

# THE MEMPHIS DEPOT TENNESSEE

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## ADMINISTRATIVE RECORD COVER SHEET

AR File Number 363

## TECHNICAL MEMORANDUM

CH2MHILL

## Final Field Sampling Plan Addendum for Operable Unit (OU) 2

TO: Tennessee Department of Environment and Conservation (TDEC)  
EPA Region IV  
Memphis Depot Caretaker  
US Army Corps of Engineers, Huntsville

FROM: CH2M HILL

DATE: September 25, 1998

### Introduction

As part of a continuing program of evaluating its hazardous waste management practices, the United States Army is performing Remedial Investigations/Feasibility Studies (RI/FS) at the Defense Distribution Depot Memphis Tennessee (DDMT). Previously completed site investigations at DDMT have confirmed the existence of contamination, and RI/FS investigations are underway to determine the extent of this contamination and appropriate remedial actions at the Main Installation, which consists of Operable Units 2, 3, and 4 (OU-2, 3 and 4). This Technical Memorandum presents a sampling plan for additional environmental characterization of surface soil, subsurface soil, surface water and sediment, and some site-specific groundwater locations. The environmental sampling proposed herein is based on a review of the initial Main Installation sampling. Additional groundwater characterization of the entire Main Installation Fluvial Aquifer was proposed to the BCT in a Technical Memorandum issued on May 8, 1998, and further discussed in the June, 1998, partnering meeting.

DDMT has initiated a series of environmental contamination investigations and remediation projects under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Base Realignment and Closure Act (BRAC). The sites investigated fall into three categories:

1. Screening Sites where environmental contamination was suspected but not confirmed. The objective of the environmental sampling was to determine if a release to the environment had occurred and therefore sample locations were biased to areas where releases would have been suspected.
2. RI sites where existing environmental contamination was evaluated for nature and extent. The objective of the environmental sampling was to evaluate the type of contamination and its horizontal and vertical extent.
3. Base Relocation and Closure (BRAC) property parcels where environmental sampling was performed to determine if the property was suitable for transfer or lease. The objective of the BRAC sampling was to determine if chemicals existed in the surface soil

and subsurface soil in concentrations that might present a concern for industrial and, in the case of Parcel 2, residential uses.

A Field Sampling Plan (FSP) was approved for OU- 2 in 1995, and the field investigation implementing this plan occurred in late 1996 and early 1997. Results of the field investigations were presented in a series of Letter Reports in 1997 and 1998. The data were also reviewed by the BRAC Cleanup Team (BCT) during a series of meetings in the summer and fall of 1997 wherein recommendations on additional characterization were made and documented in the meeting minutes.

During these meetings, the BCT determined that a comprehensive and conservative risk-based approach to evaluating the environmental data was needed. Following EPA Region IV guidance on performing a preliminary risk assessment, a Preliminary Risk Evaluation Report (CH2M HILL, 1998) was prepared on a BRAC parcel and CERCLA site basis. The risks calculated in the Preliminary Risk Evaluation (PRE) were also used as a basis for requiring additional sampling.

A series of sites was proposed for Early Removal (ER) action in the 1995 FSP, prior to inclusion of DDMT in the BRAC program. Most of these sites are in Dunn Field, only three were identified in the Main Installation. The requirements for early action have changed under BRAC, focusing on expedited removals for sites in parcels that are a priority for lease or transfer. Characterization of these sites is proposed prior to ER action.

## Methodology

Data from the Screening Sites and RI Results of the field investigations, the BRAC Sampling Recommendations (Woodward Clyde, 1996) and the results of the Preliminary Risk Evaluation (CH2M HILL, 1998) were reviewed in preparation for updating the FSPs. CH2M HILL's risk assessment staff reviewed the updated risk-based screening levels and all the available data to ensure that enough were available to complete the risk assessment before preparing the revised FSPs for each site presented below.

In addition, CH2M HILL staff field verified the proposed sampling locations, and staked and photographed each proposed sample location.

The collection of additional data is generically proposed to satisfy one of the following considerations.

**Sufficient Number of Data Points.** The number of usable data points was tabulated to assess whether a sufficient number existed to perform a risk assessment. Specific criteria used were if there was enough of data points to support a statistical estimate of the exposure concentration at each site and if the analytical methods were sufficient to characterize the site. If an insufficient data population existed for a site, additional data has been proposed.

**Definition of the Extent of Contamination.** Results of the field investigations indicated some samples at a site that exceeded the screening criteria for certain parameters. The configuration of these samples was reviewed to assess whether additional samples were needed to adequately characterize the extent of the area exceeding health-based criteria.

**Characterization of the Nature of Contamination.** If earlier sampling at a site indicated the presence of a contaminant in some of the samples, sampling for additional types of contamination may need to occur.

**Assurance of Absence of Contamination.** A sufficiently broad spectrum of analyses is also necessary to fully understand the nature of contamination at each site. If a site is judged free of contamination, the number of samples and the suite of analyses should be reviewed for adequacy. The current knowledge of recent past use may not be an adequate indicator of the potential contaminants at a site.

