

however, significant changes will be noted and the information shared with the Site Manager immediately.

4.3.2 Onsite Work Zones

To control access of personnel and equipment to possible contaminants, the site will be divided into work zones prior to any intrusive activities. The work zones are as follows:

- **Support Zone (SZ)** - Along with the control or command post, this is the outermost boundary of the site. Contamination of personnel and equipment in this area is unlikely.
- **Contaminant Reduction Zone (CRZ)** - This area serves as a corridor between the exclusion zone and the support zone. All personnel and equipment passing through this corridor from the exclusion zone to the support zone must undergo appropriate decontamination.
- **Exclusion Zone (EZ)** - This is the area where the actual operations (i.e., trenching) are being conducted. Access to this area is limited to personnel and equipment being utilized at that particular time. The risk of contamination in this area is high.

As stated previously, all work within the exclusion zone will be conducted in Level B. The decision to reduce protectiveness levels will only be available after an excavation has reached the bottom of a trench and appropriate monitoring instruments have indicated that there has been no exceedance of response levels. The level to downgrade to will determined by the Site Manager and the Health and Safety Officer.

4.3.3 Personnel Decontamination

Onsite activities will require decontamination of personnel exiting the work area, especially in cases where there has been detection of a release of contaminants by the monitoring instruments. Decontamination procedures for Level B activities are defined within Section 4 of the November 2001, US EPA Science and Ecosystem Services Division *Environmental Investigation Standard Operating Procedures and Quality Assurance Manual* (ElSOPQAM). The SSHASP will be revised to include these procedures. Personnel completing the decontamination work will know the proper procedures and the order in which to perform to insure that potential personal injuries do not occur.

4.3.4 Equipment Decontamination

Equipment decontamination procedures will be outlined in the SSHASP. All monitoring instruments and sampling equipment will be decontaminated within the contaminant reduction zone. Larger pieces of equipment which are difficult to move around the site, will need to be decontaminated within the exclusion zone. To accomplish this, a mobile decontamination unit will be setup to follow the excavator as the unit moves from site to site. The tracks or wheels of the excavator will also be decontaminated at each site, as necessary, prior to moving the equipment.

4.4 Trench Excavation

Figure 4-1 provides an estimated location of the disposal sites to be excavated and sampled. This section defines the personnel that will be onsite during these activities and procedures to be used during the trenching.

4.4.1 Onsite Personnel

Excavation will be conducted through the use of a four-wheel drive backhoe or tracked excavator that is equipped with an operator area enclosure in front of the equipment operator. Since the work will be carried out in Level B, the enclosure area of the excavator will either be large enough for the operator to wear an air-supply tank and still be able to manipulate the equipment controls or be equipped with air-cylinder rack or supplied air line.

In addition to the excavation equipment and the operator, there will also be one other person within the exclusion zone acting as a guide for the equipment operator. The guide's purpose includes:

- Acting as central control point for each excavation.
- Controlling the start and stop of the bucket on the excavator equipment. The operator must refer to the guide before, during, and after all excavation activities.
- Stopping each excavation as soon as a closed or sealed container is observed.
- Familiarity with procedures described in the EP75-1-2 in the case that OE is encountered in any disposal sites.
- Controls the sampling at each excavation. The guide is responsible for collecting each sample at the designated locations (refer to Section 5 below).

Radios will be used by all personnel in the EZ for better communication, and for contact between key personnel in support areas. Radios should be equipped with hands free devices to ensure that field personnel can work without hindrance.

Other personnel at the site, but not within the exclusion zone at the time of the trench excavation, will include the Site Manager, Health and Safety Officer, assistant to the guide, and decontamination personnel. Responsibilities for each of the persons will be defined within the task-specific Quality Assurance Project Plan to be submitted. An important responsibility for the Site Manager is that this person will also be familiar with procedures described in the EP75-1-2 in the case that OE is encountered in any of the excavated areas.

4.4.2 Excavation Procedures

The estimated number of trenches to be excavated within each site is shown in Table 4-2. All trenches will be excavated across the length of a disposal site. For those locations with a square configuration, trenching will cross the site according to easiest access and site conditions. The actual number of trenches across a site will depend upon the size of the surveyed area. For Installation Assessment Site 31, only 10 trenches will be completed across the pit. Final locations of each trench will be based upon available historical data and the data from the geophysical survey.

Trenches will be completed to a depth of 10 feet or to the top of native soils, whichever is encountered first. Geophysical or visual data may indicate that a greater trench depth is possible. A trench may continue beyond the ten foot depth if the situation is necessary, however, before proceeding the Contractor must agree with the need to excavate further and notification to the Contracting Officer must be made immediately.

Importantly, all trenching activities will be temporarily halted when encountering closed or sealed containers. If closed or sealed containers are encountered that are found to be OE, please refer to Section 4.6. A digital camera may be used to immediately transmit pictures of the suspect items to interested parties. Several of the sites (e.g. Site 15.2) are near or part of existing monitoring well locations. Excavation will be not be allowed within a 2 foot radius around each well and the well casing, grout column, surface completion, etc., will be supported in situations where the soil slumps away from a well location. Bollards can fall or be taken away and replaced as necessary after backfilling.

Excavation activities will proceed with 6-inch lifts in each trench. As the flat-edge bucket removes soil, the guide will direct the operator to continue or stop, as necessary. Excavation will continue until native soils are reached or till an obstacle is met that cannot be disturbed. Sampling will occur at two foot intervals. Visible observation and direct-reading instruments will be used to indicate no more contamination for native soils. Additional information on the sampling techniques is provided Section 5.

For those sites that are less than 10 feet wide by 10 feet long, materials removed from the trench may be placed into onsite rolloff boxes and/or overpacks for temporary onsite storage. Rolloff boxes may have to be lined if there are many containers in the soil removed from these sites, although intact containers should be segregated as much as possible. The material in each rolloff box will be sampled according to the description presented in Section 5 and will be used as guidance for offsite transport and disposal. For all other sites, materials removed from each excavation will be placed onto one side of the trench on 10-mil plastic sheeting for replacement after reaching the completion depth.

Backfill for all sites, where necessary, will consist of clean fill soil, sand, or gravel, and will be sampled to prove that the material is free of contaminants. After replacement of the trench materials, the excavator bucket will be used to tamp the materials down to existing grade. Gravel will be placed on top of the backfill of each excavated area to control potential erosion and for recognition of the site during the remedial action phase at Dunn Field. Grass seed and straw will be placed on those sites removed during this investigation to return the site to existing conditions.

4.5 Logistics

Equipment, supplies, and personnel required to complete the pre-design data collection at Dunn Field will be mobilized after approval of this plan and the Site Health and Safety Plan (HASP). The Site HASP must be reviewed and approved by USACE - Huntsville.

A site coordination meeting will be held after the final plan has been submitted and before mobilization of the field effort Participation may include personnel from DLA,EPA, TDEC, USACE, CH2M HILL, the USACE-Mobile RAC Contractor, the Depot Redevelopment Corporation, and subcontractor personnel. The meeting will include discussions of Depot

regulations, data quality objectives, field procedures, field schedules, and review of the Site Health and Safety Plan.

4.6 Contingency Plan

This contingency plan has been developed to assist in the event that conventional ordnance or CWM is encountered within any of the disposal sites being investigated during this effort. Project Managers or Regional Health and Safety Officers will be contacted immediately if any suspect material is detected.

4.6.1 Contingency Procedures

4.6.1.1 Initial Response

Evacuation routes will be established by the Site Safety and Health Officer (SSHO). Notification of Evacuation will be intervals of three short blasts on an air horn or vehicle horn, or by direct verbal communication. An air horn will be kept in the Support Zone at all times during site activities. If evacuation is necessary, all personnel are to:

- Decontaminate to the maximum extent practical;
- Evacuate to the pre-determined evacuation point specified by the SSHO.

The SSHO will account for all personnel and notify the Site Project Manager. Procedures have been established in the Site Specific Safety and Health Plan to protect human health and the environment both onsite and offsite in the event of an accident or emergency during site activities.

4.6.1.2 Personnel and Lines of Authority

The SSHO will be responsible for the overall direction and implementation of this Contingency Plan, and for overall coordination of any emergency response actions. Specific responsibilities of the SSHO include, but are not limited to, the following:

- Notifying the local police, fire department, and other offsite emergency units, as required;
- Notifying the Project Manager and providing updates as conditions change;
- Establishing emergency decontamination and providing emergency first aid;
- Site control;
- Preventing further injury and contamination of personnel;
- Directing offsite emergency response personnel to the scene and providing assistance;
- Ensuring that onsite emergency response personnel don the proper PPE, if needed;
- Providing medical background information of the sick/injured and applicable site health and safety information to the offsite emergency medical responders;
- Accounting for all personnel, subcontractors, and visitors;

- Assign individual(s) to accompany sick/injured personnel to hospital;
- Completing any follow-up reports.

In the event that the SSHO is unable to perform any of these duties, the Site Manager will assume the responsibilities

4.6.1.3 Subcontractor and Visitor Responsibilities

All Site personnel, subcontractor personnel, and visitors will be responsible for:

- Reporting any site emergencies to the SSHO;
- Knowing the exit location and evacuation route within the exclusion zone;
- Knowing the pre-planned assembly point and going there in the event of an emergency;
- Decontaminating to the fullest extent possible before leaving any containment area.
- Preventing spread of further contamination by leaving all contaminated PPE and equipment at the work site.
- Assisting emergency response personnel as requested.

4.6.2 Suspect CWM

Explosively configured chemical agent weapons (i.e., CWM) are not expected at this site. If a suspected CWM item is found, all work will cease, the Site Manager will mark the location of the item, withdraw to the CRZ, and notify the City of Memphis Police Department by dialing 911, describe the situation, and request assistance from the Hazardous Materials team. The police will be responsible for notifying the Explosive Ordnance Disposal (EOD) unit with the CEHNC - Mandatory Center of Expertise (MCX). The EOD will notify the Technical Escort Unit (TEU) and secure the area until the TEU's arrival. Onsite control will shift to personnel from EOD upon their arrival, and all other personnel will stand by for direction from the OE MCX Safety Specialist. Incident reports will be coordinated with the Site Manager and OE MCX personnel responding to the site.

4.6.3 Suspect OE Items

Conventional ordnance (i.e., OE) is not expected at this site. In the event the intrusive team encounters suspected OE, the SSHO will stop work, the Site Manager will mark the location of the item, withdraw to the CRZ, and notify the City of Memphis Police Department by dialing 911, describe the situation, and request assistance from the Hazardous Materials team. The police will be responsible for notifying the Explosive Ordnance Disposal (EOD) unit with the CEHNC - Mandatory Center of Expertise (MCX). Onsite control will shift to personnel from EOD upon their arrival, and all other personnel will stand by for direction from the OE MCX Safety Specialist. Incident reports will be coordinated with the Site Manager and OE MCX personnel responding to the site.

Table 4-2
Estimated Number of Trenches for Disposal Site Investigation
Rev. 1 Dunn Field Disposal Sites Pre-design Investigation Data Collection Plan

Installation Restoration Sites Number	DSERTS Site Number	Dimensions*		Estimated Number of Trenches**
		Length (ft.)	Width (ft.)	
3	3	36	10	4
4	4	22	10	2
4.1	90	40	10	4
7	7	13	10	2
8	8	15	10	2
10	10	72	45	7
11	11	7	5	1
12 & 12.1	12	33	10	3
13	13	25	12	3
15	15	6	6	1
15.1	91	6	6	1
15.2***	92***	6	6	14
16	16	8	6	1
16.1	93	8*	6*	1
17	17	14	8	1
(CC-2 Site)	64	40	7	4
(Site 31)[1]	64	285	72	10
			Total:	61

Notes

* Dimensions are estimated and based upon previous mapping efforts, especially *Dunn Field Investigation Site Location Map,* (CH2M HILL, March 1, 1995). Site 16 1 is assumed to be the same size at Site 16

** Number of trenches is based upon alleged length of disposal site If site is less than 10 feet long, then only 1 trench will be excavated. If site is greater than 10 feet long, then 1 trench will be excavated per 10 feet and another trench added for rounding the length to the next highest distance

*** Site 15 2 (Site 92) is allegedly composed of fourteen (14) 6 by 6 foot square pits

[1] Only ten trenches will be excavated across this site and each will be centered approximately 30 feet apart

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FIGURE 4-1
DUNN FIELD
PRE-DESIGN INVESTIGATION
DISPOSAL SITE LOCATION MAP
MEMPHIS DEPOT

CH2MHILL

5.0 Sampling and Analysis

The sampling and analysis procedures presented below outline required activities associated with the Dunn Field Disposal Sites Pre-Design Investigation, in an effort to assess quantities and types of materials located within these sites. The information found in this section outlines locations, frequency, and analyses for soil/debris to be collected from exploratory trenches during the investigation.

