

**CONFIRMATORY SAMPLING INVESTIGATION REPORT
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE**

**CONSTRUCTION DEBRIS LANDFILL
(EASTERN PORTION) — SWMI 10**

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The Contractor, EnSafe Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0318 is complete, accurate, and complies with all requirements of the contract.

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EXECUTIVE SUMMARY

As part of the U.S. Navy Installation Restoration Program, the following Confirmatory Sampling Investigation (CSI) report has been prepared for Solid Waste Management Unit (SWMU) 10, the Construction Debris Landfill (Eastern Portion), Naval Support Activity (NSA) Memphis, Millington, Tennessee. As a result of the Base Closure and Realignment Act (BRAC) of 1990, a portion of NSA Memphis, including SWMU 10, has been closed and is being prepared for transfer to the City of Millington. SWMU 10 was initially identified as not requiring investigation; however, due to the presence of petroleum-related constituents in SWMU 38 (the Miscellaneous Industrial Drainage Ditches) sediments, a CSI was recommended by the BRAC Cleanup Team to determine if SWMU 10 has impacted SWMU 38, which forms the western boundary of the landfill.

SWMU 10 is a 13- to 20-acre landfill on the NSA Memphis Northside that was used as a construction debris disposal area from approximately 1951 to 1986. The area is approximately 300 feet north of SWMU 5 (Aircraft Fire Fighting Training Facility) and 500 feet east of SWMU 60 (Northside Landfill [Western Portion]); both are currently undergoing full Resource Conservation and Recovery Act Facility Investigation (RFI) investigations. The area surrounding SWMU 10 is primarily nonindustrial and undeveloped land. A section of SWMU 38 borders the west side of SWMU 10 and a section of SWMU 6 (N-126 Plating Shop Storm Sewer and Ditch) borders the north side of the landfill. These drainage ditches receive runoff from the airfield and were the subject of a separate RFI investigation. A ravine, which traversed SWMU 10, received most of the storm water runoff from the site and subsequently drained into SWMU 38. In late 1989, surface soil excavated from the NSA Memphis housing area was used to fill and level SWMU 10.

In the spring of 1998, the site was cleared and grubbed and the area was graded, removing the site relief that created the ravine and gullies. According to Espey, Huston and Associates of Nashville, Tennessee, approximately 1,500 to 1,600 cubic yards of soil was brought in from the runway grading project and spread over the site. This topsoil was then seeded.

A geophysical investigation was performed to help identify the extent of the landfill. Based on the information obtained during this investigation, two distinct disposal areas were identified, allowing the CSI to focus on those areas. The sampling portion of the CSI focused on the landfill surface (sitewide for exposure risk evaluation and leaching potential), landfill subsurface (disposal area perimeters for soil and groundwater contamination and leaching potential), and gully sediments (site perimeter for runoff-associated migration and leaching potential). The following conclusions are based on the data collected.

Surface Soil

Soil samples collected from the surface of the landfill contained the following compounds at concentrations exceeding their respective screening levels in one or more samples: benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene exceeded their respective residential and industrial risk-based concentrations (RBCs). Dibenz(a,h)anthracene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dieldrin, heptachlor epoxide, and Aroclor-1260 exceeded residential RBCs. Arsenic exceeded its reference concentration (RC), residential RBC, and the industrial RBC (as a carcinogen); cadmium exceeded its RC and residential RBC; and lead and tin exceeded their RCs. Surface soil conditions have been altered by the recent clearing/grubbing of the site and the addition of soil from the runway grading project.

Sediment

Sediment samples collected from the gullies on the northwestern boundary of SWMU 10, which drains into SWMU 38, contained the following compounds that exceeded their respective sediment screening value (SSV) and/or RC: 4,4'-DDE, 4,4'-DDT, chlordane (alpha and gamma), and dieldrin exceeded the SSV. Benzo(a)anthracene exceeded its SSL. Cadmium exceeded its RC, SSV, and SSL; selenium exceeded its RC and SSL; and silver exceeded its SSV and SSL. The conditions under which the sediment samples were collected have been altered by the clearing/grubbing and grading of the site. The gullies, where samples were collected, no longer exists.

Subsurface Soil

Subsurface samples were collected (2' to 3' feet) from both the main portion of the landfill, and from the gullies on the northwestern boundary of SWMU 10. The sample data indicated that methylene chloride (dichloromethane) and dieldrin exceeded their soil screening levels (SSLs). Cadmium exceeded its RC and SSL. Nickel, which has no RC, exceeded its SSL. The site has been altered since these samples were collected. Clearing/grubbing, grading, and the introduction of soil from another grading project have changed the topography of the site, removing the gullies.

Groundwater

Methylene chloride was detected in samples collected from both the loess groundwater (7.3 $\mu\text{g/L}$ and 6.2 $\mu\text{g/L}$) and the upper fluvial deposits groundwater (6.1 $\mu\text{g/L}$) at concentrations exceeding both the U.S. Environmental Protection Agency (USEPA) maximum contaminant level (5 $\mu\text{g/L}$) and tap water RBC (4.1 $\mu\text{g/L}$); however, this contaminant was detected at only two locations out of 14 loess samples and only one location out of the 18 fluvial deposits groundwater samples. Benzene was present in the loess groundwater (2.9 $\mu\text{g/L}$) at one location at a concentration exceeding the tap water RBC (0.36 $\mu\text{g/L}$). Contaminated groundwater samples containing methylene chloride were collected at the same location as contaminated subsurface-soil samples.

A preliminary risk evaluation (PRE) was performed, based on the data obtained from groundwater, to evaluate the human health risk associated with SWMU 10. Surface soil and sediment were not examined in the PRE because the clearing/grubbing, grading, and introduction of soil to the site have diminished the opportunity for an individual to be exposed to the detected contaminants in these media. The following conclusions and recommendations were made based on this evaluation:

Residential Land Use

- *Carcinogens*: The cumulative risk for the residential scenario was estimated to be 9.9E-6, indicating suitability for lease for residential land use, in accordance with USEPA Region IV's November 1994 memorandum.

- *Noncarcinogens:* No noncarcinogenic constituents were detected at levels requiring a PRE.

Industrial Land Use

- *Carcinogens:* The cumulative risk for the industrial scenario was estimated to be 2.5E-6, indicating suitability for lease for industrial land use in accordance with USEPA Region IV's November 1994 memorandum.
- *Noncarcinogens:* No noncarcinogenic constituents were detected at levels requiring a PRE.

Fate and Transport

Based on the analysis of the former physical characteristics of SWMU 10 and the distributions of contaminants, the following conclusions are presented:

- Three potential contaminant migration pathways are recognized from soil to other media: (1) volatilization of volatile organic compounds (VOCs), (2) erosion and surface runoff of surface soils, and (3) leaching to groundwater via infiltration of precipitation.
- Soil contamination is limited to localized concentrations of VOCs, semivolatile organic compounds (SVOCs), herbicides, pesticides/polychlorinated biphenyls (PCBs), and metals and is generally expected to persist in soils over time.
- SVOCs, PCBs, and inorganics, identified in surface soil, sediment, and subsurface soil, are very persistent based on their relatively low vapor pressure and high octanol/water partitioning coefficient (K_{oc}) value; thus, they are not expected to be very mobile, except via the erosion and runoff pathway.
- The transport of VOCs in groundwater depends primarily on the chemical solubility and the organic content of the soils. Methylene chloride and benzene have relatively high

solubilities and low K_{oc} values, rendering them very mobile. This may explain the presence of methylene chloride in the loess and fluvial deposits groundwater samples collected at locations where it was also detected in the subsurface soil samples.