**Evaluation of Groundwater Contamination.** At some sites, surface and subsurface soil concentrations exceed criteria that signify the potential for transfer from soil to groundwater via leaching. Additional subsurface soil sampling may be proposed or grab samples of groundwater may be obtained to directly determine if an impact to groundwater is occurring.

**Sufficiency for Feasibility Studies.** Feasibility samples are proposed at sites where remedial activities are likely and data are needed to evaluate the feasibility of different remedial technologies. If, for instance, surface soil at a particular site contains elevated concentrations of arsenic and subsurface soil does not, then samples would be collected from 0 to 6 inches, 6 to 12 inches and 12 to 18 inches to determine if removing the surface soil was a feasible remedial option. TCLP samples may be collected to determine if the surface soil could be covered without the risk of the contaminants leaching to the groundwater. Geotechnical samples may be collected to evaluate if other technologies such as soil vapor extraction, solidification or other engineering control may be applicable at the site. Geotechnical testing will include grain size distribution, moisture content, pH, alkalinity, cation exchange capacity, and total organic carbon.

## Changes to Field or Laboratory Methods

EPA has promulgated a change in the methods used for collection and analysis of VOCs in soil. The sampling proposed in this addendum to the FSP incorporates this methodology for VOC analysis of soils. Previous methods have demonstrated a significant low bias in the quantitation of VOC's in soil samples (EPA, 1997).

The samples collected as part of the 1995 FSPs were analyzed by the traditional "purge and trap" procedures outlined in Update II to SW-846 (Method 5030A, Revision 1, 1992). However, on June 13, 1997, Method 5030B and Method 5035 were promulgated in SW-846 Update III. This update removed the option to analyze soils / sediments by Method 5030 and replaced it with Method 5035, "Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Water Samples". Method 5035 has several options in sample collection: field preserving with methanol or sodium bisulfite or collecting in EnCore samplers and submitting to the laboratory for preservation within the specified 48 hours.

## Revised Site Sampling and Analysis Plans

For each of the sites in this OU that require additional sampling, a synopsis of the revised sampling plan is presented below. A figure is presented for each site showing both the

previous sampling locations (including sampling performed by other firms) and any new sampling proposed in this addendum. A table for each site itemizes each new proposed sample, and provides the rationale and proposed suite of analyses.

Any Screening Sites that occur in this OU are presented in a separate FSP for Screening Sites. Early Removal (ER) and BRAC sites are presented in the OU in which they occur.

#### **RI Site 27: Former Recoupment Area (Building S-873)**

During the RI Sampling Program at this site, a few chemicals of concern (COCs) were detected in the surface soil. These COCs include PAH compounds, iron, vanadium, antimony and arsenic.

Additional samples are needed to confirm the presence of some of these COCs as well as the horizontal and vertical extent of contamination at the site. A total of ten surface soil samples (SS27K through SS27T) will be taken—to identify the extent of contamination along the foundation of Building S-873, south and southeast of the building. Three of these surface soil samples will be taken in the same location as previous surface soil samples to confirm the presence of a detected COC. The remaining surface soil samples will be collected to delineate horizontal contamination, especially north of the site along the railroad tracks. At each of the 10 surface soil sample locations, samples will be collected at depths of 0 to 12 inches. When applicable, the samples will be analyzed for PPM, PAH compounds and TAL. See Table 1 for specifics.

In addition to the surface soil samples, five shallow soil borings (SB27F through SB27J) will be installed to further assess the vertical and horizontal extent of PAH contamination at the site. Samples will be analyzed for PAHs using the Toxicity Characteristic Leaching Protocol (TCLP) to evaluate the potential for vertical migration. The borings will be taken to a depth of 10 ft. Samples from 0 to 1 foot depth will be analyzed for PAH and TCLP PAH to provide correlation between the two types of results and allow for a comparison of old and new data. Finally, fifteen more surface soil samples will be collected for feasibility study information to determine the depth of possible soil removal. The soils will be analyzed for PAH compounds and geotechnical parameters. These surface soil samples will be collected from five locations (FS27U through FS27X) at interval depths of 0 to 6 inches, 6 to 12 inches and 12 to 18 inches. See Figure 1 for location of new samples as well as previous samples taken at the site.

#### **RI Site 32: Sandblasting Waste Accumulation Area**

For Site 32, COCs detected in the surface soil include PAH compounds, PCBs, antimony, arsenic, chromium, lead, cadmium, dieldrin and DDT.

Additional samples are needed to characterize the extent of contamination from metals and pesticides at the site. Since RI Site 32 is located in the same vicinity as Screening Site 33, the additional samples to be taken at this site are discussed in the *Draft Addenda for the Screening Sites Field Sampling Plan*.

**RI Site 34: Underground Waste Oil Storage Tanks**

The lateral extent of PAHs needs further delineation at this site, and therefore four additional surface soil samples (SS34G through SS34J) are proposed to be taken from 0.0 to 1.0 feet in depth. The location of these samples is shown in Figure 2. Each of these samples will be analyzed for PAH compounds, as shown in Table 2.