5.1 Data Quality Objectives

The data quality objectives (DQOs) detailed in Table 5-1 are established to achieve the objectives outlined in Section 3.

TABLE 5-1
Data Quality Objectives

Objective	Data Quality Level	Qualitative DQO	Quantitative DQO	Method to Obtain DQO
Land surveying of disposal sites	Screening (initial) and Definitive (post investigation)	Conduct initial land survey to locate documented location of each disposal site. Post investigation survey will also be conducted to establish coordinates of identified locations.	Utilize a professional land surveyor to conduct a survey of the disposal sites on Dunn Field and provide specific geographical coordinates in a northing and easting format.	Contract with professional land surveyor registered in the State of Tennessee and provide background information for basis of survey. Field oversight will be provided by the prime contractor.
Geophysical survey of former disposal sites	Screening	Conduct a geophysical survey across each Priority Level disposal site to develop subsurface view of content and depth of each site.	Utilize electromagnetic and GPR survey equipment to develop data on the metallic content within each site, the density of material within each site, and information on the depth of disturbance of each site. This data will assist with establishing the trenching activities approach and plan for potential health and safety measures.	Provide personnel with geophysical instrumentation experience to conduct survey across each site, as described in Field Methodology section below. Ensure that personnel are capable of calibrating and operating equipment according to manufacturers specifications and are also capable of modeling data using appropriate software, as necessary, in the field or after activities are completed Use background information including geophysical data found in the documents outlined in Section 4.2. Provide map with geophysical survey lines and resultant data shown for each disposal site.

TABLE 5-1
Data Quality Objectives

Objective	Data Quality Level	Qualitative DQO	Quantitative DQO	Method to Obtain DQO
				Field oversight will be provided by the prime contractor
Trench excavation and sampling of soil within each disposal site.	Definitive	Conduct trenching within Priority Level disposal sites for soil sample collection and review of material within trenches.	Enable proper trenching equipment to collect soil samples from each trench as well as provide for visual observation and qualitative measurements of material disposed of within each site. Also, trenching equipment should be able to remove material or debris from trench for leachate testing. Trenches should be open long enough for photographs to be collected during excavation Personnel should be certified for health and safety Level B activities.	Equipment for trenching should include an excavator. Personnel operating the equipment are to be certified for Level B activities while conducting trenching operations Trenches will be based on the configuration of each disposal site, as produced by the land surveying and geophysical surveying, but in most cases will cross the site perpendicular to the longest axis of the trench, as described in Field Methodology section below Except for those sites less than 10 feet wide by 10 feet long, all soil and materials excavated from a trench will be returned to the trench and the ground surface graded to pre-existing conditions For all other sites soil will be placed into rolloff boxes for sampling, transport, and disposal Soil and waste samples will be collected from the bucket of the trenching device Soil samples will be analyzed for the Target Analyte List/Target Contaminant List (TAL/TCL) or specific parameters based on the descriptions provided in Table 1-1 and 5-3 Waste samples will be processed for leachate testing via EPA Method 1311.

Information for the land surveyor, at a minimum, should include: (1) the map entitled, *Location of Materials Buried in Dunn Field*, developed by the Office of the Post Engineer, Memphis General Depot, dated 19 January 1956, no. 16-4 D; (2) information from the ASR, *Findings* and *Conclusions and Recommendations* documents; (3) maps within the June 1999 CWM EE/CA (Parsons, 1999); and (4) Figure 4-1, which has the northing and easting of each corner, or other points, listed for each disposal site. Final product received from the surveyor will include a listing of the surveyed corners of each site and a map on a 1:50 scale for both the preliminary and final surveys.

5.2 Sample Collection

Samples will be collected by the guide at each excavation location directly from the bucket of the excavating unit using a stainless steel spoon and bowl, according to procedures described in Section 12.3.2 of the November 2001, US EPA Science and Ecosystem Services Division *Environmental Investigation Standard Operating Procedures and Quality Assurance Manual* (EISOPQAM).

Samples will be collected for composite purposes from each trench, except for discrete samples to be analyzed for volatile organic compound (VOC) content, which will be collected immediately from the center of the excavator bucket. Additional instructions on the collection of VOCs can be found in this section.

The number of samples to be collected prior to compositing the soil will be dependent upon the number of trenches completed per disposal site. Tables 5-2 and 5-3 present the number of trenches to be excavated and the number of composite samples to be collected per disposal site, respectively.

Since Installation Restoration Sites 11, 15, 15.1, 15.2, and 16 are reported to be less than 10 feet wide and 10 feet long and, accordingly, all contents within each site will likely be removed, soil samples will also need to be collected from the walls and floors of each pit prior to backfilling each location. Samples will be collected by the guide at each excavation location directly from the bucket of the excavating unit using a stainless steel spoon and bowl, according to procedures described in Section 12.3.2 of the EISOPQAM. In addition, after the sampling is completed, each pit will be lined with 10 mil thick polyethylene sheeting in such a manner that the plastic extends out of the top of the pit before backfilling is completed.

Once sample material is placed into the stainless steel bowl, the guide will transfer the bowl to the assistant also within the EZ for transfer to personnel outside the EZ for storage prior to receiving additional soil and mixing of the entire lot to form the composite sample. The composite will be placed into the sample jars for transport to the laboratory for analysis. Compositing of samples will be conducted according to procedures described in Section 5.13.8 of the EISOPQAM.

Samples for VOC analysis will be collected directly from the excavator bucket not from composited soil and according to EPA SW846 Method 5035 using a syringe. This method is thoroughly described in Section 12.4 of the EISOPQAM. At the same time, and in approximately the same location as the Method 5035 sample, another sample will be collected in a 16 ounce jar. This jar will be used to scan for VOC levels using a flame-ionization detector (FID) and the resulting value recorded. The jar sample with the highest FID reading for the lot of samples will be compared to corresponding Method 5035 samples. The corresponding Method 5035 sample will be sent to the laboratory for analysis. All duplicate samples or matrix spike/matrix spike duplicates for VOC analysis will be handled in the same manner.

5.3 Analytical Methods

Samples will be analyzed for target compound list/target analyte list (TCL/TAL) parameters, as presented in Tables 5-4 and 5-5. Samples will also be analyzed for leachability according to toxicity characteristic leachate procedures (TCLP) via EPA Method 1311, also presented in Table 5-4 TCL/TAL parameters include VOCs, semivolatile organic compounds (SVOCs), pesticides/herbicides, polychlorinated biphenyls (PCBs), and metals. TCLP analyses will include the toxicity characteristics in accordance with SW 846 and will also include reactivity, corrosivity and ignitability.

According to Table 5-3, the estimated quantity of samples to be collected during this pre-design investigation is 124. This table does not include duplicates or blank samples that will also be analyzed for quality assurance and quality control purposes. The total number of samples will be dependent of what is discovered in the exploratory trenches.

5.4 Investigation-Derived Waste

Representative samples of the investigation-derived waste (IDW) will be collected for chemical characterization needed for off-site disposal. IDW will be removed for offsite disposal within 60 days following completion of the field sampling activities. IDW samples will be analyzed for the list of parameters described within Table 5-5. For other sites, all soil will be returned to each disposal site, as described in Section 4.4.2.

5.4.1 Sediment

Sediment will be removed from the decontamination area and placed in drums. Sediment samples will be collected from the drums and analyzed for the same parameters as soil samples to assess final disposition of IDW materials.

5.4.2 Water

Water derived from decontamination activities, drums will be collected and drummed. Water samples will be collected from the drums and analyzed for VOC content, reactivity, corrosivity, flammability, and explosivity. Results will be used to determine final disposition of the water.

5.4.3 Personnel IDW

IDW from personnel, including Tyvek® or Saranex® coveralls, nitrile gloves, rubber booties, duct tape, spent jars from field screening, etc., will be placed into separate drums for waste collection purposes. Analytical results from the soil samples will help determine whether there is need to sample the IDW, and, if so, what analyses should be performed. Two IDW samples are estimated for this effort.

5.4.4 Rolloff Boxes and Overpacks

At the end of the investigation, soil material derived from the excavation activities will be sampled directly from the rolloff boxes containing the soil prior to transport and disposal away from the site. Soil samples shall be collected using a hand-auger to collect several

samples from each box for compositing purposes. Any containers will have to be overpacked and sampled by the disposal company prior to transport and disposal.

Table 5-2
Estimated Number of Trenches for Disposal Site Investigation
Rev. 1 Dunn Field Disposal Sites Pre-design Investigation Data Collection Plan

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8	8	15	10	2
10	10	72	45	7
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13	13	25	12	3
15	15	6	6	1
15.1	91	6	6	1
15 2***	92***	6	6	14
16	16	8	6	1
16.1	93	8*	6*	1
17	17	14	8	1
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(Site 31)[1]	64	285	72	10
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Notes

* Dimensions are estimated and based upon previous mapping efforts, especially *Dunn Field Investigation Site Location Map,* (CH2M HILL, March 1, 1995) Site 16 1 is assumed to be the same size at Site 16

** Number of trenches is based upon alleged length of disposal site. If site is less than 10 feet long, then only 1 trench will be excavated. If site is greater than 10 feet long, then 1 trench and another trench added for rounding the length to the next highest distance

*** Site 15 2 (Site 92) is allegedly composed of fourteen (14) 6 by 6 foot square pits

[1] Only ten trenches will be excavated across this site and each will be centered approximately 30 feet apart

Table 5-3

Disposal Sites Soil Sampling and Analysis Summary

Memphis Depot Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

Sample Task	Sample Point	Sampling Frequency	Approx Sample No	Sampling Method
Sampling at IR Site No 3	At the center of each of 4 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into two samples for the disposal site	Each of 4 trenches	2 samples	4 sets of grabs into 2 composite samples (VOCs will single point grab)
Sampling at IR Site No 4	At the center of each of 2 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into one sample for the disposal site	Each of 2 trenches	1 sample	2 sets of grabs into 1 composite (VOCs will single point grab)
Sampling at IR Site No 4 1	At the center of each of 4 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into two samples for the disposal site	Each of 4 trenches	2 samples	2 sets of grabs into 1 composite (VOCs will single point grab)
Sampling at IR Site No 7	At the center of each of 2 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into one sample for the disposal site	Each of 2 trenches	1 sample	2 sets of grabs into 1 composite (VOCs will single point grab)
Sampling at IR Site No 8	At the center of each of 2 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into one sample for the disposal site	Each of 2 trenches	1 sample	2 sets of grabs into 1 composite (VOCs will single point grab)
Sampling at IR Site No 10	At the center of each of 7 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into 3 samples for the disposal site	Each of 7 trenches	3 samples	7 sets of grabs into 3 composite (VOCs will single point grab)
Sampling at IR Site No 11	At the center of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for the trench and disposal site Also, after removal of pit contents, sample floor and each wall of pit	1 sample from pit floor; 1 sample from each pit wall	5 samples	5 sets of grabs into 5 composites (VOCs will single point grab)

Table 5-3

Disposal Sites Soil Sampling and Analysis Summary

Memphis Depot Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

Sample Task	Sample Point	Sampling Frequency	Approx Sample No	Sampling Method
Sampling at IR Site No 12 & 12 1	At the center of each of 3 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into 2 samples for the disposal site	Each of 3 trenches	2 samples	3 sets of grabs into 2 composites (VOCs will single point grab)
Sampling at IR Site No 13	At the center of each of 3 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into 2 samples for the disposal site	Each of 3 trenches	2 samples	3 sets of grabs into 2 composites (VOCs will single point grab)
Sampling at IR Site No 15	At the center of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for the trench and disposal site Also, after removal of pit contents, sample floor and each wall of pit	1 sample from pit floor, 1 sample from each pit wall	5 samples	5 sets of grabs into 5 composites (VOCs will single point grab)
Sampling at IR Site No 15 1	At the center of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for the trench and disposal site Also, after removal of pit contents, sample floor and each wall of pit	1 sample from pit floor; 1 sample from each pit wall	5 samples	5 sets of grabs into 5 composites (VOCs will single point grab)
Sampling at IR Site No 15 2	At the center of each of 14 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench Also, after removal of pit contents, sample floor and each wall of pit, however, will only sample one wall where next pit wall is adjacent	1 sample from pit floor; 1 sample from each pit wall, however, will only sample one wall where next pit wall is adjacent	54 samples	14 sets of grab into 14 composite samples (VOCs will single point grab)
Sampling at IR Site No 16	At the center of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for the trench and disposal site Also, after removal of pit contents, sample floor and each wall of pit	1 sample from pit floor; 1 sample from each pit wall	5 samples	5 sets of grabs into 5 composites (VOCs will single point grab)