The clearing/grubbing, grading and introduction of soil to the site has significantly diminished the opportunity for the contaminants to reach a potential receptor.

SWMU 38

The original intent of this CSI was to determine if a release has occurred at SWMU 10 and to determine if past operations or conditions existing at SWMU 10 have contributed to the SVOC concentrations identified in the SWMU 38 sediments during its previous RFI. Evidence does not indicate that SWMU 10 has had a recent impact on the sediment at SWMU 38 because PAHs, SVOCs, and TPH in SWMU 10 sediment samples had a low frequency of detection.

Future Use

In the early spring of 1998, the Millington Airport Authority had the site cleared/grubbed, graded, and soil from the runway grading project brought in and spread over the site. The site was then seeded and the intended site use will be open land that is part of the runway protection zone, remaining a mowed, grass lawn.

Recommendations

At SWMU 10, methylene chloride was reported in loess (two detections out of 14 samples) and fluvial deposits groundwater (one detection out of 18 samples) at concentrations above the tap water RBC and the MCL in three samples. As explained in USEPA's RBC table, the tap water RBC ($4.1 \mu\text{g/L}$) is based on residential land use and a target cancer risk of $1\text{E-}6$. The maximum concentration reported for methylene chloride was $7.3 \mu\text{g/L}$; therefore the risk estimate would be approximately $1.8\text{E-}6$ ($7.3 \mu\text{g/L} \times 1\text{E-}6 \div 4.1 \mu\text{g/L}$). This is within USEPA's acceptable risk range of $1\text{E-}6$ to $1\text{E-}4$ and below the risk threshold of $1\text{E-}4$ recommended by USEPA Region IV to be used in preliminary risk evaluations when determining suitability for lease.

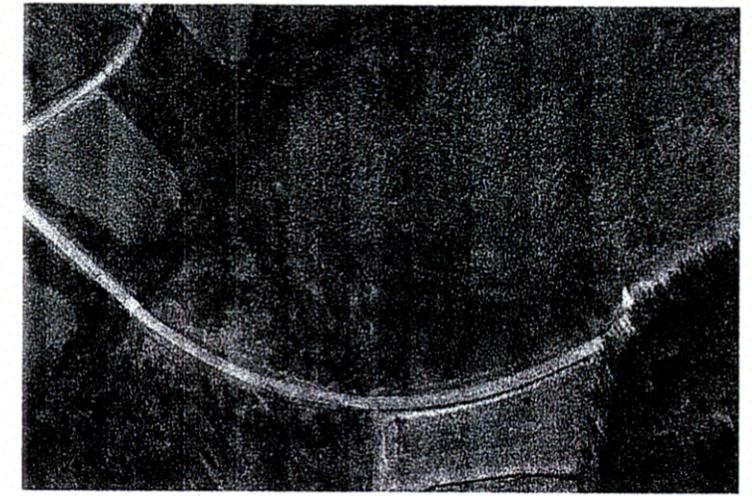
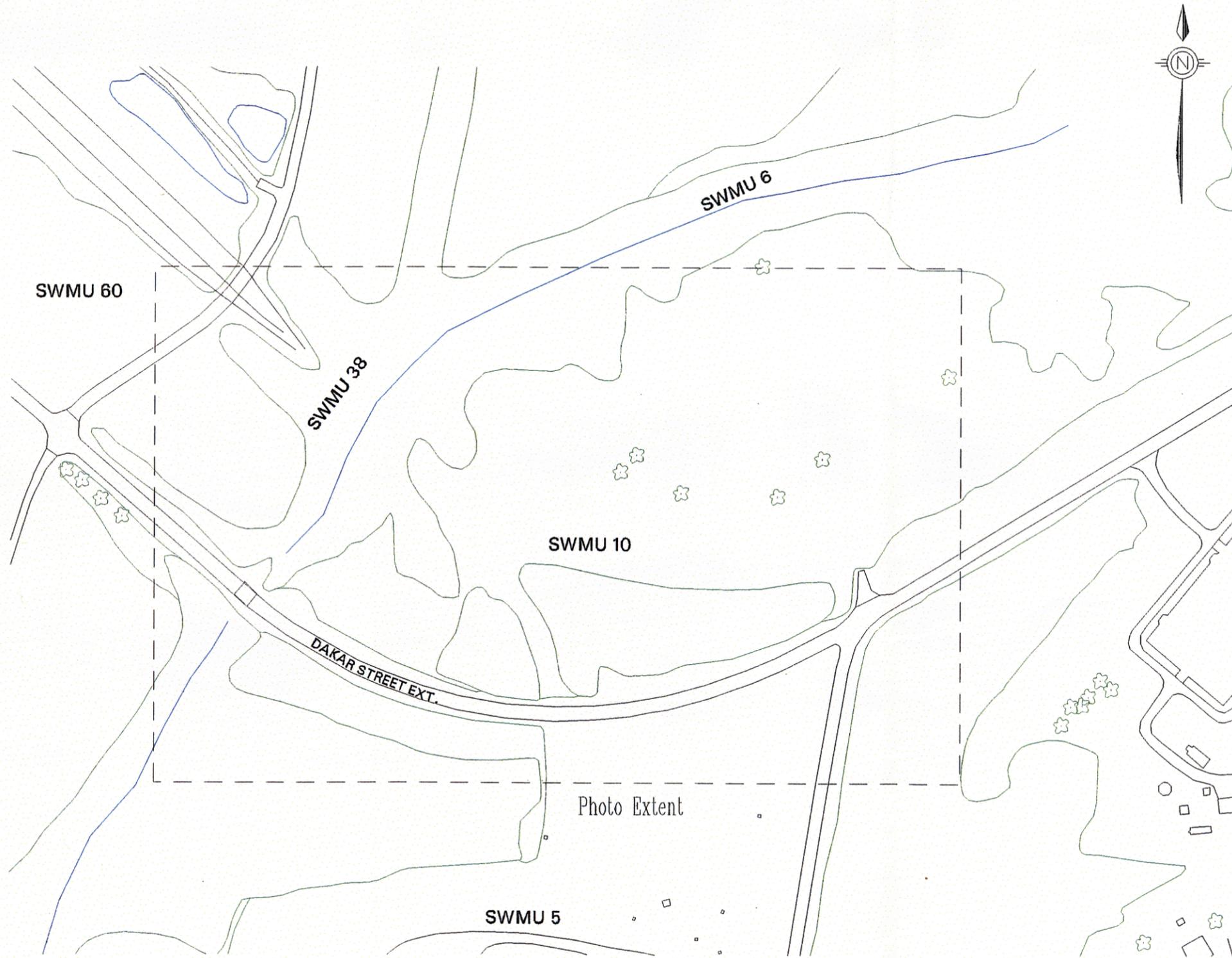
Based on the relatively low concentrations and short half-life of methylene chloride, the infrequency of these detections, the close proximity of contaminated samples to one another, the recent changes to the site condition (clearing/grubbing, grading and addition of soil), and the planned reuse of the site as a mowed field in association with the runway protection zone, no further action is recommended for SWMU 10. However, coordination with the TDEC Division of Solid Waste is recommended to determine whether additional cover or other closure actions will be required for the landfill.