**BRAC Sites (30, 26, and 23): RR Tracks East of Building 970**

COCs detected at these sites include arsenic, chromium, dieldrin, lead, antimony, barium, beryllium, cadmium, chromium, iron, PAH compounds and zinc.

Four additional samples are needed to delineate PAH contamination in surface soils, as shown in Figure 3. The samples will be collected from 0 to 12 inches. To complete the assessment of depth of soil contamination, three sample depths (i.e., 0.0 to 0.5, 0.5 to 1.0, and 1.0 to 1.5 ft.) will be sampled at two different locations and analyzed for PAH TCLP and geotechnical parameters (Table 3). The depth distributions will be used to assess soil quantities for remediation.

**ER Site 87: DDT, Banned Pesticides (Building 1084)**

Additional sampling is required at this site to investigate whether pesticides are present in the soil near Building 1084 (Table 4). Surface soil samples will be collected northwest, northeast and southwest of Building 1084 at depths of 0 to 12 inches (Figure 4). The samples will be analyzed for pesticides and PCBs.

Furthermore, six more surface soil samples will be collected just southwest and northeast of Building 1084 for Feasibility Study information. The samples will be collected from two locations at interval depths of 0 to 6 inches, 6 to 12 inches and 12 to 18 inches. These samples will also be analyzed for pesticides, PCBs and geotechnical parameters.

**New Sampling and Analysis Plan**

A Sampling and Analysis Plan is proposed for new potential sites that were discovered as a result of the *Historical Environmental Aerial Photographic Analysis of the Main Depot Area South of Dunn Avenue* (TEC, 1998). This study reviewed available black and white aerial photographs and supplemental collateral materials spanning from 1945 to 1990, to identify features that may be of environmental concern. Stereo-paired photography, non-stereo photo maps, and ground photography were available. The observed features include ditches, excavations and ground scars, cleared areas, and open storage areas. Features that disappeared over time (such as an old pond that was drained and filled in) were also noted.

After TEC produced its report, CH2M HILL reviewed the observed features and compared them to known sites or sampling areas. Confirmatory sampling was proposed at several new sites as a result of this review. The sites that are included in this OU are described below.

### **Old Pond Area**

Clear evidence of an old pond in OU-2 is found in the TEC report (TEC, 1998). The pond existed from 1945 to 1952, and was approximately 200 feet long by 100 feet wide, with its long axis oriented in a northwest/southeast direction. It was located southeast of the current location of K Street, and northwest of Building 689. Its depth is not known, but based on the permanent berm along its northwest edge (now K Street), and other visual evidence, it may be assumed that the deeper end of the pond was to the northwest.

A note on the 1953 aerial indicates that the pond had been drained, and a fill area was in progress. By 1963, a ball field had been constructed over the former pond area (TEC, 1998).

The sampling plan consists of obtaining two Rotosonic cores to a depth of 10-12 feet, and reviewing the cores for evidence of the pond bottom (Figure 5 and Table 5). Sample TEC-90B is designed to sample the deeper end of the pond. In vertical profile, it would be expected to see an upper layer of clean fill, followed by a relatively thin layer of dark organically stained material (the former pond bottom). The native material would be expected below the organic layer. It is proposed to take one soil sample at the pond bottom interface, presumed to be at approximately 8-10 feet in depth, and a second sample in the native material beneath the interface (at approximately 10-12 feet). Both samples will be analyzed for TAL/TCL.

Sample TEC-90A will be taken in the northeast corner of the former pond, to sample the area of the pond where runoff from a pile of mounded material may have occurred. It is also likely that the pond may have been more shallow at this end, and therefore one sample is proposed either at the interface, if it can be discerned, or at the 8-10-foot interval if the interface can not be located.

### **Mallory Avenue Ground Scar**

The Mallory Avenue Ground Scar is observable in the aerial photos from 1949 to 1953. It occurs in the southwest corner of the installation, along the perimeter just east of Mallory Avenue, and just south of the current location of MW-21.

One surface soil sample (TEC-93A) is proposed to be taken in the center of the elliptical area of the ground scar, from 0 – 1 foot deep (Figure 6). It will be analyzed for TCL/TAL (Table 6).

### **Norris Avenue Ground Scar**

The Norris Avenue Ground Scar is observable in the aerial photos from 1949 to 1953 (TEC, 1998). It occurs in the southwest corner of the installation, along the perimeter just east of Norris Avenue.

This area has previously been sampled in conjunction with Screening Site 33, Sandblasting Waste Drum Storage, and therefore additional samples in this area will be associated with Site 33.

## References

CH2M HILL. *Final Preliminary Risk Evaluation*. Prepared for United States Army Engineering Support Center, Huntsville, Alabama. April 1998.

"*Determination of Volatiles in Soil-Directive for Change*", Memorandum from Norman Niedergang, Director, Waste, Pesticides and Toxics Division, U.S. EPA Region 5, December 22, 1997.

U.S. Army Topographic Engineering Center. *Historical Environmental Aerial Photographic Analysis of the Main Depot Area South of Dunn Avenue*. Prepared for U.S. Army Engineering and Support Center Huntsville, Alabama. September, 1998.