Table 5-3

Disposal Sites Soil Sampling and Analysis Summary

Memphis Depot Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

Sample Task	Sample Point	Sampling Frequency	Approx Sample No	Sampling Method
Sampling at IR Site No 16 1	At the center of one trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample Depending upon number of trenches, composite samples will be placed into X number of samples for the disposal site Also, after removal of pit contents, sample floor and each wall of pit	1 sample from trench or 1 sample from pit floor and 1 sample from each pit wall	1 per trench (est 5 samples total)	Est 10 sets of grabs into 8 composites (VOCs will single point grab)
Sampling at IR Site No 17	At the center of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for the trench and disposal site	1 sample from 1 trench	1 sample	1 set of grabs into 1 composite (VOCs will single point grab)
Sampling at IR Site No CC-2 (DSERTS Site 64)	At the center of each of 4 trenches, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench and then into two samples for the disposal site	Each of 4 trenches	2 samples	4 sets of grabs into 2 composites (VOCs will single point grab)
Sampling at IR Site No 31 (DSERTS Site 64)	At the center of each of 1 trench, Single grab will be collected from every 2 feet from the surface to 10 feet bls and composited into one sample for each trench	Each of 10 trenches	10 samples	10 sets of grabs into 10 composites (VOCs will single point grab)
Samples around corroded or collapsed drums or containers or generally where staining is evident	Collect sample of soil and container/drum contents where drum corroded or collapsed or where staining is generally evident	As needed	As needed (Est to be a total of 17 samples)	Grab (Total estimated to be 17 samples)

Note

*Each grab sample from the trench will be screened using an OVA/FID The VOC sample will be collected at the point where the highest reading is recorded

**Middle of the trench is considered the default sample point If along the trench, staining, etc , is evident, the sample point may be relocated per the judgement of the site samplers

Table 5-4

Sample Analytical Methods

Memphis Depot Dunn Field Disposal Sites Pre-Design Investigation Data Collection Plan

Prelim TAT/ Final TAT	Data Package Reqmnt	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
7 days/14 days	CLP-type full package	TCL VOCs	5035	14 days	Sodium Bisulfite or Methanol, Cool to 4°C	(3) 40 mL vials, one with methanol, 2 with sodium bisulfate (pH of sample should be 2 or lower)
		TCL SVOCs	8270C	14 day extr, 40 day analysis	Cool to 4°C	(4) 8oz WM glass
		TCL Pesticides	8081A	14 day extr, 40 day analysis	Cool to 4°C	
		TCL PCBs	8082	14 day extr, 40 day analysis	Cool to 4°C	
		Herbicides	8151A	14 day extr; 40 day analysis	Cool to 4°C	
		TAL Metals	6010B/7471A	6 months, Hg = 28 days	Cool to 4°C	
		Trichloroacetic Acid	SW8151A	14 day extr, 40 day analysis	Cool to 4°C	
		TCLP VOCs	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(4) 8oz WM glass
		TCLP SVOCs	1311/8270C	14 day TCLP extr, 7 day extr; 40 day analysis	Cool to 4°C	
		TCLP Pesticides	1311/8081A	14 day TCLP extr, 7 day extr, 40 day analysis	Cool to 4°C	
		TCLP Herbicides	1311/8151A	14 day TCLP extr, 7 day extr, 40 day analysis	Cool to 4°C	
		TCLP Metals	1311/6010B74 70A	6 month TCLP extr, 6 month analysis Hg 28 day TCLP extr, 28 day analysis	Cool to 4°C	
		Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7 3 3 2 & SW7 3 4 2	ASAP	Cool to 4°C	
		Corrosivity	9045C	ASAP	Cool to 4°C	
		Ignitability	1010/1030	ASAP	Cool to 4°C	

Notes

TAT = turnaround time

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

CLP = EPA Contract Laboratory Program quality assurance control procedures

TCLP = Toxicity Characteristic Leachate Procedure, analysis method

C = Celcius

Table 5-5

Transport and Disposal and Quality Assurance/Quality Control Samples

Memphis Depot Dunn Field Pre-Design Investigation Data Collection Plan

Sample Point	Matrix	Sampling Frequency	Approx. Sample No	Sampling Method	Sampling Equipment	Prelim TAT/ Final TAT	Data Package Reqmnt	Required Analysis	Analytical Methods	Holding Time	Sample Preservation	Containers
Rolloff Boxes	Soil	Once per unit	10	Prepared in Field	Hand-auger device prior to compositing (except for VOCs)	7 days/14 days	CLP-like full package	TCLP VOCs	1311/8260B	14 day TCLP extr, 14 day analysis	Cool to 4°C	(4) 8oz WM glass
								TCLP SVOCs	1311/8270C	14 day TCLP extr, 7 day extr, 40 day analysis	Cool to 4°C	
								TCLP Pesticides	1311/8081A	14 day TCLP extr, 7 day extr, 40 day analysis	Cool to 4°C	
								TCLP Herbicides	1311/8151A	14 day TCLP extr 7 day extr, 40 day analysis	Cool to 4°C	
								TCLP Metals	1311/6010B7 470A	6 month TCLP extr 6 month analysis Hg 28 day TCLP extr; 28 day analysis	Cool to 4°C	
								Reactivity (Reactive Cyanide & Reactive Sulfide)	SW7 3 3 2 & SW7 3 4.2	ASAP	Cool to 4°C	
								Corrosivity	9045C	ASAP	Cool to 4°C	
								Ignitability	1010/1030	ASAP	Cool to 4°C	
Equipment Rinsate Blank	Water	1 per set of field-cleaned equipment (10%)	10% or at least one per day of sampling	Prepared in Field	Analyte-free water, SS funnel	7 days/14 days	CLP-like full package	TCL VOCs	5035	14 days	HCl pH< 2 Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr; 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months, Hg = 28 days	HNO_3 pH< 2 Cool to 4°C	(1) 500 mL HDPE
Trip Blank	Water	Once	8	Prepared by Lab	N/A	7 days/14 days	CLP-like full package	TCL VOCs	8260B	14 days	HCl pH< 2, Cool to 4°C	(2) 40 mL vials
*MSDS***	Soil	1 per 20 samples	4	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	Selected by Personnel in Field	Appropriate Method	Corresponds to Method	Appropriate Measures	Appropriate Containers
Duplicates	Soil	1 per 10 samples	12	Prepared in Field	Same Equipment for Soil Samples	7 days/14 days	CLP-like full package	TCL VOCs	5035	14 days	HCl pH< 2, Cool to 4°C	(2) 40 mL vials
								TCL SVOCs	8270C	14 day extr 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL Pesticides	8081A	14 day extr 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TCL PCBs	8082	14 day extr, 40 day analysis	Cool to 4°C	(1) Liter amber glass
								Herbicides	8151A	14 day extr, 40 day analysis	Cool to 4°C	(1) Liter amber glass
								TAL Metals	6010B/7471A	6 months, Hg = 28 days	HNO_3 pH< 2 Cool to 4°C	(1) 500 mL HDPE

Notes.

**Matrix Spike(MS)/MS Duplicate Samples (MSDS) samples will be supplied to the laboratory as an extra bottle containing the sample and the analysis will be the responsibility of the laboratory

TAT = Turnaround time

CLP = EPA Contract Laboratory Program quality assurance control procedures

SS= Stainless steel

TCL/TAL = Target Compound List/Target Analyte List

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

C = degrees celcius

ml = milliliter

6.0 Data Management, Analysis, and Interpretation

6.1 Data Description

Information generated from this investigation will include land survey, geophysical survey results, and geochemical data. Land survey data will be derived from the locating of the estimated corners (as available) or area of each disposal site. Geophysical data will derive from completion of the EM and GPR surveys. The data will help refine depth and perimeter estimates for each disposal site. Geochemical information from this study will derive from analysis of all soil samples collected from the trenching. These data are critical for planning of the final disposition of the soil in the disposal sites.

6.2 Data Management

Data management for the Pre-Design investigation will match the requirements of the DQOs presented in Section 5. Much of the field data will be obtained through the efforts of field screening, which includes use of direct-reading instruments, and laboratory analysis of samples. The information presented in this section is considered supplemental to the site-specific Quality Assurance Project Plan (QAPP) for these activities. The QAPP will be amended by the contractor conducting this investigation and will be submitted to the BCT for review prior to the commencement of field activities.

6.2.1 Sample Numbering System

During sampling events conducted for the Pre-Design investigation, nomenclature for the soil samples will be used to distinguish between disposal sites, sample locations, and, where appropriate, depth of sample collection. Sample numbering protocol will be as shown in Table 6-1.

TABLE 6-1
Sample Numbering Protocol

Sample Event	Type of Sample(s) and Location	Sample Number Description	Example Sample Number
Geophysical Survey	Geophysical Line	Data collected along survey lines Number reflects disposal site, line, and value	DS31_L1_?
Soil Sample Collection from Disposal Sites	Soil, Disposal Sites, Trench Number	For VOC samples, sample numbers will reflect depth of sample collection and trench number. Samples for other chemical analysis will reflect sample location and composited trenches	For VOCs DS31_2-4_T3 For others DS31_T1-T3

TABLE 6-1 (Cont.)
Sample Numbering Protocol

Transport and Disposal of IDW	Soil, Rolloff Boxes	For VOC samples, sample numbers will reflect soil collected from each bin for this purpose. Samples for other chemical analyses will reflect bin number	For VOCs RO1_S1 For others RO1

For Duplicate soil samples, a double blind sample number will be used for the duplicate sample Matrix spike/matrix spike duplicates will be denoted with an "MS/MSD" at the end of the sample number. Equipment, field, and trip blanks will be designated with "EB", "FB", and "TB", respectively

6.2.2 Field Screening Data Management

Field screening efforts will include ambient air screening around each disposal site with an PID, OVA-FID, CGI/O2 meter, and dust monitor(s). The data collected from these instruments will require the full attention of the operator to ensure that reported values are not misinterpreted or misunderstood. Data recorded with each measurement will include the following:

- Date and time;
- Elapsed time since excavation began, as necessary;
- Location of measurement/location where the sample was collected, as necessary; and
- Instrument measurement.

Each measurement will be handwritten into a bound field notebook and, after each excavation has been completed, the data will be transferred into an electronic file for use within the investigation technical memorandum. Field notebooks should also contain instrument calibration completion records and background monitoring information.

Other field notes to be collected during performance of the investigation and written in the field notebook(s) include: weather information; personnel present during onsite activities; subcontractor names and activities; sketches of the disposal sites during excavation; and other pertinent information that may effect study results and data evaluation.

6.2.3 Analytical Laboratory Data Management

Multiple samples will be submitted to an analytical laboratory for VOC and geochemical analysis and reporting. During collection of soil samples, the date, time, location of sample collection, and sample number will be recorded in the field notebook. This information will be transferred, as required, to the Chain-of-Custody (COC) documents. Copies of the COC will be kept at the site until the study is over and will be transferred to the site files for record keeping.

After the analytical data have been received from the laboratory, the data will be stored electronically, summarized, and reproduced for the technical memorandum and the RD. Prior to this, however, the data will be reviewed by a project chemist for quality assurance (QA) and a validation report will be submitted. If there are any differences between the project chemist's and the laboratory's review of the data, the validation report will include a description of the differences and any potential results from the study. Electronic Deliverable Data will be delivered according to EDMS version 4.11 or higher. Information

on EDMS can be found here:
http://www.aee.faa.gov/emissions/edms/edms_Updates/Updates.htm

7.0 Residuals Management

Waste handling will be part of this investigation and may be classified as noninvestigative waste or investigative/field-generated waste.

Noninvestigative waste, such as litter and household garbage, will be collected on an as-needed basis to maintain the site in a clean and orderly manner. This waste will be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers will be sealed containers or plastic garbage bags.

Investigative/field-generated waste will be properly containerized and temporarily stored at each site, prior to transportation. Materials may include soil collected from disposal sites less than 10 feet wide by 10 feet long and water and sediment derived from decontamination activities. Depending on the constituents of concern, fencing or other special marking may be required. The number of containers for the soil and sediment will be estimated on an as-needed basis. For wastewater, acceptable containers will be sealed, U.S. Department of Transportation-approved steel 55-gallon drums. The containers will be transported in a manner to prevent spillage or particulate loss to the atmosphere.

The investigative/field-generated waste will be segregated at the site according to matrix (solid or liquid) and means of derivation (i.e., decontamination fluids). Each container will be properly labeled with site identification, matrix, constituents of concern, and other pertinent information for handling.

Soil, wastewater and sediment generated from equipment decontamination activities will be stored at the site prior to removal from Dunn Field. Once analytical data have been obtained, all containers will be removed from Dunn Field within 60 days. During past investigation activities at Dunn Field, IDW water was disposed of in the City of Memphis sewer system after a temporary permit had been obtained from the City of Memphis Public Works Department. The permit provided an explanation that the water contained concentrations of contaminants similar to the effluent from the operating Dunn Field groundwater extraction system, which discharges into the City's sewer system.