1.0 INTRODUCTION

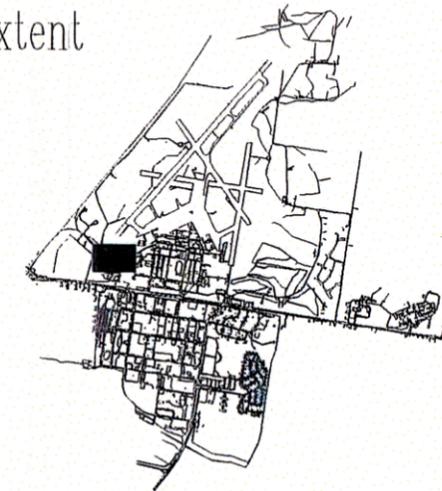
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CSI Report
NSA Memphis
Construction Debris Landfill (Eastern Portion) – SWMU 10
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Map Extent



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RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-1
SITE AND VICINITY MAP
CONSTRUCTION DEBRIS LANDFILL (EAST
SECTION) SWMU 10

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2.0 SITE DESCRIPTION AND BACKGROUND INFORMATION

SWMU 10 is a 13- to 20-acre construction-debris landfill on the NSA Memphis Northside (Figure 1-1) that operated as a disposal area from approximately 1951 to 1986. The area is approximately 300 feet north of SWMU 5 (Aircraft Fire Fighting Training Facility) and 500 feet east of SWMU 60 (Northside Landfill [Western Portion]). Both of these SWMUs are currently undergoing full Resource Conservation and Recovery Act Facility Investigation (RFIs). The area surrounding SWMU 10 is primarily non-industrial and undeveloped land. A section of SWMU 38, the Miscellaneous Industrial Drainage Ditches, borders the west side of SWMU 10 and a section of SWMU 6 (N-126 Plating Shop Storm Sewer and Ditch) borders the north side of the landfill. These drainage ditches receive runoff from the airfield and were addressed under a separate RFI investigation. The ravine, which drained into SWMU 38, received most of the storm water runoff from the site. In late 1989, surface soil excavated from the NSA Memphis housing area was used to fill and level SWMU 10.

In the spring of 1998, the site was cleared and grubbed and the area was graded, removing the site relief that created the ravine. According to Espey, Huston and Associates of Nashville, Tennessee, approximately 1,500 to 1,600 cubic yards of soil was brought in from the runway grading project and spread over the site. This topsoil was then seeded. The intended site use will be open land that is part of the runway protection zone and will remain a mowed field.

2.1 Regional Geology and Hydrogeology

The general hydrogeology of the Memphis area is discussed in detail in Section 2.11 and a conceptual model of the hydrogeology at NSA Memphis is presented in Section 2.12 of the *Comprehensive RFI Work Plan (E/A&H, October 1994)*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee* (Kingsbury and Carmichael, 1995). On the basis of this

and other updated information, the hydrogeology of the principal units under investigation at NSA Memphis Northside is resummarized below.

The two stratigraphic units investigated during the RFIs at the NSA Memphis Northside are the loess/alluvium of Pleistocene and Holocene age and the underlying fluvial deposits of Pleistocene to Pliocene age. The loess — eolian deposits consisting of silt, silty clay, clay, and minor amounts of sand — is the principal unit occurring at land surface throughout most of the NSA Memphis Northside. Alluvium, which is restricted to minor stream valleys on the NSA Memphis Northside, includes alluviated or reworked loess with some sandy lenses locally. The loess is typically 0 to 65 feet in the Memphis area; at the NSA Memphis it ranges from 15 to 45 feet thick. Water-bearing zones are present in the loess primarily in the upper part of this unit; however, yields are low and water-quality analyses performed during the water-use survey portion of previous underground storage tank (UST) investigations at the NSA Memphis Northside indicate that turbidity normally associated with samples of uncontaminated loess groundwater cause it to not meet many primary and secondary drinking water standards. Previous investigations at NSA Memphis Northside have found depth to water in the loess varying between 5 and 15 feet below land surface (bls) and vertical hydraulic conductivities to range from 10^{-6} to 10^{-8} centimeter per second (cm/sec) (Appendix A). Although the loess may be considered an aquitard on the basis of the relatively low hydraulic conductivities, the shallowest water-bearing zone within the NSA Memphis is present within this unit. Groundwater flow in the loess is primarily downward, although locally some groundwater in the loess/alluvium may discharge to nearby streams, drainage ditches, and other surface-water bodies.

The fluvial deposits underlie the loess in upland areas of the NSA Memphis Northside and consist of sand, gravel, and some clay, with thin layers of ferruginous sandstone and conglomerate locally in the basal part. This unit ranges from 0 to 100 feet thick in the Memphis area; on the Northside

of NSA Memphis, it ranges from 10 to 60 feet thick and represents the most significant component of the surficial aquifer. Many shallow domestic wells in rural areas of Memphis are completed in the fluvial deposits. Relative groundwater elevations between wells completed in the loess/alluvium and fluvial deposits indicate semiconfined to confined conditions in the fluvial deposits. Typically a downward vertical gradient exists between water in the loess/alluvium and the fluvial deposits in most areas of the NSA Memphis Northside, except for the most northern part. Sediments in the fluvial deposits generally coarsen with depth, and the upper portion typically consists of a mixture of very fine sand with varying degrees of silt and clay that becomes increasingly less silty with depth, grading into a fine to medium sand near the middle of the unit. Grain sizes typically coarsen below this interval, grading into a gravelly sand near the basal section.

Within the NSA Memphis Northside, the fluvial deposits are underlain by the Cockfield Formation, the uppermost part of the Jackson-upper Claiborne confining unit. The Cockfield Formation is a heterogeneous formation consisting of very fine silty sand interbedded with clay and silt lenses or clay with interbedded fine sand lenses. The more permeable characteristics of the fluvial deposits, compared to the relatively impermeable properties of the overlying loess/alluvium and the underlying Cockfield Formation, result in the fluvial deposits being the preferential zone of groundwater flow and contaminant transport in the subsurface beneath the NSA Memphis Northside.

2.2 Site-Specific Geology and Hydrogeology

The subsurface investigation at SWMU 10 did not include the collection of lithologic data. However, site-specific data are available from SWMU 5 (E/A&H, May 1996), which is on the south side of Dakar Street Extended, approximately 500 feet south of SWMU 10.

A stratigraphic profile was assembled from the lithologic information collected from borehole and geophysical-logging data collected during the SWMU 5 RFI. The profile shows the local geology from 0 to 63.7 feet bls, which is the approximate depth to the top of the Cockfield Formation in the SWMU 5/SWMU 10 area. The loess/alluvium and fluvial deposits are described below.

Loess/Alluvium

Silt and clay soil types were encountered from land surface to the top of the fluvial deposits, which ranged from 31 to 40 feet bls at SWMU 5. The loess consists of a moist yellowish-brown silt changing in color at about 15 to 20 feet bls to a gray to medium gray/clayey silt. The observed thickness of the loess at SWMU 5 is approximately 38 feet, which is the typical thickness identified throughout the NSA Memphis Northside (E/A&H, October 1994).

A Shelby tube sample collected during the SWMU 5 RFI at the 18- to 20-foot depth interval was analyzed for vertical hydraulic conductivity per American Society for Testing and Materials Method D-5084-90 using a flexiwall permeameter. The results indicated a permeability coefficient of 1.4×10^{-7} cm/sec. Sieve analysis indicated a lean clay soil type.

Fluvial Deposits

The upper portion of the fluvial deposits at SWMU 5 consists of silty sand with layers of clay (lenses). The amount of gravel increases with depth; likewise, sand grain-size distribution shifts from fine-grained in the upper part of the fluvial deposits to coarse-grained in the lower part. The base of the fluvial deposits consists of sand with gravel. Gravel content varied from boring to boring at SWMU 5.