Woodward-Clyde. *Sampling and Analysis Recommendations*. 1996.





Table 2  
 Site 34 - Underground Waste Oil Storage Tanks  
 Final Addendum to Field Sampling Plan  
 DDMT Delivery Order 11 - Main Installation  
 September, 1998

Type of Site	OU No.	Parcel No.	Site No.	Description	Sampling Objective	Proposed Sample ID	Sample Interval (ft)	Sample Location/Basis	Analyses						Comments
									BTEX	PPM Metals	VOC	PAH	Pest/PCB	TAL	
RI	2	24	34	Underground Waste Oil Storage Tanks	Delineate lateral extent of PAHs										
						SS-34G	0-1	Approximately 50 ft north east of SS-34F				1			
						SS-34H	0-1	Approximately 40 ft west of SB-34A				1			
						SS-34I	0-1	Approximately 50 ft south of SB-34A				1			
						SS-34J	0-1	Approximately 50 ft south of SS-34E					1		

Table 3 Parcel 26 - RR Tracks East of Building 970 Final Addendum to Field Sampling Plan DDMT Delivery Order 11 - Main Installation September, 1998																	
Type of Site	OU No.	Parcel No.	Site No.	Description	Sampling Objective	Proposed Sample ID	Sample Interval (ft)	Sample Location/Basis	Analyses						Comments		
									STEX	PPM	VOC	PAH	Pest/PCB	TAL		TCL	
BRAC	2	26	N/A	RR tracks east of Building 970	Further delineate PAH contamination in surface soils based on previous sampling.	F(20.1)	0-1	North of B(26.2)									
						C(26.2)		South of B(26.2)					1				
						D(26.2)		North of A(26.2)					1				
						B(26.1)		South of A(26.2)					1				
					Feasibility Study Information - Evaluate vertical extent in near-surface soil.	FS-26.2A	0.0-0.5, 0.5-1.0, 1.0-1.5	At A(26.2) to determine possible depth of removal									
						FS-26.2B		At B(26.2) to determine possible depth of removal								3	



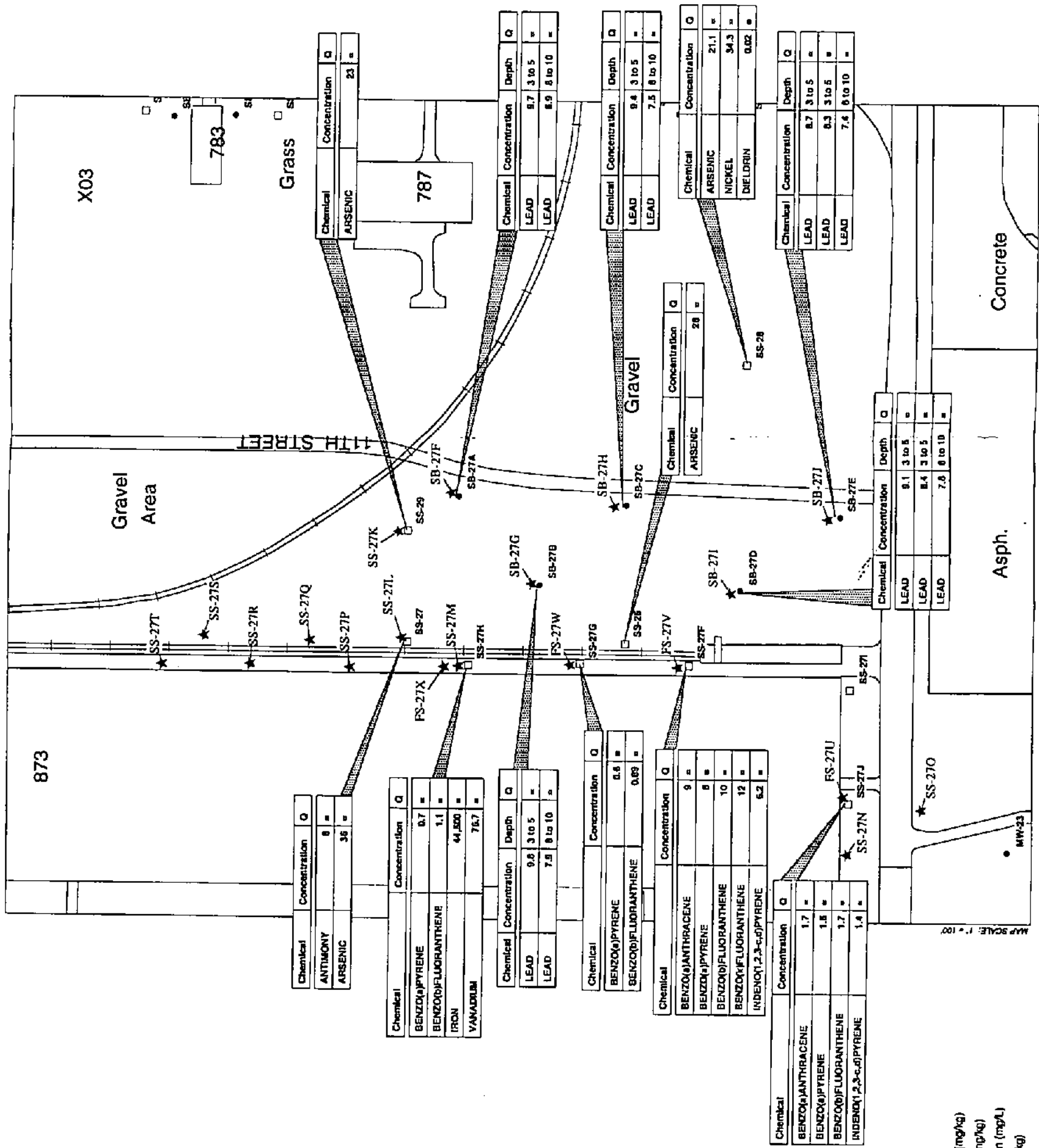
Table 6  
TEC Site—Old Pond  
Final Addendum to Field Sampling Plan  
ODMT Delivery Order 11 - Main Installation  
September, 1998