8.0 Community Relations

The Memphis Depot has an active community involvement that monitors the events that occur at the Memphis Depot site, especially for Dunn Field. This investigation will occur with the knowledge of members of the community, many of which live just beyond the perimeter of Dunn Field. It is imperative that this investigation be conducted according to the specifications presented herein and that if any changes are necessary proper notification is followed along with discussions with all stakeholders.

It is anticipated that the plans for the investigation will be presented to the Memphis Depot Restoration Advisory Board (RAB) prior to field activities. In addition, prior to initiation of field activities, fact sheets describing the investigation and duration of the fieldwork will be distributed to the local community members that live in the area surrounding the Memphis Depot. The findings from the study will also be presented to the RAB members once they are finalized.

9.0 Reports

A Disposal Sites Pre-Design Investigation Technical Memorandum (TM) will provide the necessary documentation of the completed investigation process. CH2M HILL will complete the technical memorandum according to the schedule presented in Section 10.0. The technical memorandum will include, but not be limited to the following:

- A description of the investigation procedures;
- Field measurement methods and data collected;
- Summary of field and laboratory analytical data as presented in graphs and tables;
- Variances to field procedures performed;
- Maps showing all confirmed pit locations with removed pits noted as such;
- Refined cost estimates for the disposal pits RA;
- Recommended parameters for the RD.

The technical memorandum will also contain a separate section that covers the data quality and validation. At a minimum, the following information will be included in this section:

- Assessment of measurement data precision, accuracy, and completeness;
- System and performance audit results,
- Potential QA problems and corrective actions implemented; and
- Copies of documentation, such as memos and reports

10.0 Schedule

The following preliminary schedule is presented for the proposed fieldwork and preparation of the final TM.

Table 10-1
Schedule of Activities

Task	Date Completed
Submit Draft (Rev. 0) Disposal Sites Pre-Design Investigation Data Collection Plan	March 24, 2003
Present the Draft Data Collection Plan to the BCT	March 25, 2003
Receive Comments on Draft Data Collection Plan from Agencies	May 12, 2003
Submit Rev. 1 Data Collection Plan	June 16, 2003
Submit Final Data Collection Plan	August 28, 2003
Prepare and Submit Rev. 0 Implementation Plan to the BCT	August 25, 2003
Prepare and Submit Rev. 1 Implementation Plan to the BCT	October 9, 2003
Mobilize for Investigation Effort	October 15, 2003
Onsite Investigation Activities & Laboratory Analyses	November 5, 2003
Demobilization	November 6, 2003
Prepare Rev 0 Pre-Design Investigation Technical Memorandum for the Disposal Sites Remedial Design	January 5, 2004

11.0 References

CH2M HILL, March 1995. *Dunn Field Investigation Site Location Map.*

CH2M HILL, July 2002. *Dunn Field Remedial Investigation Report.* Defense Distribution Depot Memphis, Tennessee. Prepared for the U.S. Army Engineering Support Center, Huntsville, Alabama.

CH2M HILL, July 2002. *Dunn Field Engineering Evaluation/Cost Analysis, Former Pistol Range, Site 60.* Defense Distribution Center (Memphis). Prepared for the U.S. Army Engineering Support Center, Huntsville, Alabama.

CH2M HILL, October 2002. *Dunn Field Action Memorandum Former Pistol Range, Site 60.* Defense Distribution Center (Memphis). Prepared for the U.S. Army Engineering Support Center, Huntsville, Alabama.

CH2M HILL, January 2003. *Final Dunn Field Five-Year Review.* Defense Distribution Center (Memphis). Prepared for the U.S. Army Engineering Support Center, Huntsville, Alabama.

CH2M HILL, May 2003. *Dunn Field Feasibility Study.* Defense Distribution Center (Memphis). Prepared for the U.S. Army Engineering Support Center, Huntsville, Alabama.

Chemical Systems Laboratory, Environmental Technology Division, Installation Restoration Branch for the Assessment Division of the US Army Toxic and Hazardous Materials Agency (USATHAMA), 1982. *Installation Assessment of Defense Depot Memphis, Memphis, Tenn., Report No. 191.* Aberdeen Proving Ground, Aberdeen, Maryland

Law Environmental, Inc., August 1990. *Final Remedial Investigation for the Defense Distribution Depot Memphis, Tennessee.*

OHM Remediation Services Corp., January 1998. *Technical Memorandum: Results of the Geophysical Investigation, Dunn Field, Defense Depot, Memphis, Tennessee.* Prepared for UASCE-Huntsville.

OHM Remediation Services Corp., February 1998. *Technical Memorandum: Results of the Expanded Geophysical Investigation, Dunn Field, Defense Depot, Memphis, Tennessee.* Prepared for UASCE-Huntsville.

Parsons Engineering-Science, Inc., June 1999 *Final Engineering Evaluation/Cost Analysis for the Removal of Chemical Warfare Materiel, Former Defense Distribution Center - Memphis, Tennessee.* Prepared for UASCE-Huntsville.

Simms, J.E., March 1994. *Electromagnetic and Magnetic Surveys at Dunn Field, Defense Depot Memphis, Tennessee.* Technical Report GL-94-8, USACE-Waterways Experiment Station, 60p.

US Army Corps of Engineers Mandatory Center of Expertise and Design Center for Ordnance and Explosive Waste, United States Army Corps of Engineers - Huntsville Center, January, 1995. *Archives Search Report-Findings.*

US Army Corps of Engineers Mandatory Center of Expertise and Design Center for Ordnance and Explosive Waste, United States Army Corps of Engineers – Huntsville Center, January, 1995. *Archives Search Report-Conclusions and Recommendations.*

US Environmental Protection Agency, Science and Ecosystem Services Division, November 2001. *Environmental Investigation Standard Operating Procedures and Quality Assurance Manual* (EISOPQAM). Athens, Georgia.

UXB International, Inc., December 2001. *Final Chemical Warfare Materiel Investigation/Removal Action Report.*

Attachment 1

Visual Evidence Survey Across Dunn Field

RECD JAN 10 1997

MEMORANDUM

CH2MHILL

Visual Landfill Site Evidence, Dunn Field, DDMT

TO: Ken Wengler / GNV

COPIES: Mark Corey / MGM

FROM: Edward Underwood/WDC

DATE: January 7, 1997

Mark Corey asked me to send to you this information concerning visual evidence of possible landfill trench locations on Dunn Field. On the basis of the following discussion, I don't know how useful this information might be, but here it is.

As you might have been told, approximate trench locations on Dunn Field were compiled sometime ago using DDMT records. These locations, which were supposedly measured from fences and other known features, are shown on the Dunn Field maps I assume you have and are shown as the screened-back lines on Figures 1, 2, and 3 of the attached memorandum.

There has been some concern as to how accurate the "originally measured" locations actually were and, as a result, attempts have been made to estimate how accurate these locations might be. These attempts have included:

- Geophysical surveys by the government to locate possible landfill trench areas (These are shown on Figure 1)

- Field mapping (using a 100-foot tape and the human eyeball) by CH2M HILL of surface irregularities (depressions, sinkholes, debris, etc.) which might evidence landfill trench areas. (These are shown in Figure 2.)

As can be seen in Figure 1, the government geophysical surveys did not correspond well with the recorded locations of landfill trenches. Surface irregularities in Figure 2 corresponded better with the mapped trench locations, but still show significant differences in many areas. Many of these irregularities when viewed in Figure 3, the composite of information from Figures 1 and 2, even suggest additional disposal areas corresponding with geophysical anomolies in Figure 1.

In summary, there is alot of evidence of disturbance in Dunn Field. Some of this evidence confirms the general location of recorded disposal trench areas from disposal records, much does not. I'm not sure that mapping every anomoly shown on Figure 2 would be that useful since none of the information is exact. I would assume that larger depressions might be picked up anyway, depending upon the contour interval, etc.

I don't know what your scope of work is. However, it would be useful for future analysis and design purposes (various potential options) to have at least the following on the final topographic map, if it can be worked into your approved scope:

- Good topographic mapping of the entire area north of the power lines and west of the railroad tracks, plus a 50-foot minimum width around that area to locate drainage, security, and cap edging requirements should the entire area require capping.

- A contour interval of about 1 foot (no more than 2 feet) to show major anomolies, slopes, etc., on the relatively flat portion of Dunn Field.

- An accurate overlay showing the approximate trench locations based on disposal records , as shown on our current maps and figures.

This mapped information could be used with other information, such as the information provided in Figures 2 and 3 of the attached memorandum, to provide starting points and approximate limits for excavations, capping, and other options we might get involved with in remediating Dunn Field.

Please call me at WDC (703) 471-6405, ext 4427, if you have questions.

Best Available Copy

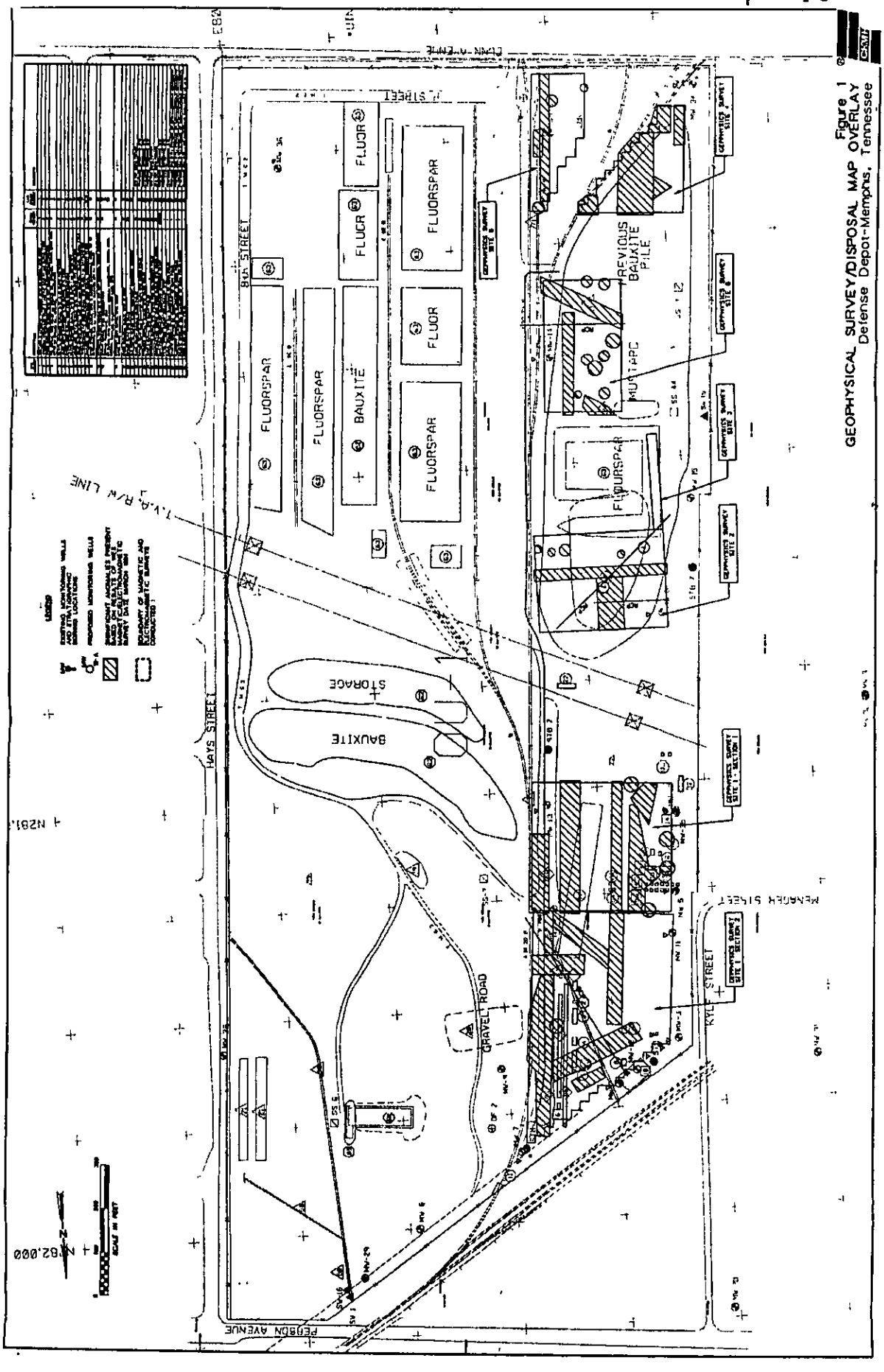


Figure 1
GEOPHYSICAL SURVEY/DISPOSAL MAP OVERLAY
Defense Depot-Memphis, Tennessee