2.3 Site-Specific Hydrogeology

A specific capacity of 0.75 gallons per minute per foot was calculated for well 005G01UF at SWMU 5, based on drawdown measured in the well during purging. Using this specific-capacity value and a fluvial deposits aquifer thickness of 25 feet at this location, a horizontal hydraulic conductivity was approximated at 12.17 feet per day (ft/day; E/A&H, May 1996).

Groundwater level data were collected from SWMU 5 on March 31, 1995, and on March 3, 1996. These data were used to determine the potentiometric surface in the fluvial deposits from each date, and the loess for the March 1996 data. Data from both the March 1995 and 1996 measurements indicate general groundwater movement to the west-northwest in the fluvial deposits. The hydraulic gradient for the fluvial deposits was estimated for the March 1995 and March 1996 data at 1.6×10^{-3} and 1.4×10^{-3} feet/foot, respectively. Flow in the loess is indicated to the northwest at the east side of the site near the former UST 1489 location, and to the west-northwest on the west end of site near the former UST 1508 location. The indicated groundwater flow directions are similar to those identified in the 1992 UST environmental assessment (E/A&H, 1992).

The horizontal groundwater velocity was estimated for the fluvial deposits using the hydraulic conductivity and estimated gradients. Velocity for the March 1995 data was estimated at 0.069 ft/day and the estimate for the March 1996 data was 0.061 ft/day.

Horizontal groundwater velocities were calculated using the following derivation of Darcy's law:

$$V = Ki/n$$

where:

K = hydraulic conductivity from specific-capacity test
i = groundwater gradient
n = effective porosity of aquifer matrix

An effective porosity of 28% for the fluvial deposits sand and gravel (Heath, 1989) is assumed.

The vertical gradient between the loess and the fluvial deposits was approximated as 0.32. This was calculated by determining the difference in groundwater elevation and dividing by the distance (elevation difference) between the top of the fluvial deposits and the middle of a loess well-screen at a selected location. The top of the fluvial deposits was used instead of the middle elevation of the fluvial well screen since the groundwater in the fluvial deposits is confined. The positive gradient value indicates downward flow. Wells 005G03S and 005G03UF were chosen because both were installed during the SWMU 5 RFI using rotasonic drilling techniques.

3.0 PRELIMINARY INVESTIGATIONS

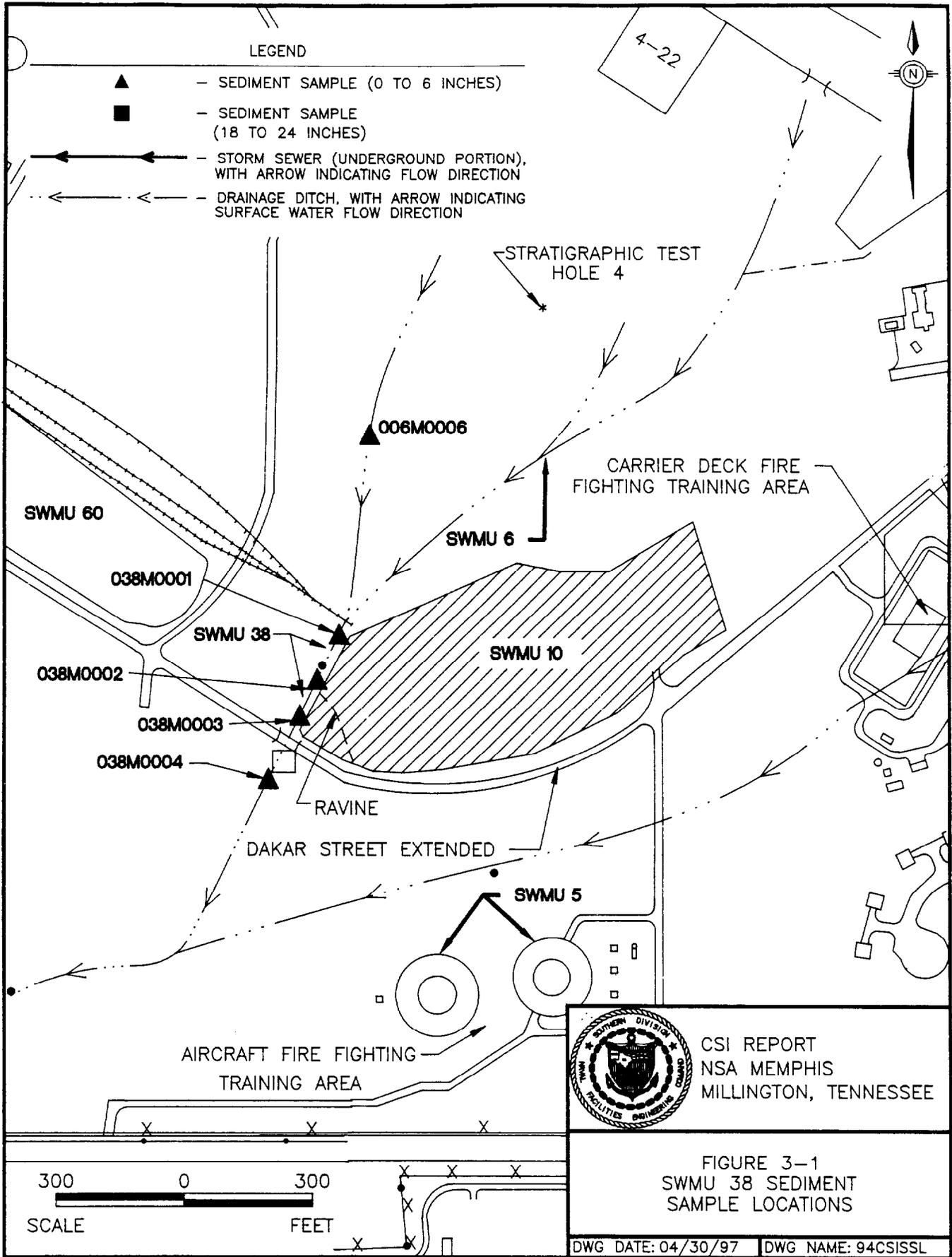
Previous studies conducted at SWMU 10 are limited to the 1983 Initial Assessment Study (IAS). According to the IAS, the material disposed of at the site "consisted of mostly construction rubble and other inert materials." Based on this information, the SWMU was not recommended for further study.

In 1989, the Department of the Navy conducted a Preliminary Assessment (PA) at NSA Memphis to document the site conditions for what was then the Tennessee Department of Health and Environment (currently Tennessee Department of Environment and Conservation [TDEC]). The PA relied exclusively on information obtained from NSA Memphis records and a visual site inspection. Based on the information obtained during that investigation, SWMU 10 again was not recommended for further investigation.

However, in 1995, EnSafe/Allen & Hoshall (E/A&H), on behalf of the Navy, investigated SWMU 38 as part of the Assembly B RFI and identified elevated concentrations of petroleum-related constituents in the sediments adjacent to and downstream of SWMU 10. Figure 3-1 shows the SWMU 38 sediment sample locations, and Tables 3.1 and 3.2 summarize the contaminants identified along the reach of SWMU 38 adjacent to SWMU 10. To identify the source for these petroleum constituents, the NSA Memphis BCT determined that an investigation of the SWMU 10 landfill was warranted.