Type of Site	QU No.	Parcel No.	Site No.	Description	Sampling Objective	Proposed Sample ID	Sample Interval (ft)	Sample Location/Basals	Analyses							Comments	
									BTEX	PPM	VOC	PAH	Pest/PCB	TAL	TCL		
TEC	2	24	NA	Old Pond	Need to sample for all related compounds to characterize the site	TEC-80A	8-10	Southeast of K Street							1	1	Upper Samples at each location should sample pond bottom interface, if detectable
						TEC-90B	8-10								1	1	
						TEC-90B	10-12								1	1	

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Table 6  
TEC Site—Mallory Avenue Ground Scar  
Final Addendum to Field Sampling Plan  
DDMT Delivery Order 11 - Main Installation  
September, 1998

Type of Site	OU No.	Parcel No.	Site No.	Description	Sampling Objective	Proposed Sample ID	Sample Interval (ft)	Sample Location/Basis	Analyses							Comments	
									BTEX	PPM	VOC	PAH	Pest/PCB	TAL	TCL		
TEC	2	28	NA	Mallory Avenue Ground Scar	Need to sample for all related compounds to characterize the site	TEC-93A	0-1	South of MW-21							1	1	Sample in center of ellipse



**LEGEND**

- Surface Soil Sampling Location (mg/kg)
- Soil Boring Sampling Location (mg/kg)
- Surface Water Sampling Location (mg/L)
- ★ Sediment Sample Location (mg/kg)
- ★ Proposed Sampling Location

(Q) Qualifier Definitions  
= Indicates unqualified detection  
J - Indicates estimated value above detection limit, but below reporting limit

Figure 1  
RI Site 27, Former Recoupment Area (bldg S-873)  
Constituents Exceeding Risk-Based Criteria  
Defense Distribution Depot Memphis, TN

Sampling locations without data boxes had no constituents exceeding risk-based criteria