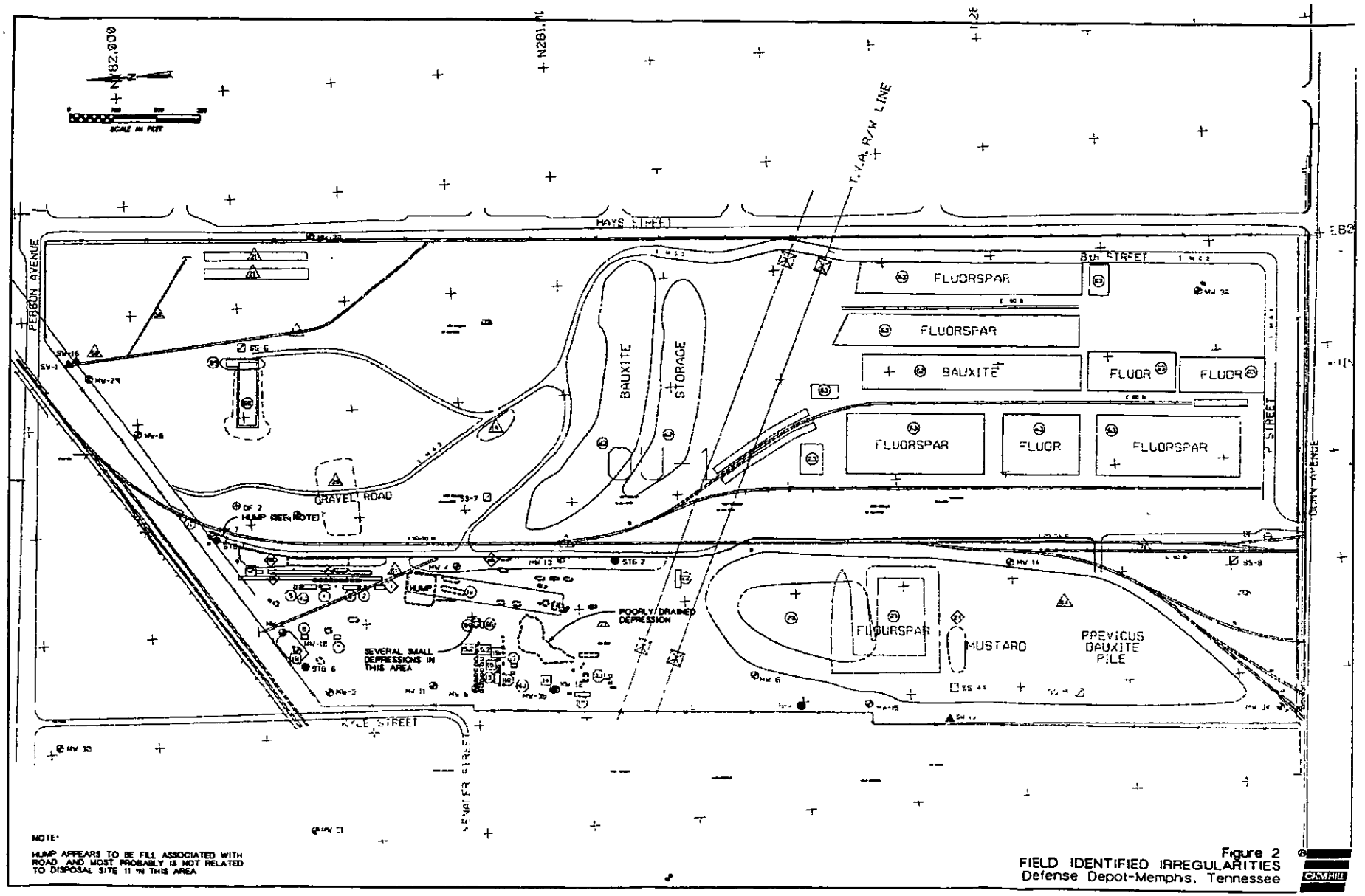


Figure 2
FIELD IDENTIFIED IRREGULARITIES
Defense Depot-Memphis, Tennessee

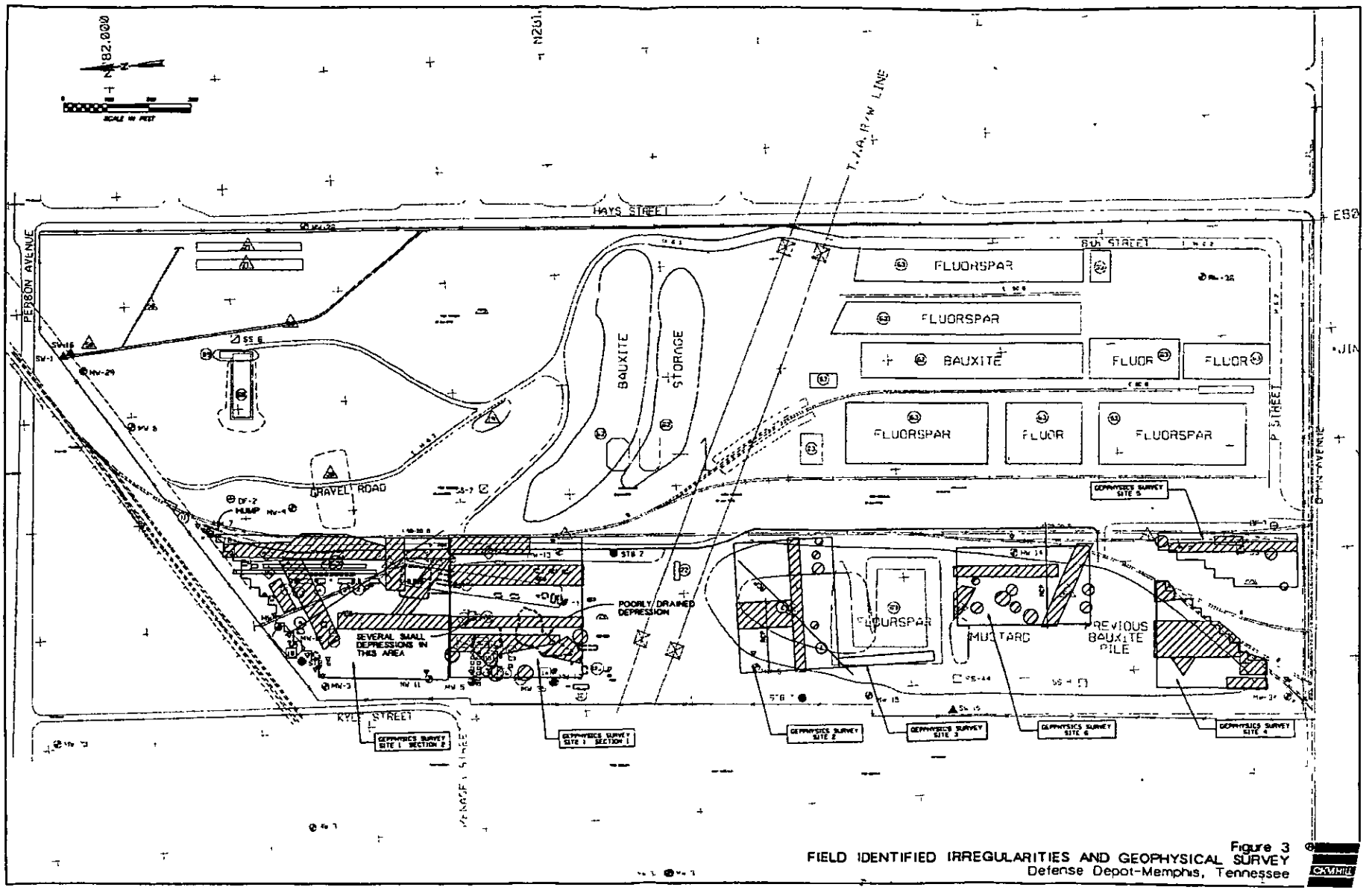


Figure 3
FIELD IDENTIFIED IRREGULARITIES AND GEOPHYSICAL SURVEY
Defense Depot-Memphis, Tennessee

Attachment 2

Technical Memorandum: Review of the Potential Presence of Ordnance and Explosives (OE) as Defined by References for the Dunn Field Area

Review of the Potential Presence of Ordnance and Explosives (OE) as Defined by References for the Dunn Field Area, Defense Distribution Center (Memphis), Memphis, Tennessee

PREPARED FOR: US Army Corps of Engineers, Huntsville Center

Memphis Depot BRAC Cleanup Team (BCT)

PREPARED BY: CH2M HILL

DATE: December 2, 2002

During BCT review of the Rev. 0 *Dunn Field Five-Year Review* document (CH2M HILL, September 2002), comments were received on the second sentence of the fifth paragraph from Section 1.3.1 - Operational History. That paragraph of the document with the sentence highlighted is repeated below:

> *The Chemical Warfare Materiel (CWM) disposal pits were located in the Disposal Area section of Dunn Field and the Stockpile Area portions of Dunn Field (Sites 24-A and 24-B).* ***The remains of destroyed or partially destroyed explosive ordnance (OE) were also buried in pits in the Disposal Area.*** *Reports indicate that a 3.2-inch mortar rounds, smoke pots, hand grenades (smoke), and other unspecified OE were buried in these pits (USATHAMA, 1982 and USACE, 1995b). Section 1.3.4 of the Dunn Field RI presents additional information on the CWM at Dunn Field.*

The comment specifically addresses the origin of the statement regarding OE, and questions if there is any supporting material that states that OE or materials similar in nature, other than that described in Table 1-1 of the *Dunn Field Five-Year Review* document, are present in Dunn Field.

This memorandum seeks to clarify the understanding of the potential presence of OE within the Dunn Field area of the Defense Distribution Center (Memphis) beyond that listed and described in Table 1-1 of the *Dunn Field Five-Year Review* document. The discovery process was completed by reviewing documents that made mention of OE at Dunn Field or presented specific descriptions of disposal of OE at Dunn Field. If the documents included references for the description of OE, an attempt was made to find and review the source of that information.

As noted in the *Dunn Field Five-Year Review* document as well as the *Dunn Field Remedial Investigation* (RI) *Report* (CH2M HILL, July 2002), CWM material (principally remnants of World War II vintage German mustard gas bombs and associated materiel) was removed by UXB International, under contract with the US Army Corps of Engineers - Huntsville Center. The remedial measures were conducted from mid-2000 to March 2001 at Defense

Sites Environmental Tracking System (DSERTS) Sites 1, 24-A, and 24-B, to reduce or eliminate the potential CWM risk posed by these wastes.

1982 Installation Assessment

During the review, the earliest document to note the presence of OE at Dunn Field was the 1982, *Installation Assessment of Defense Depot Memphis, Memphis, Tenn., Report No. 191*. The assessment was conducted by the Chemical Systems Laboratory, Environmental Technology Division, Installation Restoration Branch for the Assessment Division of the US Army Toxic and Hazardous Materials Agency at the Aberdeen Proving Ground, Aberdeen, Maryland.

Section 2.1.4 of the *Installation Assessment* refers to the use and testing of standard flamethrowers, high pressure air compressor flamethrowers, ignition cartridges utilizing No. 2 diesel fuel, standard M2 mechanical smoke generators utilizing SGF1 and 2 fog oil, and smoke pots at the Dunn Field. However, the description of these items does not include the location of the testing and if disposal occurred at Dunn Field. In Appendix D - Interviews of the *Installation Assessment*, an interview with Mr. Paul J. Traut revealed that the flamethrowers were tested against the middle of the northwest side of the curved loading dock on Dunn Field. According to Mr. Traut, diesel fuel was always used in these tests. After the test, the flamethrowers were recharged and placed back into stockage.

Mr. Traut also revealed that after World War II, Military Police personnel would bring ordnance confiscated from returning service members. One confiscated item was a 3.2-inch mortar round. Mr. Traut stated that he would destroy the materials in pits at Dunn Field either by demolition (explosive) or by chemical reaction. The pits were later covered up with bauxite storage. In addition, Mr. Traut discussed the history of approximately 200 bombs that were stored in NC1 Section 1 (most likely a location on the Main Installation portion of the Memphis Depot). After disassembling one of the bombs on Dunn Field, the bomb was found to contain incendiary components. This effort resulted in shipment of the bombs to "another location".

The Contaminated Waste section of Section 2.2.2 - Solid Waste Treatment presents Figures 10 and 11 and Table 7. Figure 11 shows the disposal and storage sites used at Dunn Field from the date of the assessment. Table 7 presents a description of materials at various burial, burn, storage, and other sites. Site 21 is described as a burn site for sanitary waste, smoke pots, and CN (acronym for chloroacetophenone) canisters. See attached Table 7 and Figure 11 from the *Installation Assessment* report.