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Table 3.1
SWMU 38 — Organics Sample Summary — Hits Only (µg/kg)

Sample ID	Parameter	Concentration	
038M000101	4,4'-DDD	460 DJ	
	4,4'-DDE	95 DJ	
	4,4'-DDT	180 DJ	
	Acenaphthene	310 J	
	Acenaphthylene	93 J	
	Acetone	8 J	
	Benzo(a)anthracene	3,200	
	Benzo(a)pyrene	3,900	
	Benzo(b)fluoranthene	5,000	
	Benzo(g,h,i)perylene	1,400	
	Benzo(k)fluoranthene	2,100	
	bis(2-Ethylhexyl)phthalate (BEHP)	410 J	
	Anthracene	400 J	
	Butylbenzylphthalate	380 J	
	Carbazole	340 J	
	Chrysene	3,600	
	Dibenz(a,h)anthracene	630	
	Dibenzofuran	150 J	
	Dieldrin	220 DJ	
	Fluoranthene	4,700	
	Fluorene	260 J	
	Indeno(1,2,3-cd)pyrene	1,500	
	Naphthalene	60 J	
	Phenanthrene	1,900	
	Pyrene	4,700	
	Total Petroleum Hydrocarbons	420,000	
	TPH - Diesel Range Organics	82,000	
	038M000201	4,4'-DDD	37 DJ
		4,4'-DDE	72 DJ
		4,4'-DDT	47 DJ
		Dieldrin	44 DJ
Fluoranthene		330 J	
Pyrene		260 J	
TPH - Diesel Range Organics		11,000	

Table 3.1
 SWMU 38 — Organics Sample Summary — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration
038M000301	4,4'-DDD	130 DJ
	4,4'-DDE	70 DJ
	4,4'-DDT	87 DJ
	Acenaphthene	640 J
	Anthracene	470 J
	Benzo(a)anthracene	1,900 J
	Benzo(a)pyrene	1,700 J
	Benzo(b)fluoranthene	1,900 J
	Benzo(g,h,i)perylene	630 J
	Benzo(k)fluoranthene	1,600 J
	BEHP	630 J
	Bromomethane	2 J
	Chrysene	2,100 J
	Dibenz(a,h)anthracene	350 J
	Dibenzofuran	270 J
	Dieldrin	150 DJ
	Fluoranthene	3,800
	Fluorene	510 J
	Indeno(1,2,3-cd)pyrene	730 J
	Phenanthrene	1,800 J
Pyrene	3,300 J	
TPH - Diesel Range Organics	23,000	
Total Petroleum Hydrocarbon	360,000	
038M000401	4,4'-DDD	11 J
	Acetone	49
	Dieldrin	12 J
	TPH - Gasoline Range Organics	67 J
038M000402	2-Butanone (MEK)	7 J
	Acetone	93
	Bromomethane	2 J
	Toluene	1 J
	TPH - Diesel Range Organics	15,000

Notes:

- J = Laboratory data qualifier; concentration is less than the method detection limit and therefore is estimated.
- D = Laboratory data qualifier; sample was diluted prior to analysis.
- $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Table 3.2
SWMU 38 — Inorganic Sample Summary — Hits Only (mg/kg)

Sample ID	Parameter	Concentration
038M000101	Arsenic	8.9
	Barium	109
	Cadmium	1.1 J
	Chromium	19.9
	Cobalt	9.4 J
	Copper	22.4
	Lead	73 J
	Mercury	0.2
	Nickel	22.9
	Vanadium	25.8
	Zinc	85.4
038M000201	Arsenic	6.8
	Barium	102
	Chromium	11.9
	Cobalt	6 J
	Copper	14.5
	Lead	22.2 J
	Nickel	14.1
	Thallium	0.57 J
	Vanadium	19.2
	Zinc	47.8
	038M000301	Arsenic
Barium		116
Cadmium		0.83 J
Chromium		14.9
Cobalt		10.1 J
Copper		16.6
Lead		43 J
Mercury		0.16
Nickel		16.3
Vanadium		21.2
Zinc		58.9

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Table 3.2
SWMU 38 – Inorganic Sample Summary – Hits Only (mg/kg)

Sample ID	Parameter	Concentration
038M000401	Arsenic	18.3 J
	Barium	233
	Cadmium	1.3 J
	Chromium	10.3 J
	Cobalt	18.3
	Copper	18.7
	Lead	18.7 J
038M000402	Nickel	21
	Vanadium	33.8 J
	Zinc	57 J
	Arsenic	16.2 J
	Barium	196
	Cadmium	1.1 J
	Chromium	10.9 J
	Cobalt	9.2 J
	Copper	19
	Lead	16.7 J
Nickel	13.2	
Vanadium	21.7 J	
Zinc	50.9 J	

Notes:

J = Laboratory data qualifier; concentration is less than the method detection limit and therefore is estimated.
 mg/kg = milligram per kilogram (part per million)

4.0 FIELD INVESTIGATIONS AND METHODOLOGY

This section summarizes the field sampling rationale, objectives, and protocols employed during this CSI at SWMU 10, which were based on the following U.S. Environmental Protection Agency (USEPA) and TDEC-approved documents: *Comprehensive RFI Work Plan* (E/A&H, October 1994), *Assembly A Site Investigation Plans* (E/A&H, October 1994) and the *Assembly B Site Investigation Plans* (E/A&H, May 1996). The soil and groundwater sampling tasks performed during the CSI followed the procedures outlined in the *Comprehensive RFI Work Plan*.

The investigation focused on four media: surface soil, subsurface soil, sediment, and groundwater. Table 4.1 presents the rationale for each medium sampled:

Table 4.1
SWMU 10 — Sampling and Analysis Rationale

Media	Analysis	Sample Interval	Rationale
Surface Soil	Full Scan Analysis (FSA)	0 to 1 foot bls	Surficial soil samples (0 to 1 foot bls) were collected to assess impact from past operations at the landfill, assess risk (human health or ecological) associated with exposure, and contaminant migration potential associated with the landfill.
Subsurface Soil	Volatile Organic Compounds (VOCs)	2 to 3 feet bls & Soil-Water Interface (approx. 15 feet bls)	Subsurface soil samples (> 1 foot bls) were collected to screen for possible releases associated with past operations at the landfill and to assess the contaminant migration potential of the landfill. VOCs were selected as an indicator parameter because of their ease of collection and onsite analysis, and because their mobility in the environment makes them a potential groundwater contaminant.
Sediment	FSA	0 to 1 foot bls	Sediment samples were collected to assess the migration potential of any contaminants present, to determine if SWMU 10 is one of the sources of the contaminants detected in the SWMU 38 sediments, and to assess the human health and ecological risk associated with the landfill.

Table 4.1
SWMU 10 – Sampling and Analysis Rationale

Media	Analysis	Sample Interval	Rationale
Groundwater	VOCs	Fluvial Deposits (approximately 45 feet bls)	Groundwater samples (upper fluvial deposits groundwater) were collected to determine if past operations at the landfill have impacted the groundwater, to assess both the vertical (downward) and horizontal contaminant migration potential, and to assess risk. VOCs were selected as an indicator parameter for the reasons stated above. Also, VOCs have been the most common groundwater contaminant at other NSA Memphis SWMUs.

Specific objectives for the CSI at SWMU 10 were to:

- Delineate the horizontal extent of the operational area of the landfill using geophysical methods.
- Determine the presence of any surface soil, subsurface soil, or sediment contamination (possible source of contamination found at SWMU 38), and delineate if necessary.
- Determine the presence of any contamination in the shallow (loess) groundwater or deeper (upper fluvial deposits) groundwater, and delineate if necessary.

4.1 Geophysical Investigation

A geophysical investigation was conducted at SWMU 10 to determine the outer boundaries of the landfill and to identify the disposal cells. An EM-31 terrain conductivity meter was used to locate disturbed areas and to identify subsurface metallic objects. The survey was conducted using procedures outlined in Section 4.3.3.2 of the *Comprehensive RFI Work Plan*. The results of the electromagnetic (EM) survey are described briefly in Section 5.1 and detailed in Appendix B of this report.