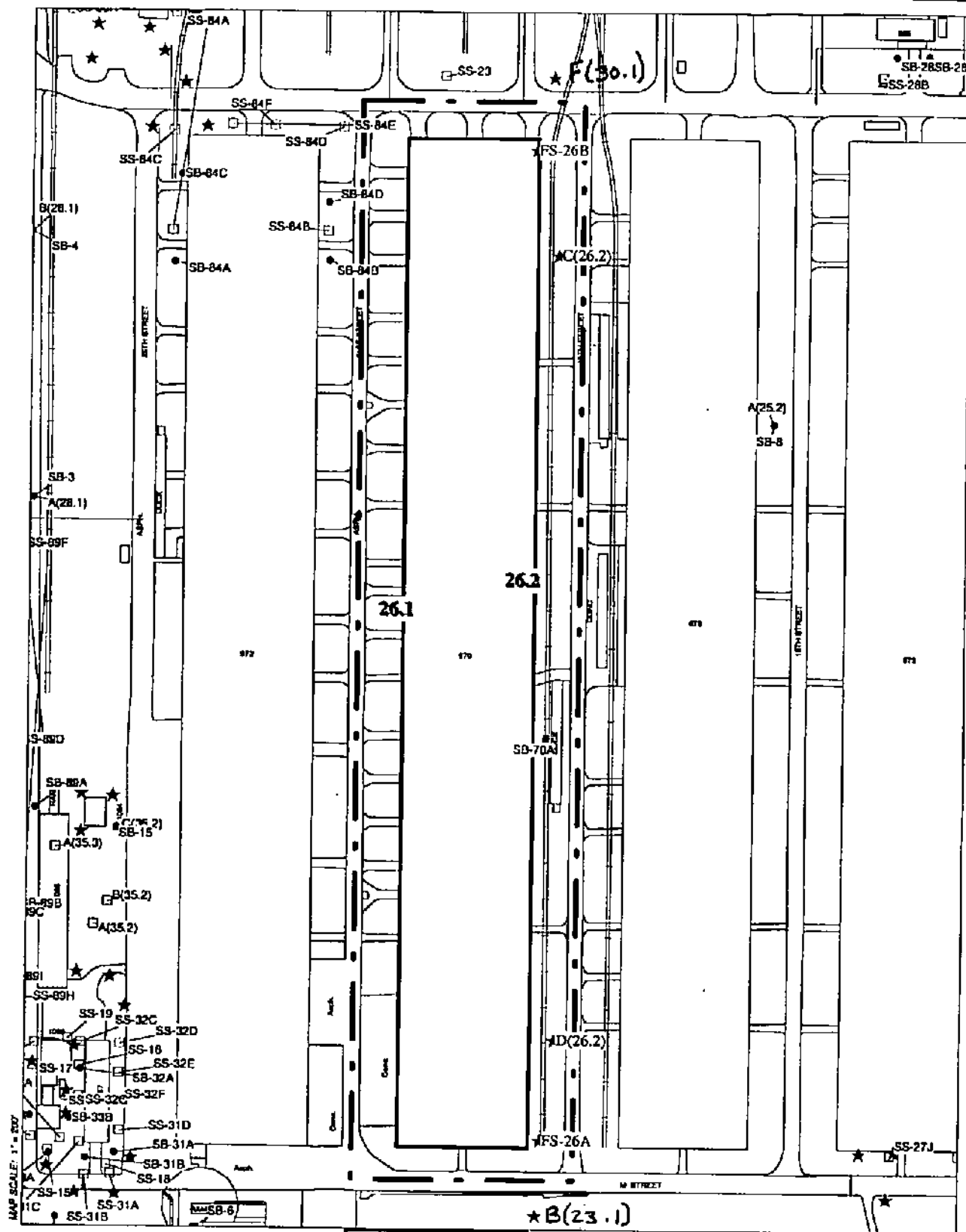


☐ Surface Soil Sampling Location (mg/kg)  
☒ Soil Boring Sampling Location (mg/kg)  
☐ Surface Water Sampling Location (mg/L)  
☒ Sediment Sample Location (mg/kg)  
 Proposed Sampling Location

**(Q) Qualifier Definitions**  
 = - Indicates unqualified detection  
 J - Indicates estimated value above detection limit, but below reporting limit.

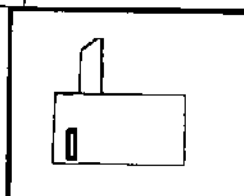
**Figure 2**  
**RI Site 34, Underground Waste Storage Oil Tanks**  
**Constituents Exceeding Risk-Based Criteria**  
*Defense Distribution Depot Memphis, TN*





# LEGEND

- Surface Soil Sampling Locations
- Soil Boring Sampling Locations
- Surface Water Sampling Locations
- Sediment Sampling Locations
- ★ Proposed Sample Location