On page 2-22 of the *Installation Assessment*, Section 2.2.3 - Demolition and Burning Ground Areas, states that a trash-burning operation area was located just north of the Tennessee Valley Authority (TVA) line in Dunn Field. The assessment further stated that "burning in this area dates back to the 1940s and included CN canisters, fuses, and smokes, in addition to sanitary wastes Operations were conducted in pits and incorporated the weekly cleanup of residue and garbage in addition to material. The ash was then buried in the north end of Dunn Field." Review of Table 7 indicates that this trash-burning area is most likely Site 21. *Installation Assessment* Site 21 correlates to the DSERTS Site 19 (Former Tear Gas Canister Burn Site), as presented in Table 1-1 of the Dunn Field RI report.

Also on page 2-22 of the *Installation Assessment*, Section 2.2.3, the document states: "Another area in the southwest end of Dunn Field was used for burning smoke-pots, CN grenades, and souvenir ordnances. The areas was covered by the bauxite storage pile in early 1949." Review of Table 7 indicates that this burn area is most likely Site 31, which, according to the map presented as Figure 11 in the *Installation Assessment*, is located approximately 150 feet east to southeast of DSERTS Site 24-B. This is most likely the area referenced by Mr. Traut as the location used to destroy confiscated ordnance.

Page 2-23 of the *Installation Assessment*, Section 2.2.4 – Demilitarization, states: "Limited quantities of souvenir ordnances were turned into DDMT after WW II for disposal. These items were destroyed at Dunn Field." There is no discussion as to whether this is the same material mentioned within Sites 21 and 31

1995 Archives Search Report - Findings

The January 1995 *Archives Search Report* (ASR) - *Findings*, which contains the *Installation Assessment* document, was produced as part of a review of burial and disposal practices of CWM and OE performed by the Chemical Warfare Service (CWS) in association with the Memphis Defense Depot. The document was developed by the US Army Corps of Engineers Mandatory Center of Expertise and Design Center for Ordnance and Explosive Waste, under authority from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA). The purpose of the ASR was to compile information obtained through historical research at various archives and records holding facilities, interview with persons associated with the site or its operations, and personal visits to the site. All efforts were directed towards determining possible use or disposal of CWM on the site.

Section 5.1 – Historical Summary of OEW Operations, on page 5-1 of the ASR does not mention the presence of OE at Dunn Field beyond the description of a Pistol Range in the northeast area of Dunn Field. The range (known as DSERT Site 60 – Former Pistol Range) and associated soils surrounding the range are reportedly scheduled to be removed in January 2003. An Engineering Evaluation/Cost Assessment (EE/CA) and Action Memorandum have been submitted as final for this site. This range is also mentioned in the 1982 *Installation Assessment* document.

Section 5 1 also states that incendiary bombs were stored in Building 229 of the Main Installation part of the Memphis Depot. These bombs, which are most likely the same as those described by Mr. Traut, were shipped out of the Memphis Depot after World War II.

Appendix A of the ASR contains interviews of former employees associated with the former CWS at the Memphis Depot. An interview of Mr. Charles E. Anderson, who worked with the Chemical Supply Section in 1955 and 1956, revealed that CN capsules were burned in pits at Dunn Field from approximately 1950 to 1953. These pits may be the same as Site 21 referenced above. Importantly, Mr. Anderson did note that no live munitions were buried. The interview summary did not state if this was directly applicable to Dunn Field.

1995 Archives Search Report – Conclusions and Recommendations

The ASR – *Findings* document is accompanied with the *Archives Search Report – Conclusions and Recommendations*. This report generally reviews and summarizes the information presented in the *Findings* document, but also includes maps and drawings of the Memphis Depot area along with RAC worksheets used to define the risk of OE at the Memphis Depot.

Section 2 1 – Conclusions, Dunn Field Area, describes the CWM and other materiel that was buried or destroyed at Dunn Field. In addition, this section states that conventional ordnance was also destroyed in the Dunn Avenue Area following World War II.

Section 2.2 – Recommendations, Dunn Avenue Area, states in the first paragraph: "There is a risk that unexploded Conventional Ordnance may not have been properly disposed of in the Dunn Avenue Area (Map 3, Area A [attached]). The possibility exists, that others may have disposed of conventional ordnance in the pits used by Mr. Traut of the Chemical Supply Section. Mr. Traut used the area to dispose of Conventional Ordnance, which was confiscated from returning service members and brought to the Depot by the local Military Police." Area A in Map 3 corresponds to the southern end of the Disposal Area and the southwest area of the Stockpile Area, as defined the Dunn Field RI report (CH2MHILL, July 2002). Section 2 2 goes on to note that: "Any sub-surface activities in the Dunn Avenue Area, should consider both the Conventional Ordnance and CWM reported above."

Section 3.0 of the ASR – *Conclusions and Recommendations* document evaluates the ordnance and CWM contamination at the Memphis Depot. Section 3.2 discusses the Dunn Avenue Area. The first paragraph of this section states: "There are many areas in the Dunn Avenue Area which contain known burials and destructions. There may be more burials/destruction areas which were not captured by the [ASR] process. Extreme caution should be used in any intrusive type operations in Areas A, B, & C identified on Map 3 of this report. Known and probable disposals are discussed in later paragraphs." The second paragraph of Section 3.2 also notes that: "The remains of conventional ordnance which was destroyed or partially destroyed is in pits located in Area A. This includes at least one mortar round, smoke pots &hand grenades (smoke) and other conventional ordnance not specified in interviews." The reader should note that the document did not mention the burning and destruction of smoke pots and CN canisters in Site 21.

Page 3-2 of the ASR – *Conclusions and Recommendations* document also notes that "...the area identified as being used to test Flamethrowers does not present an ordnance hazard."

1999 Engineering Evaluation/Cost Analysis for the Removal of Chemical Warfare Materiel

In 1998, Parsons Engineering Science, Inc. (Parsons) conducted an EE/CA as part of an investigation into the CWM at Dunn Field. The work only addressed OE related to disposal/burial of German mustard bombs that contained CWM. As part of this EE/CA, Parsons utilized aerial and electromagnetic surveys of the western half of Dunn Field to define the potential CWM areas. Figures 2.8 through 2.18 present the results of the electromagnetic surveys and review of these figures indicates that the area known as Site 31 on Figure 11 of the *Installation Assessment*, which, based on available maps in the ASR, is approximately 150 feet east to southeast of DSERTS Site 24, is shown as an area with more disturbance and higher metallic content than surrounding areas. The surveys did not cover the former Site 21 area.

Conclusions

The documents that have been reviewed for this memorandum have revealed that OE other than that listed and described in Table 1-1 of the *Dunn Field Five-Year Review* document has been brought on to the Dunn Field area and burned, detonated, and chemically destroyed prior to disposal on Dunn Field. The OE in this case reportedly includes "souvenir ordnance," smoke pots, CN canisters, fuses, and smokes, grenades (smoke), and one mortar round and possibly other conventional ordnance not specified in interviews. The pits that were used for the destruction process were located in Sites 21 and 31. Site 21 is now referred to as DSERTS Site 19, whereas Site 31 does not appear to have a DSERTS site designation. The later covering of this site by bauxite storage most likely contributed to the lack of follow up on this location. As stated by the by the US Army Corps of Engineers in the ASR, there may be more burials/destruction areas which were not captured by the ASR process.

Future events that include subsurface activities at Dunn Field should be careful to involve monitoring for OE as well as personnel that are trained in recognizing the hazards associated with encountering OE and can fragments or whole units of OE. Future remedial design and remedial action activities at Dunn Field that are currently scheduled to occur will include investigation and removal efforts at the disposal sites listed as Priority A and B in Table 1-1 of the *Dunn Field Five-Year Review*. Health and Safety Plans for these activities will need to describe potential encounters with the various types of OE described herein, avoidance techniques, and procedures if OE is encountered. Importantly, any and all subsurface activities must be designed, undertaken, and completed with the knowledge and approval of USACE-Huntsville OE Center of Expertise.

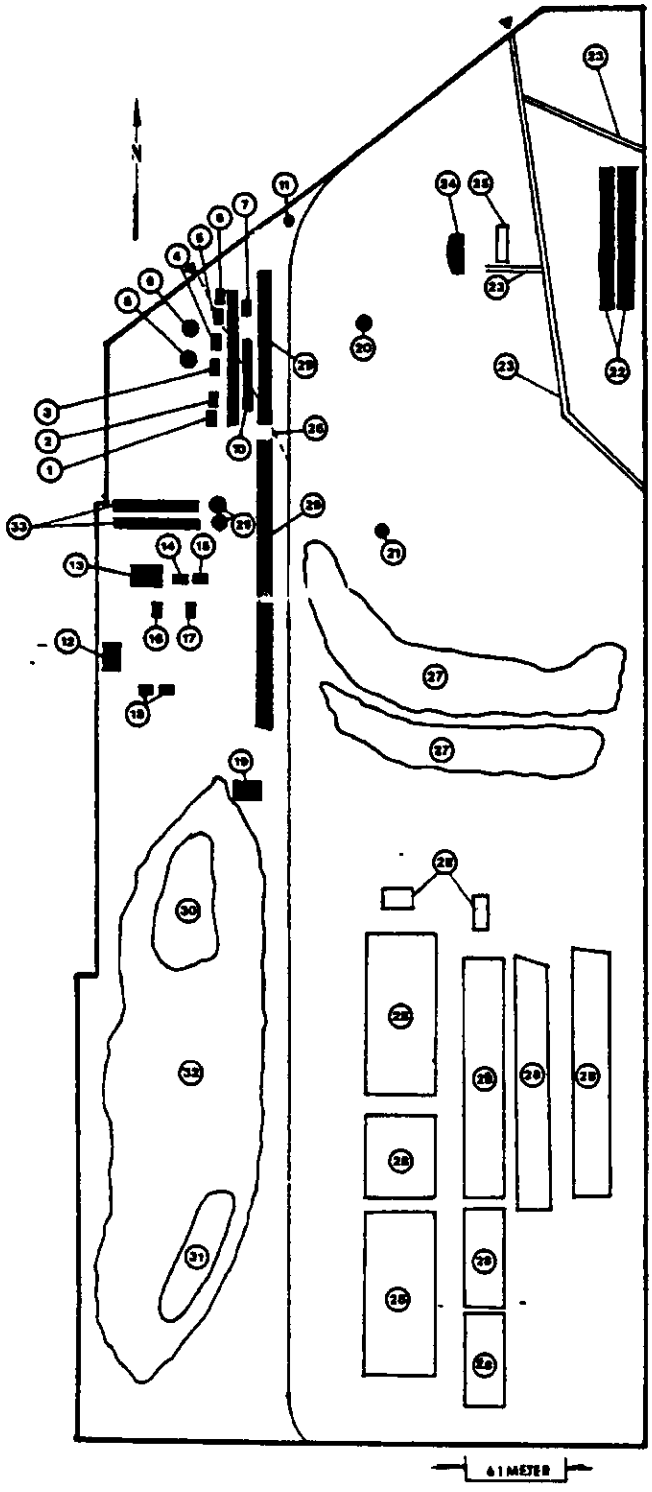


Fig. 11 Dunn Field Disposal and Storage Sites

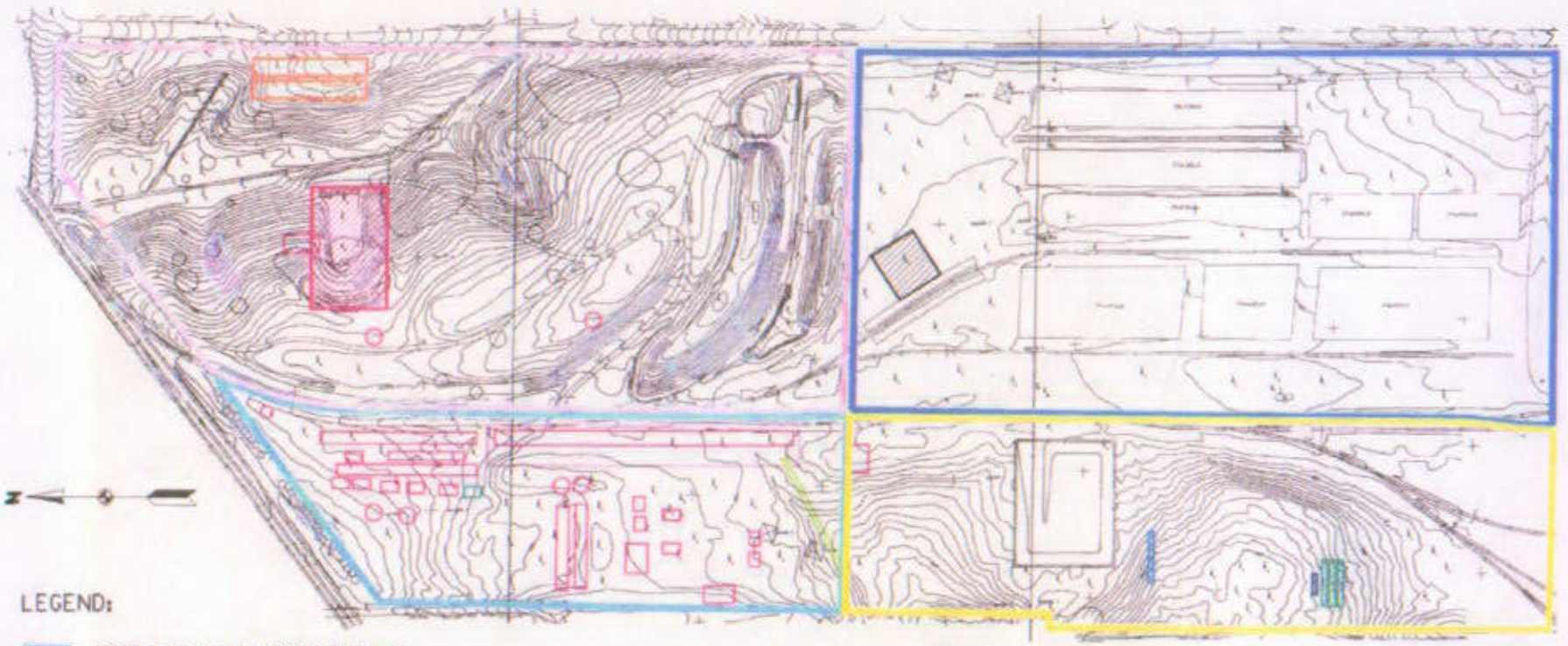
(See Table 7 for Descriptions of Sites)