4.2 Soil and Sediment Investigation

Soil samples were collected using either a hand-auger or a Geoprobe direct-push sampler. Samples collected using stainless-steel hand-augers followed the methods outlined in Section 4.4.3 of the *Comprehensive RFI Work Plan*. The hand auger method was used to collect samples from shallow depths (<1 foot bls). The direct push method was used to collect samples from 1 foot bls to 15 feet bls, following the methods outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*.

4.3 Groundwater Investigation

The direct push, or Geoprobe, sampling methodology was also used to collect groundwater samples during the SWMU 10 investigation. Groundwater samples were collected from both the loess (approximately 18 feet bls) and from the upper part of the fluvial deposits (approximately 45 feet bls). All groundwater samples were collected in accordance with Section 4.6.2 of the *Comprehensive RFI Work Plan*.

4.4 Analytical Methods

Soil and groundwater samples were collected and analyzed to determine the nature and extent of any contaminants and to assess potential human-health and ecological risks. To expedite the investigation, an onsite mobile laboratory was used to analyze for VOCs only and to provide quick turnaround on the samples collected. Samples collected for risk assessment were submitted to an offsite laboratory for full scan analysis (FSA), to include the parameters shown in Table 4.2.

A portion of the samples collected for VOC analysis, and all samples collected for FSA, were submitted to National Environmental Testing, laboratory in Bedford, Massachusetts. Samples were analyzed in accordance with Solid Waste 846 methods and reporting requirements were based on the USEPA Contract Laboratory Program (CLP) Target Compound List. Soil and groundwater

samples were analyzed using Level III-equivalent data quality objectives. Table 4.2 summarizes the parameters and methods.

Table 4.2
 Analytical Parameters — Chemical Characterization
 Northside Landfill (Eastern Portion) — SWMU 10
 NSA Memphis

Purpose	Media	Parameters	SW-846 Method
Risk Assessment and Site Characterization	Surface Soil and Sediment	<u>Full Scan Analysis</u>	
		Volatile Organic Compounds	8240
		Semivolatile Organic Compounds	8270
		Chlorinated Pesticides	8080
		Organophosphorus Pesticides	8140
		Herbicides	8150
		Appendix IX Metals	6010/7000 series
		Cyanide	9012
		Total Petroleum Hydrocarbons - (gasoline range organics)	TN Modified 8015
Total Petroleum Hydrocarbons - (diesel range organics)	TN Modified 8015		
Site Characterization	Subsurface Soil	Volatile Organic Compounds	8240
	Groundwater	Volatile Organic Compounds	8240

4.4.1 Sampling Protocols

All sampling activities were conducted in accordance with the *Comprehensive RFI Work Plan*. Sample handling was minimized and material was transferred from the sampling device to containers expediently, in as clean an environment as possible. Plastic sheeting was laid over the sample table and new gloves were donned before each sample was collected. Empty containers were kept packaged until use, at which time they were immediately chilled and isolated in a cooler. VOC samples were containerized first from unhomogenized material (soil/sediment) to minimize the loss of volatile constituents.

Quality Assurance/Quality Control Samples

Quality assurance/quality control (QA/QC) samples were collected to evaluate the sampling and analytical process, quality of equipment decontamination, quality of source waters and materials, sample exposure to ambient contamination during handling, and the level of laboratory precision and accuracy. QA/QC samples were analyzed for the same contaminant assessment parameters as the associated environmental samples. All field QA/QC samples were collected in accordance with the *Comprehensive RFI Work Plan* and consisted of the following:

Type and frequency

- *Duplicates*: 10% of soil and groundwater samples.
- *Equipment rinsates*: One per week during sampling.
- *Field blanks*: Once per sampling event (week) per source of water.
- *Matrix spikes/matrix spike duplicates*: 5% of the samples collected.
- *Trip blanks*: Submitted with each cooler containing VOC samples.

Samples requiring chemical preservation were preserved in the field in accordance with the USEPA *Standard Operating Procedures/Quality Assurance Manual* (USEPA, May 1996). As soon as samples were collected, sample containers were labeled, a custody seal was placed over each lid with the sample identification, date, and sampler's name designated, then the containers were placed in a cooler.

Sample Processing and Chain of Custody

Samples shipped offsite were individually bubble-wrapped, bagged in resealable bags, and packed inside sturdy coolers containing bagged ice. Samples were typically shipped to the laboratory the day of collection and positioned in the cooler with a sufficient volume of ice to maintain uniform and appropriate preservation temperatures during shipment. Temperature blanks were placed in

all coolers for laboratory verification of the temperature inside the cooler. Trip blanks were placed in coolers containing samples for VOC analysis. Cooler lids were secured with packing tape and sealed with signed custody seals. Packaged samples were shipped overnight via Fed Ex priority service for next morning delivery. The laboratory was notified on the day of shipment of the number of samples submitted and E/A&H personnel were contacted by the laboratory the following day to acknowledge receipt of the samples and their conditions. All sample shipments were reported to have arrived at the laboratory in good condition and at appropriate temperatures.

To ensure the integrity of the sample transfer process, a strict chain-of-custody procedure was implemented for all samples collected. This procedure was initiated in the field for each sampling event and followed through custody transfer to the contract laboratory. A chain-of-custody form was completed for each sample batch, itemizing sample numbers, containerization, preservatives, analyses requested, date and time of sampling, and FedEx shipment number. Custody transfers were recorded by signature, date and time of relinquishment, and receipt of custody by the parties involved.

Sample Labeling

All samples collected in the field were labeled with a 10-digit alphanumeric code that identified the site, sample media, location, and depth. The first three digits identify the site location (SWMU 10 = 010). The fourth digit identifies the sample type collected (soil = S, soil duplicate = C, sediment = M, groundwater = G, groundwater duplicate = H). The next four digits indicate the sample location (0001 = location 001), and the ninth and tenth digits represent the sample depth (50 = 50 feet bls).

Examples:

010S000107 SWMU 10 — soil sample from location 1 at 7 feet bls

010H001150 SWMU 10 — duplicate groundwater sample from location 11 at 50 feet bls

4.4.2 Data Validation

Data from FSA samples were validated using either CKY Environmental Services, Inc. of Torrance, California, or Validata Chemical Services of Norcross, Georgia. Data validation was performed in accordance with *USEPA CLP National Functional Guidelines for Organic and Inorganic Data Review* (USEPA, 1994). A data validation report is included as Appendix D and analytical data is included as Appendix E.

4.5 Decontamination and Investigation-Derived Waste

Decontamination

Field equipment was decontaminated in accordance with guidelines set forth in the *Comprehensive RFI Work Plan*. All nondisposable sampling equipment was decontaminated before and after use as outlined here:

- High-pressure, hot soap and water wash/scrub.
- Rinse with potable water.
- Rinse with deionized water.
- Rinse with pesticide-grade isopropyl alcohol.
- Rinse with deionized water.
- Wrap with aluminum foil.

New disposable nitrile gloves were donned before personnel handled decontaminated sampling equipment. Rinse water generated from decontamination activities was stored in a 2,000-gallon holding tank at the decontamination pad at Building S-775 and emptied into the oil-water separator (which drains into the sanitary sewer) after a VOC scan and approval from the City of Millington's wastewater consultant, Fisher & Arnold, Inc.

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5.0 CONFIRMATORY SAMPLING INVESTIGATION RESULTS

5.1 Geophysical Investigation

As stated in Section 4.1, a geophysical investigation was performed to determine whether any buried metallic objects were present at SWMU 10, and to detect any areas of disturbed soil that could indicate disposal cells. The in-phase results show an area of possibly disturbed soil in the southeastern portion of the site. The conductivity results indicate a buried metallic object, possibly an abandoned sewer line, traversing the site from north to south. Maps and details of the geophysical investigation are included in Appendix B.