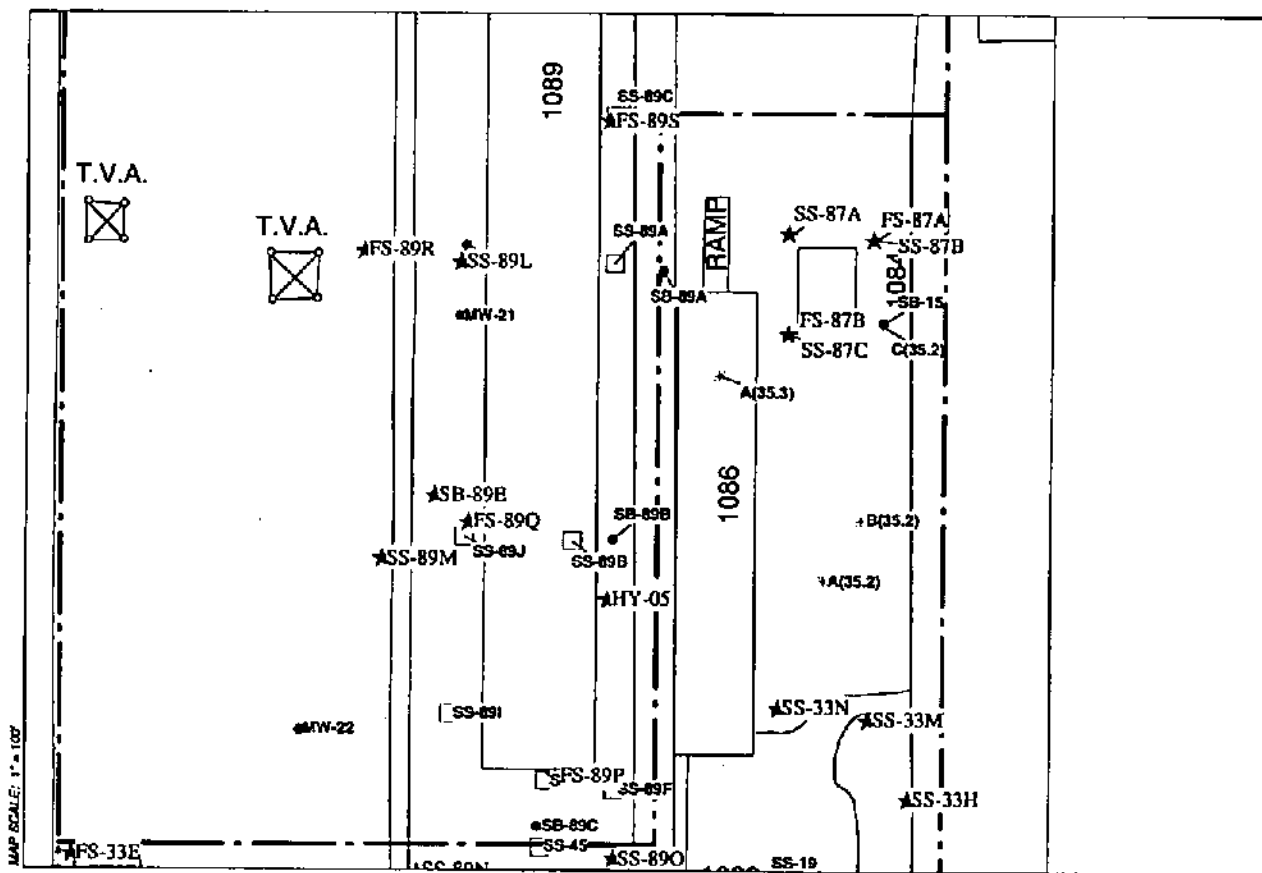
KEY LOCATION MAP

1" = 10,000'






Figure 3  
PARCEL 26  
Sampling Locations

Defense Distribution Depot Memphis, TN

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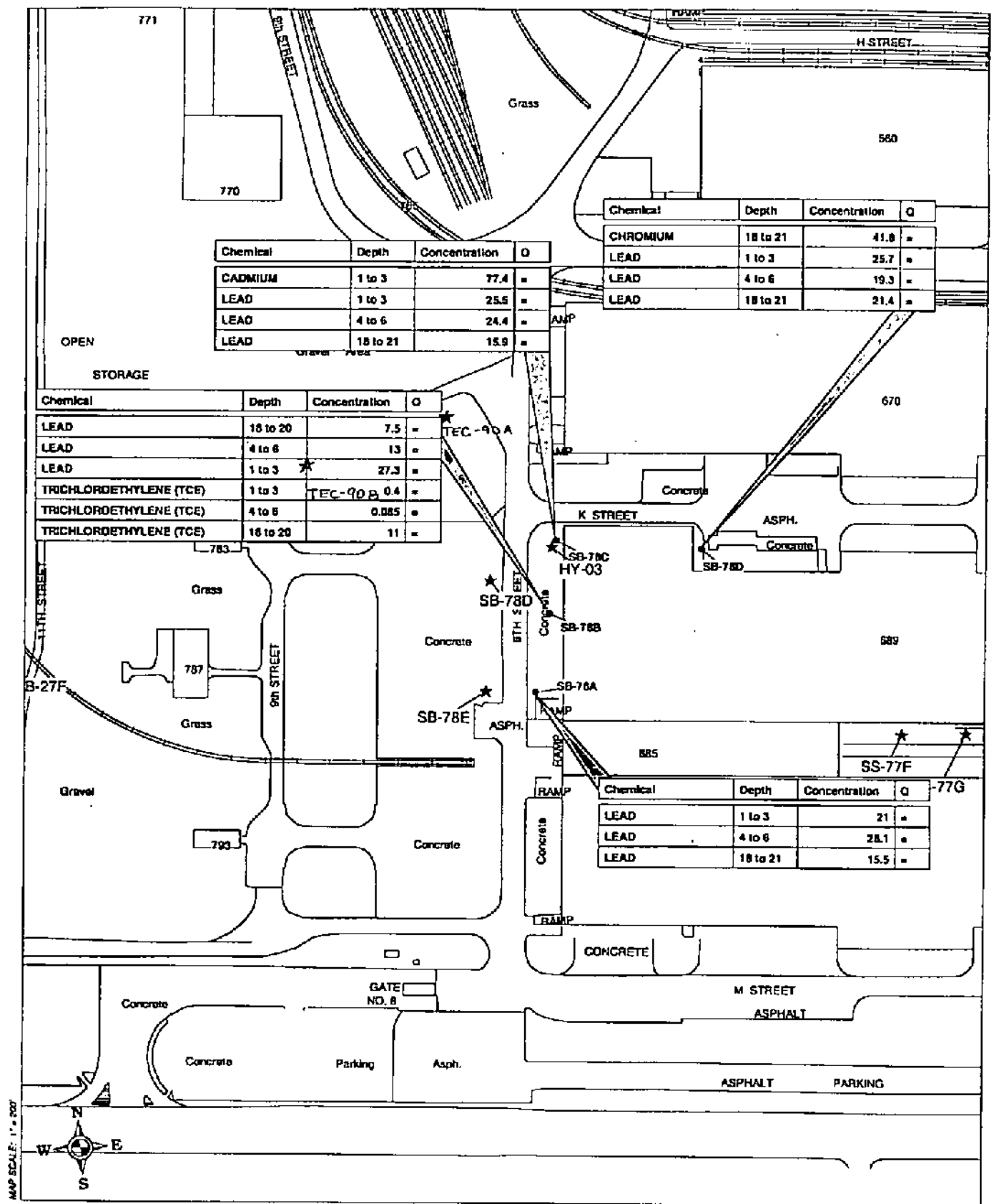