Table 7. Description of Dunn Field Disposal and Storage Sites (Locations of Sites are Shown on Fig. 11)

Location	
Burial Sites	
1	Training sets, nine each, mustard and Lewisite, 1955
2	7 pounds (lbs) ammonium hydroxide, 1 gal glacial acetic acid, 1955
3	3,000 quarts (qt) chemicals, 5 cubic feet (ft^3) ortho-tolidine dihydrochloride, 1955
4	Thirteen 55-gal drums oil, grease, and paint, date unknown
5	Thirty-two 55-gal drums oil, grease, and thinner, 1955
6	3 ft^3 methyl bromide, 1955
7	40,037 units ointment (eye), 1955
8	1,700 bottles fuming nitric acid, 1954
9	3,768 1-gal cans methyl bromide, 1954
10	Ashes and metal refuse from burning pit, 1955
11	1,433 1-ounce (oz) bottles trichloroacetic acid, 1965
12	Sulphuric/hydrochloric acids, 1967
13	32 cubic yards mixed chemicals and acid, 900 lbs detergent, 7,000 lbs aluminum sulphate, 200 lbs sodium
14	Sodium, 1968
15	Sodium phosphate, 1968
16	Acid, 1969
17	Herbicide, cleaning compound, medical supplies, 1969
18	Acid, date unknown
19	Hardware (nuts and bolts)
22	XXCC3 impregnite
29	Food supplies
30	Burial site prior to bauxite storage; foods, construction debris burned; 1948
33	14 burial pits containing sodium phosphate, sodium, acid, medical supplies, chlorinated lime; 1970
Burn Sites	
21	Sanitary waste, smoke pots, CN canisters
31	Old burn area, 1946

Table 7. Description of Dunn Field Disposal and Storage Sites
(Locations of Sites are Shown on Fig. 11)
(Continued, Page 2 of 2)

Location	
Storage Sites	
25	Pesticide storage
27	Bauxite
28	Fluorspar
32	Bauxite, 1942-72
Other Sites	
20	Asphalt dump
23	Open drain ditches
24	Pistol range
26	Buried drainpipe



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 IMPREGNITE, 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 PHOTOS).
- 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

M-3

MEMPHIS ORDNANCE DEPOT
MEMPHIS, TENNESSEE
GARVER AND GARVER DRAWING

PROJ. DATE: JAN. 1995	DATE OF MAP:
[illegible]	[illegible]

Attachment 3

Minutes from the 11 February 2002 BCT Teleconference

TECHNICAL MEMORANDUM **CH2MHILL**

Minutes from 11 February 2002 BCT Teleconference

TO: Defense Distribution Center (Memphis)
U.S. Environmental Protection Agency (USEPA), Region 4
Tennessee Department of Environment and Conservation (TDEC)
U.S. Army Engineering and Support Center, Huntsville

ATTENDEES: John De Back, DDC (Memphis)
Turpin Ballard, USEPA
Jim Morrison, TDEC
Clyde Hunt, USACE-Memphis
Dorothy Richards, USAESCH
Scott Bradley, USAESCH
Steve Offner, CH2M HILL
David Nelson, CH2M HILL

FROM: CH2M HILL

DATE: February 14, 2002

A conference call was conducted on Monday, 11 February 2002 at 1510 EST to review the investigation and remediation status of the disposal sites present on Dunn Field. During the initial phase of the call, a brief history of the disposal sites was reviewed. The review included discussion of activities such as historical data reviews, surface investigations, including geophysical methods and soil gas collection, and limited subsurface soil sampling. Documents, such as the Archives Search Report (ASR), which included maps maintained by a Mr. Truitt, were also included in the review. Other items discussed in the review phase included the realization that the disposal sites might be hard to locate because previous investigations had shown that the maps were not as accurate as thought.

The next phase of the conversation centered on: (1) what the approach should be for each of the sites, including how much information is available on these sites; (2) what qualitative risk does each site present; (3) where do the sites fit in to the larger Dunn Field picture of investigation and remediation; and (4) how should the need for site remediation be documented. Suggestions were made on how to approach the handling of the sites in the Rev. 1 Dunn Field Remedial Investigation (RI). Most ideas focused on discussing the sites in the current version of the RI report (Rev. 1), developing remedial alternatives and cost estimates in the FS (Rev. 0), and carrying them forward into the Proposed Plan, Record of Decision and Remedial Design (RD)/Remedial Action (RA).

From this stage, the conversation delved into a discussion of which disposal sites should be included in the documents or those that should be considered further in the process for remedial action. This portion of the conference call included discussion of Remedial Action Objectives (RAOs) and reviewing the list of sites to develop potential approaches. In addition, the idea of understanding the types of wastes and how to handle each was introduced. EPA suggested that the procedure should be to: (1) give credence to available historical information in the RI; (2) develop the information within the RI/FS reports; (3) and discuss ways to remediate and present these in the Proposed Plan and ROD for Dunn

Field. This approach would not require more investigative field work at this time and would keep the RI/FS process moving forward with minimal schedule delay. An agreement was reached that the FS document should review the sites to develop remedial alternatives. Also, the ROD should be written as to provide details about procedures for review and removal of the suspected areas.

The BCT agreed that the next steps are to: (1) expand the Rev 1 RI report to include descriptions of each site, history of disposal activities, and the investigations conducted to date; (2) document the qualitative risks associated with the disposal sites in the risk assessment portion of the RI; and (2) develop the RAOs within the FS. The "Qualitative Risks" and the "RAOs" where documented by the EPA and TDEC as follows:

Qualitative Risk

- *Buried containers of hazardous liquids could leak and discharge to the environment and impact groundwater and any selected groundwater remedy(s)*
- *Buried containerized hazardous liquids could be accessed through future intrusive activities and cause immediate injury to human health and release to the environment*
- *Buried hazardous solids/residuals that could leach contaminants to groundwater and/or cause immediate injury to human health if accessed through intrusive activities*

Remedial Action Objectives (RAOs)

- *Eliminate potential for groundwater impacts from a release of buried containerized hazardous liquids and the leaching of contaminants from buried hazardous solids;*
- *Eliminate future unacceptable risk of direct contact with buried hazardous liquid and/or solids due to intrusive activities during future land use or site development.*

The last portion of the conference call was to go through the list of sites and prioritize each according to rank to determine which site to carry forward into the FS and RA. The levels included; (A) Highest Priority; (B) Medium Priority; and (C) No RA required. The levels were based on quantity of material within each site, potential hazards of the material, and the form of the material (solid versus liquid). The resulting prioritization can be found in the attached Table.

List of Dunn Field (OU 1) Sites

INSTALLATION RESTORATION SITES NUMBER	DSERTS SITE NUMBER(a)	PRIORITY LEVEL(b)	SITE TYPE	SITE DESCRIPTION
Northeast Open Area				
19	19	C	SS	Former Tear Gas Canister Burn Site
20	20	C	SS	Probable Asphalt Burial Site
21	21	C	SS	XXCC-3 Impregnite Burial Site (300,000 Pounds)
50	50	C	SS	Dunn Field Northeastern Quadrant Drainage Ditch
60	60	C	SS	Pistol Range Impact Area/Bullet Stop
62	62	C	SS	Bauxite Storage
85	85	C	RI	Old Pistol Range Building 1184/Temporary Pesticide Storage
Disposal Area				
1	1	Remediated	CWM	Mustard and Lewisite Training Sets Burial Site (1955)
2	2	C	RI	Ammonia Hydroxide (7 Pounds) and Acetic Acid (1-Gallon) Burial Site (1955)
3	3	B	RI	Mixed Chemical Burial Site (Orthotouidine Dihydrochloride) (1955)
4	4	A	RI	POL Burial Site (13, 55-Gallon Drums of Oil, Grease and Paint)
4 1	90	A	RI	POL Burial Site (32, 55-Gallon Drums of Oil, Grease and Thinner)
5	5	C	RI	Methyl Bromide Burial Site A (3 Cubic Feet) (1955)
6	6	C	RI	40,037 Units of Eye Ointment Burial Site (1955)
7	7	A	RI	Nitric Acid Burial Site (1,700 Quart Bottles) (1954)
8	8	A	RI	Methyl Bromide Burial Site B (3,768 1-gallon cans) (1954)
9	9	C	RI	Ashes and Metal Burial Site (Burning Pit Refuse) (1955)
10	10	B	RI	Solid Waste Burial Site (Near MW-10) (Metal, Glass, Trash, etc)
11	11	B	RI	Trichloroacetic Acid Burial Site (1,433, 1-ounce Bottles) (1965)
12 & 12 1	12	B	RI	Sulfuric Acid and Hydrochloric Acid Burial (1967)
13	13	A	RI	Mixed Chemical Burial (Acid, 900 Pounds, Unnamed Solids, 8,100 Pounds)
14	14	C	RI	Municipal Waste Burial Site B (Near MW-12) (Food, Paper Products)
15	15	B	RI	Sodium Burial Sites (1968)
15 1	91	B	RI	Sodium Phosphate Burial (1968)
15 2	92	B	RI	14 Burial Pits Na2PO4, Sodium, Acid, Medical Supplies, and Chlorinated Lime
16	16	B	RI	Unknown Acid Burial Site (1969)
16 1	93	B	RI	Acid Burial Site
17	17	B	RI	Mixed Chemical Burial Site C (1969)
18	18	C	Proposed NFA	Plane Crash Residue
22	22	C	Proposed NFA	Hardware Burial Site (Nuts and Bolts)
23	23	C	Proposed NFA	Construction Debris and Food Burial Site
24-A	24	Remediated	CWM	Bomb Casing Burial Site (29 Bomb Casings used to Transport Mustard Agent)
61	61	C	SS	Buried Drain Pipe
63	63	C	Proposed NFA	Fluorspar Storage
64	64	C	Proposed NFA	Bauxite Storage (1942 to 1972)
86	86	C	RI	Food Supplies
Stockpile Area				
24-B	24	Remediated	CWM	Neutralization Pit for the Contents of the 29 Bomb Casing used to Transport Mustard Agent
62	62	C	SS	Bauxite Storage
63	63	C	Proposed NFA	Fluorspar Storage
64	64	C	SS	Bauxite Storage (1942 to 1972)
--	--	B	--	CC-2 Impregnite Burial Site (86,100 Pounds in 1947)

Notes

SS	Screening Site
RI	Remedial Investigation
NFA.	No Further Action
CWM	Chemical Warfare Material
Na2PO4	Sodium Phosphate
POL	Petroleum Oil, and Lubricants
XXCC-3/CC-2	Stabilized/Unstabilized Impregnite for Impregnating Clothing Used to Protect Personnel against the Action of Vesicant-Type Chemical Agents

(a) Defense Site Environmental Restoration Tracking System (DoD Database)

(b) Priority levels were established for Installation Restoration Sites Number/DSERT Site Number Areas where remedial action action will be required with some investigatory effort to determine extent of area Levels are as follows A - Highest Priority; B - Medium Priority; C Not to be carried forward Designation is based on described quantity of material, potential hazard to human health andd the environment, and form of material (solid or liquid)

Attachment 4

Final September 24, 2002 BRAC Cleanup Team Meeting Minutes

FINAL

BRAC Cleanup Team

Meeting Minutes

September 24, 2002

BRAC Cleanup Team	Organization	Phone
John De Back	Defense Logistics Agency (DLA)/Defense Distribution Center (Memphis)	(901) 544-0622
Turpin Ballard	Environmental Protection Agency, Region IV (EPA)	(404) 562-8553
James Morrison	Tennessee Department of Environment and Conservation, Memphis Field Office, Division of Superfund (TDEC)	(901) 368-7958
Project Team	**Organization**	**Phone**
Clyde Hunt	Memphis Depot/USACE Memphis	(901) 544-0617
Bruce Railey	Corps of Engineers-Huntsville	(256) 895-1463
Peggy DuBray	Corps of Engineers-Mobile	(931) 454-6630
Claude Leak	Corps of Engineers-Mobile	(251) 690-2318
Stephen Offner	CH2M HILL	(770) 604-9182 x302
David Nelson	CH2M HILL	(770) 604-9182 x394
Virgil Jansen	Jacobs Engineering	(865) 220-4933
Kraig Smith	Jacobs Engineering	(931) 393-6448
David Buxbaum	US Army Environmental Center	(404) 524-5061

Master Schedule

Mr. De Back requested that no changes be made to the schedule dated 22-Aug-2002. The schedule will be periodically updated with actual dates.