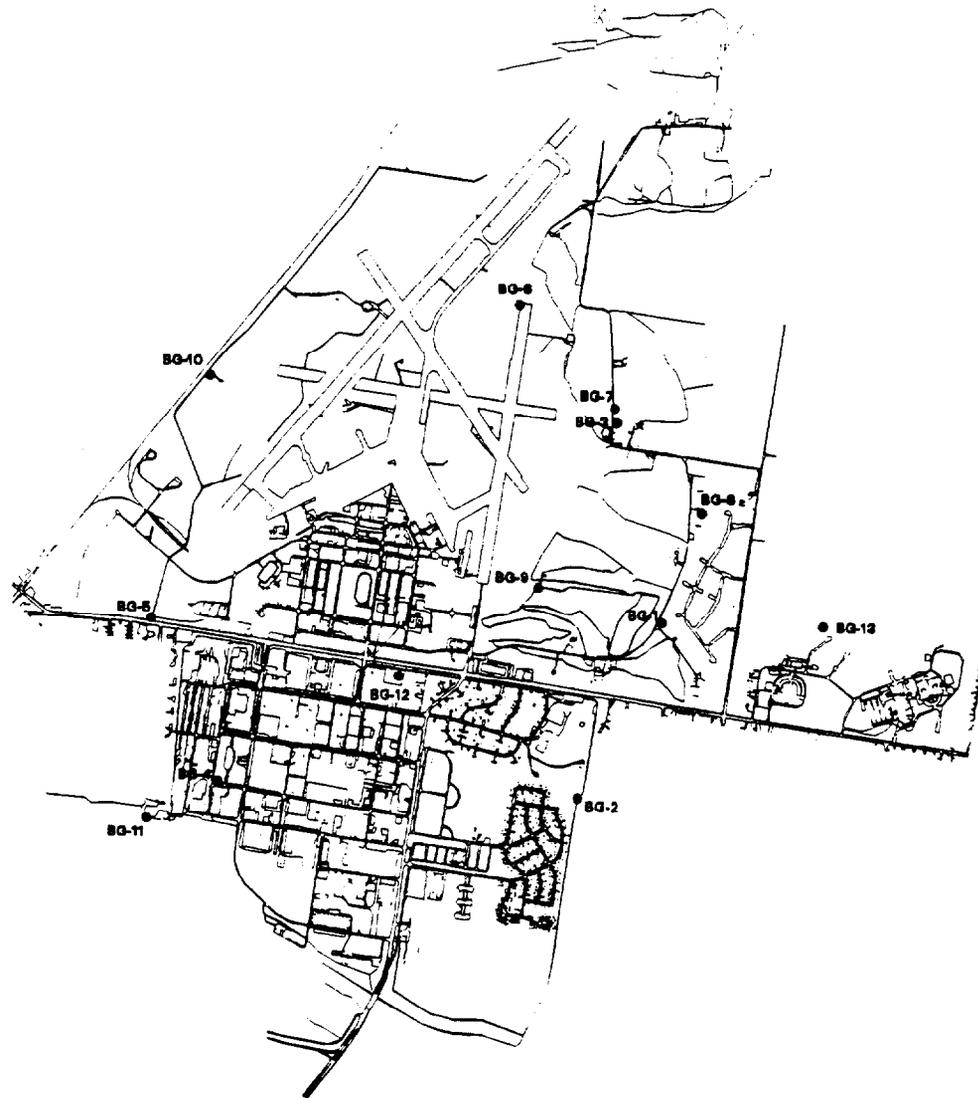
5.2 Background Criteria

Background locations were established at five areas across NSA Memphis (Figure 5-1) to determine ambient soil and groundwater conditions during the Assemblies A through D RFI/CSI. Sample data collected from these locations were used to establish background reference concentrations (RCs) for the inorganic constituents occurring naturally throughout NSA Memphis. The criteria, and the referenced data, are documented in the *Technical Memorandum — Reference Concentrations* (E/A&H, August 1996).

A sediment background concentration was also established for inorganics during the investigation of the SWMU 38 drainage ditches (Assembly B RFI, E/A&H, January 1997). One sediment sample (006M000601) was collected in an area upstream of any airfield runoff influences (Figure 3-1) and is presumed to represent inorganic background conditions that have not been impacted by industrial operations at the Navy base. As shown in Table 5.1, groundwater data collected from the loess at background wells across NSA Memphis exceed certain national Primary and Secondary Drinking Water Standards (USEPA, Office of Water, *Drinking Water Regulations and Health Advisories*, February 1996).

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LEGEND

- * SOIL BACKGROUND DATA ONLY
- BG-2
- BACKGROUND LOCATION 2

0 feet 6000

NOTES:

1. SURFACE SOIL BACKGROUND DATA COLLECTED FROM BACKGROUND LOCATIONS BG-1 THROUGH BG-13.
2. SUBSURFACE SOIL BACKGROUND DATA COLLECTED FROM BACKGROUND LOCATIONS BG-1 THROUGH BG-6.
3. LOESS AND LOWER FLUVIAL DEPOSITS GROUNDWATER DATA COLLECTED FROM BACKGROUND LOCATIONS BG-1, BG-2, BG-4 AND BG-6.
4. UPPER FLUVIAL DEPOSITS GROUNDWATER DATA COLLECTED FROM BACKGROUND LOCATIONS BG-1, BG-2, BG-4, BG-5, BG-8, BG-10, BG-12 AND BG-13.
5. MIDDLE FLUVIAL DEPOSITS GROUNDWATER DATA COLLECTED FROM BACKGROUND LOCATION BG-9.
6. MIDDLE ALLUVIUM GROUNDWATER DATA COLLECTED FROM BACKGROUND LOCATION BG-11.
7. UPPER COCKFIELD GROUNDWATER DATA COLLECTED FROM BACKGROUND LOCATIONS BG-6 AND BG-7.



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**FIGURE 5-1:
SOIL AND GROUNDWATER
BACKGROUND LOCATIONS**

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Table 5.1
NSA Memphis
Loess Groundwater vs. Drinking Water Standards

Sample ID	Date	Parameter	Result	Units	Drinking Water Standard ^a	Standard
OBGG01LS01	21-Mar-95	Antimony	20	µg/L	6	Primary
OBGG01LS02	10-Nov-95	Antimony	25	µg/L	6	Primary
		Thallium	3	µg/L	2	Primary
OBGG02LS01	17-Mar-95	Antimony	20	µg/L	6	Primary
		Chromium	167	µg/L	100	Primary
		Lead	33.6	µg/L	15	Primary
		Nickel	143	µg/L	100	Primary
OBGG02LS02	9-Nov-95	Antimony	25	µg/L	6	Primary
		Thallium	3	µg/L	2	Primary
OBGG04LS01	16-Mar-95	Antimony	20	µg/L	6	Primary
		Chromium	213	µg/L	100	Primary
		Nickel	165	µg/L	100	Primary
OBGG04LS02	9-Nov-95	Antimony	25	µg/L	6	Primary
		Cadmium	5.4	µg/L	5	Primary
		Chromium	222	µg/L	100	Primary
		Nickel	157	µg/L	100	Primary
		Thallium	3	µg/L	2	Primary
OBGG05LS01	17-Mar-95	Antimony	40.5	µg/L	6	Primary
		Chromium	160	µg/L	100	Primary
		Nickel	114	µg/L	100	Primary
OBGG05LS02	9-Nov-95	Antimony	25	µg/L	6	Primary
		Thallium	3	µg/L	2	Primary