## LEGEND

-  Surface Soil Sampling Locations
-  Soil Boring Sampling Locations
-  Surface Water Sampling Locations
-  Sediment Sampling Locations
-  Proposed Sampling Location

**Figure 4**  
**Site 87, DDT, Banned Pesticides**  
**Sampling Locations**

Defense Distribution Depot Memphis, TN



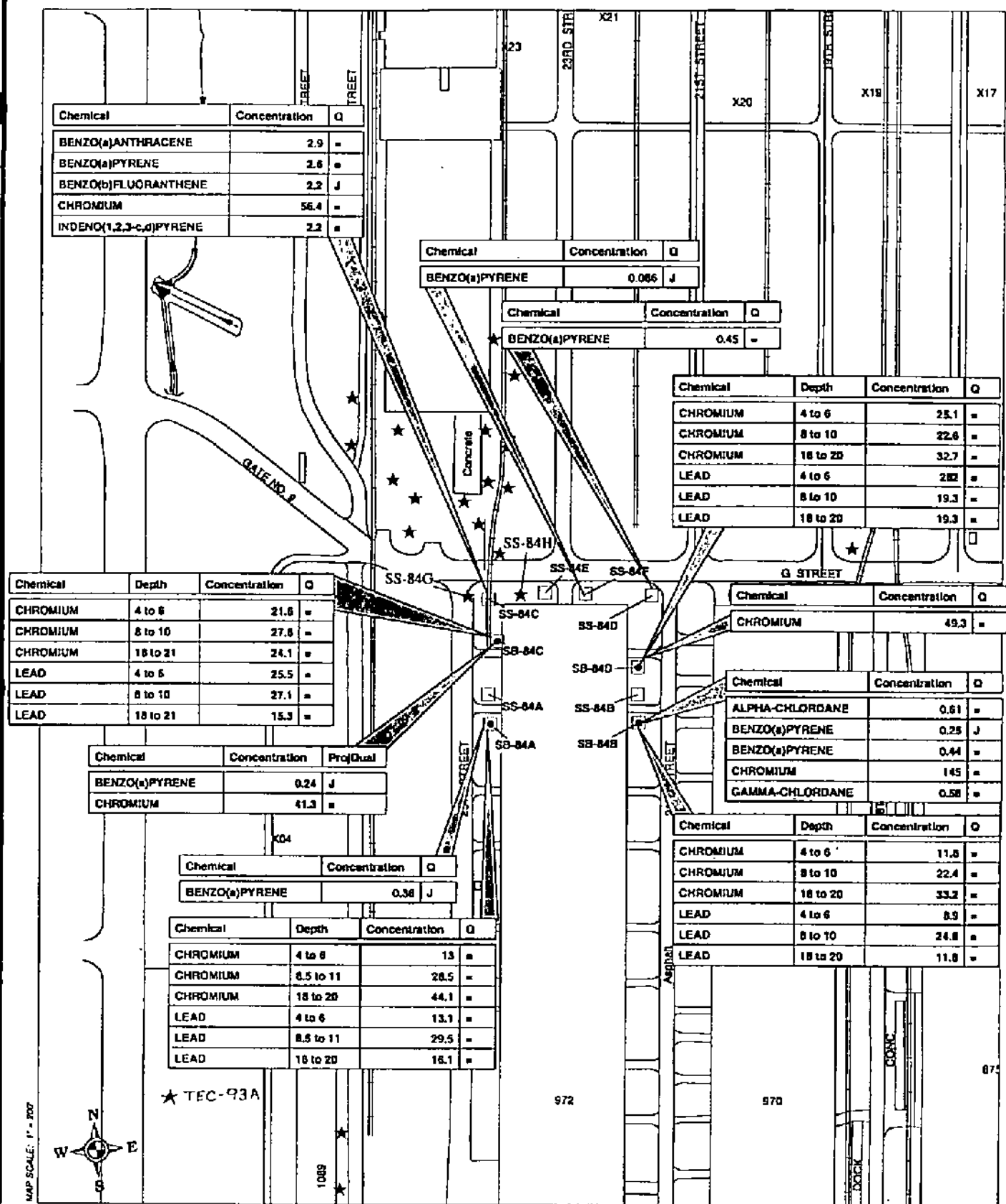
## LEGEND

- Surface Soil Sampling Location (mg/kg)      (Q) Qualifier Definitions  
● Soil Boring Sampling Location (mg/kg)      ■ - indicates unqualified detection  
★ Proposed Sampling Location                  J - indicates estimated value above detection limit, but below reporting limit.

**Figure 5**  
**Old Pond**  
**Proposed Sampling Location**

Defense Distribution Depot Memphis, TN

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