LUCIP

Mr. De Back reported that it has been sent out to Stan Citron for review. Mr. Buxbaum requested a copy for comments.

BRAC Cleanup Plan

Mr. De Back has the final revision and is incorporating the final changes. Due date is October 22.

CERCLA 5 yr Review

Mr. Ballard reported that Rev 0 was distributed via the Memphis Depot FTP website on Friday, September 20, 2002. CD version of the document was made available at the meeting.

Main Installation (MI) EBT Study

Mr. Nelson presented diagrams and results of groundwater sampling data collected thus far during the MI EBT Treatability Study. Three sampling rounds have been conducted to date – one baseline and two performance monitoring events. One other event has been completed but the data is not available at this time. The data was presented according to each study site. Initial review of the results indicates that there is generally a positive response at both sites; however, the BCT agreed that this is not enough to make any conclusions yet; will wait for more samples. The BCT also discussed implications of the injection of the fluids into the aquifer, specifically contaminant transport in the aquifer via convection, geochemical reactions, preinjection carbon levels, and dissolved oxygen level variance. Mr. Morrison requested more uniform scales for easier comparison and to determine significant and meaningful changes in the data.

Dunn Field Recovery System (Industrial Wastewater Discharge)

Mr. Smith reported that the City of Memphis has been lobbied to increase discharge limits to system. There was a significant increase in carbon tetrachloride and chloroform with the installation of four (4) new wells. Three (3) pump and motor failures occurred this summer; two (2) have been replaced. Mr. Smith expressed concern with the cost of pump assembly replacement and has suggested retrofitting the discharging piping from the pump to the wellhead with flexible hosing (steel piping is used now). Mr. De Back requested a cost analysis and data on how long the pumps will run before deciding to retrofit the system. Mr. Jansen reported that the diffusion sampling bags were in place for semi-annual sampling. Mr. De Back requested a separate meeting regarding some O&M issues.

Site 60 EE/CA

Mr. Offner reported no major changes had occurred since submittal of the Rev. 1 document in August 2002 and the preparation of the Action Memorandum. The Action Memorandum for Site 60 has been provided to DLA for review and comment, as necessary. A signature on the document by DLA will be necessary prior to submittal to the BCT. Mr. De Back requested that, during the removal action, every truck leaving the site be covered. Mr. Jansen asked the BCT if analytical testing of backfill soil was required if the soil was obtained from the site (Dunn Field). Mr. Ballard said that testing was required prior to placement of the backfill material. The testing should be at least as rigorous as if it were from an offsite source. On further consideration, Mr. Ballard stated that since the soil would be from an NPL site, more rigor would be desirable. It was noted that any action required concerning the backfill material would depend on levels found during tests. Mr. Buxbaum suggested that the current soil standards for disposal be used. Mr. Jansen will discuss this with his disposal contractor.

PCP Dip Vat

Mr. De Back and Mr. Offner discussed locations of proposed borings. Mr. Offner suggested placing borings around and inside the building. Mr. De Back agreed to perform

soil samples for PCPs. They agreed that the PCP results from samples collected during the MI RI would be summarized in the work plan to provide rational for the proposed locations of additional borings/samples. TDEC's approval of the work plan will be required prior to field activities. Work may begin in January 2003.

Up Gradient VOCs – Tech Memo

Mr. Morrison reported that TDEC is installing three (3) wells for another site east-northeast of Dunn Field, as part of another investigation. Mr. Offner will complete the Tech Memo based on TDEC's comments and he will coordinate with Mr. Smith to define the location of each new well and assist in obtaining access for each location; Mr. De Back agreed to aid in securing access.

Dunn Field FS Alternatives

Mr. Offner presented a summary of the Rev. 0 Feasibility Study to the BCT.

Regarding Section 3, he explained the alternatives are sub-categorized by medium. Mr. Ballard expressed concern about length and readability of report, detailing the "No Action" alternatives per medium. Mr. De Back suggested that a single paragraph statement discussing the "No Action" alternative as being site wide, and being evaluated against detailed screening alternatives. Mr. Ballard states that he would respond to this issue in his comments on the FS.

Mr. Buxbaum stated that a new TN law was enacted last summer (signed by Gov. Sunquist July 2001) which requires recordation of a "Notice of Land Use Restrictions" and may be an ARAR for Dunn Field. Although this new law was enacted as part of several amendments to the Tennessee Voluntary Cleanup/Brownfields Program it applies to any remedial action, including those conducted under CERCLA or RCRA. The notice must be filed when land use restrictions are part of the remedial action. Also, recordation must identify the areas of potential concern (i.e., disposal areas) with respect to surveyed, permanent benchmarks and identify type, quantity of hazardous substances known to exist at the site. Mr. De Back explained the area will be handled as a total site area for deed purposes, therefore the current information on the plots is adequate. Mr. Buxbaum indicated that increased efforts may be needed if new law does apply.

Mr. Ballard questioned wording in Section 6 – vertical vs. horizontal SVE systems. Mr. Ballard requested it be taken out of the FS (but kept for the conceptual design), use only SVE and cost out at higher end. Mr. De Back agreed.

Mr. Ballard suggested that "institutional controls" as an alternative for the disposal sites should be screened-out in the FS.

Mr. Offner displayed several options for groundwater remediation. Issues involved with offsite access were also discussed.

There was a relatively long group discussion concerning groundwater remediation alternatives. Mr. De Back asked if just on-site treatment would apply with respect to the modeling conducted in the RI that says that VOCs would not impact the Allen Well Field. Mr. Ballard and Mr. Morrison indicated that some offsite groundwater treatment would likely be required at this time. After a group discussion, groundwater alternative 4 was chosen by the BCT as being most efficient remedy for groundwater. Changes to

treatment-zone locations were discussed among group and are as follows: (1) changes included combining PRB wall along west of Rozelle, (2) assume implementation across the MLGW powerline corridor, (3) consider the treatment area in the MLGW substation area as a contingency element, (4) the up-gradient treatment wall to be moved northeast and should be a contingency, but the costs should be kept in the FS. These changes apply to many of the elements of the various groundwater alternatives.

Mr. Ballard suggested the removal of MNA as an acceptable standalone remedy, since it can't pass the EPA effectiveness screening. Mr. Ballard also requested removing location (onsite & offsite) for groundwater alternatives 5 & 6,since it will be decided later. The BCT concurred with combining these two alternatives and listing offsite as a contingency with separate costs.

Mr. Morrison asked about the static (or natural) groundwater flow directions without the influences of the groundwater extraction system. Mr. Offner presented baseline groundwater flow diagram from November 1998. Mr. Morrison requested that static groundwater flow conditions be considered in the groundwater alternatives.

Mr. De Back discussed choosing an alternative before seeking access agreement. Mr. Ballard also requested identification of access requirements per the chosen alternative before access agreements are sought. Timetable was discussed among the group and it was decided that access agreements would begin in January 2003. This activity will be added to the master schedule.

Pre-Design Investigation (Dunn Field Disposal Sites)

Mr. Offner discussed sites using Table 1-2 (as provided in the Rev. 0 FS), and that the alternatives presented in the FS consider that some remediation will be necessary at a number of the sites (assumed 75% of category A & B sites).

The BCT agreed that the CC-2 site in the Stockpile Area will be investigated to see if it poses a risk; if not, it will be moved to category C. Mr. De Back requested immediate sampling and to remove if it looks like a contamination source. Mr. De Back also discussed the fact that the CC-2 site did not have an IRP or DSERT number.

The BCT discussed the investigation/removal of the disposal sites. There was BCT agreement on investigating the sites first, to better define the contents.

Mr. Ballard suggested that since all of the disposal site alternatives require a pre-design investigation, it should conducted as soon as possible after the public comment period. This means that the development of the work plan to conduct the pre-design investigation should begin as soon as possible. It was agreed that this would be a joint effort between CH2M HILL and Jacobs. Ms. DuBray and Mr. Hunt will obtain headquarter understanding about the joint effort. Mr. De Back favored an early start on this. Mr. Offner agreed to develop a Tech Memo concerning alternative selection; promoting an earlier start date. The BCT agreed.

Mr. Buxbaum mentioned the RCRA landfill post-closure requirements for preparing a survey plat and recording along with Deed Notice as a possible "relevant and appropriate" requirements that would provide regulatory driver and address TDEC's concern about maintaining accessible information about the disposal areas.

There was a group discussion regarding priority categories for the individual disposal sites. Category A & B sites will be treated similarly and Mr. Offner will map priority category C sites.

Pre-Exit Strategy for the SVE System

Mr. Offner explained the calculations and process for the soil cleanup standards presented in the FS. Mr. Ballard currently has two other reviewers (from EPA and USGS) reviewing the document and will provide comments for later discussion. Mr. Ballard added that the intermediate shutdown and elevation steps, including testing for possible rebound affects following temporary shutdown periods, need to be better presented in the FS as part of the overall SVE shutdown strategy. Mr. Offner stated that additional discussion would be provided in the Dunn Field FS concerning the elements and phases of the SVE shutdown procedures.

OPS for Dunn Field

Mr. De Back requested a decision tree for OPS concerning groundwater be developed within the Remedial Design for Dunn Field. Mr. Ballard explained that Mr. De Back will have to submit a document to the EPA to concur on the OPS for headquarter signature. Mr. Ballard said that he would send a copy of the EPA OPS guidance to Mr. De Back.

SIGNED 25-Oct-02
JOHN DE BACK DATE
Defense Logistics Agency/Defense Distribution Center (Memphis)
BRAC Environmental Coordinator
BRAC Cleanup Team Member

SIGNED 25-Oct-02
TURPIN BALLARD DATE
Environmental Protection Agency
Federal Facilities Branch
Remedial Project Manager
BRAC Cleanup Team Member

SIGNED 25-Oct-02
JAMES W. MORRISON DATE
Tennessee Department of Environment and Conservation
Division of Superfund
BRAC Cleanup Team Member

Attachment 5

Statement of Clearance
26 August 2003

Statement of Clearance
Chemical Warfare Materiel (CWM)
Dunn Field, Former Defense Depot
Memphis, Tennessee

Dunn Field, located within the boundary of Former Defense Depot, Memphis, Tennessee, has been carefully researched, and a field search was conducted using the best available technology. Dunn Field has been cleared of all CWM and explosive ordnance reasonably possible to detect. Two live bursters (ordnance items) were found and destroyed. Activities are described in the Final Removal Report for Chemical Warfare Materiel Investigation/Removal Action, performed by UXB under contract to the Engineering and Support Center, Huntsville, Alabama (Contract No. DACA87-97-D-0006, DO 0006).

It is recommended that:

Dunn Field may be used for any purpose for which the land is suited.

This action has been conducted in accordance with Army Regulation 385-61 (The Army Chemical Agent Safety Program), Army Regulation 384-64 (Ammunition and Explosives Safety Standards), AR 405-90 (Disposal of Real Estate), and the DDESB approved Explosives Safety Submission.

SIGNED BY:

26 August 2003

John D. Rivenburgh — Date
COL, EN
Commander, Engineering and Support Center,
Huntsville

APPROVED BY:

Dennis J. Lillo — Date
Division Chief, Environmental Quality
Defense Logistics Agency

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