Notes:

- J = estimated
- a = USEPA, Office of Water, (February 1996). *Drinking Water Regulations and Health Advisories*. EPA 822-R-96-001. USEPA: Washington, D.C.
- µg/L = micrograms per liter

5.3 Soil and Sediment Analytical Results

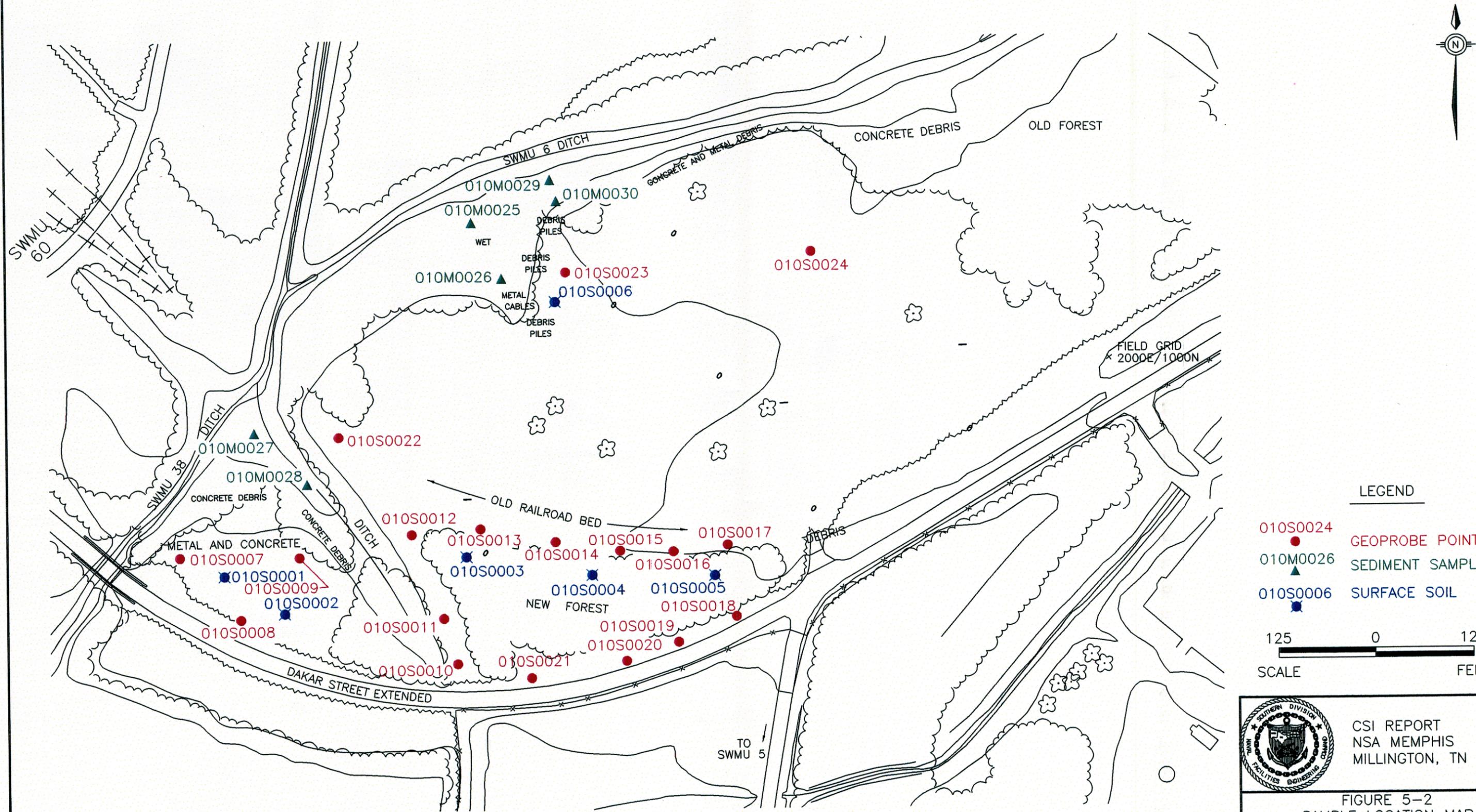
Soil and sediment samples were collected from locations on the landfill surface, in the gullies that drain to SWMU 38, and from the subsurface soil in the surrounding area of the landfill as shown in Figures 5-2 and 5-3. The following sections outline the concentrations detected in each medium and include figures showing the location of the detected concentrations which exceed their respective risk-based concentration (RBCs) (USEPA Region III, April 1998), sediment screening values (SSV) (USEPA Region IV, 1995), soil screening level (SSL; USEPA Region III, May 1996) and RC (metals). The analytical results and any associated risks are further discussed in Section 6 — Preliminary Risk Evaluation.

Total Petroleum Hydrocarbon Cleanup Levels

Petroleum hydrocarbon sample data, collected from both the surficial soil and the gully sediments at SWMU 10, have been compared to the TDEC Soil Cleanup Levels as established in the TDEC Underground Storage Tanks Division Environmental Assessment Guidelines (TDEC, August 1996) and accepted by the TDEC Division of Solid Waste Management. The cleanup levels are based on two variables: soil permeability and groundwater classification. Data collected during the RFI at SWMUs 5 (Aircraft Fire Fighting Training Facility) and 60 (Northside Landfill), both of which border SWMU 10, (Figure 3-1), indicate soil permeabilities in the loess of 1.4×10^{-7} and 1.7×10^{-7} , respectively. Based on both the permeability data and the drinking water standards comparison information, the applicable TDEC cleanup level for TPH and benzene in soil are 1,000 mg/kg and 100 mg/kg, respectively.

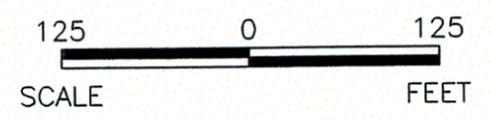
5.3.1 Surface Soil

Samples collected from the surface-interval soil (0 to 1 foot bls) at SWMU 10 were submitted for FSA (as outlined in Table 4.1) to provide data needed for the preliminary risk evaluation (PRE). The constituents detected, their corresponding concentrations, and their respective RBCs and SSLs are presented below. The respective RCs for inorganics are included in the discussion Metals in Soil.



LEGEND

- 010S0024 ● GEOPROBE POINTS
- 010M0026 ▲ SEDIMENT SAMPLE
- 010S0006 ■ SURFACE SOIL



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FIGURE 5-2
SAMPLE LOCATION MAP
SWMU 10
CONSTRUCTION DEBRIS LANDFILL
(EASTERN PORTION)

NOTE: POINTS SHOWN ARE APPROXIMATE.
GPS DATA NOT AVAILABLE AT THIS TIME.

DWG DATE: 09/09/98 DWG NAME: 0094B022

00612F024

Volatile Organic Compounds

All concentrations of VOCs detected in the surface soil samples are presented in Table 5.2. There were no RBC or SSL exceedances for those compounds detected.

Table 5.2
 SWMU 10 — Volatile Organic Compounds In Surface Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	Industrial RBC	Residential RBC	SSL
010S000401	Toluene	3J	410,000,000	16,000,000	600
010S000501	Styrene	2J	410,000,000	16,000,000	200
	Toluene	6J	410,000,000	16,000,000	600
010S000601	Toluene	4J	410,000,000	16,000,000	600

Notes:

- J = Concentration estimated
- $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)
- RBC = Risk-Based Concentration (USEPA, Region III, April 1, 1998).
- SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

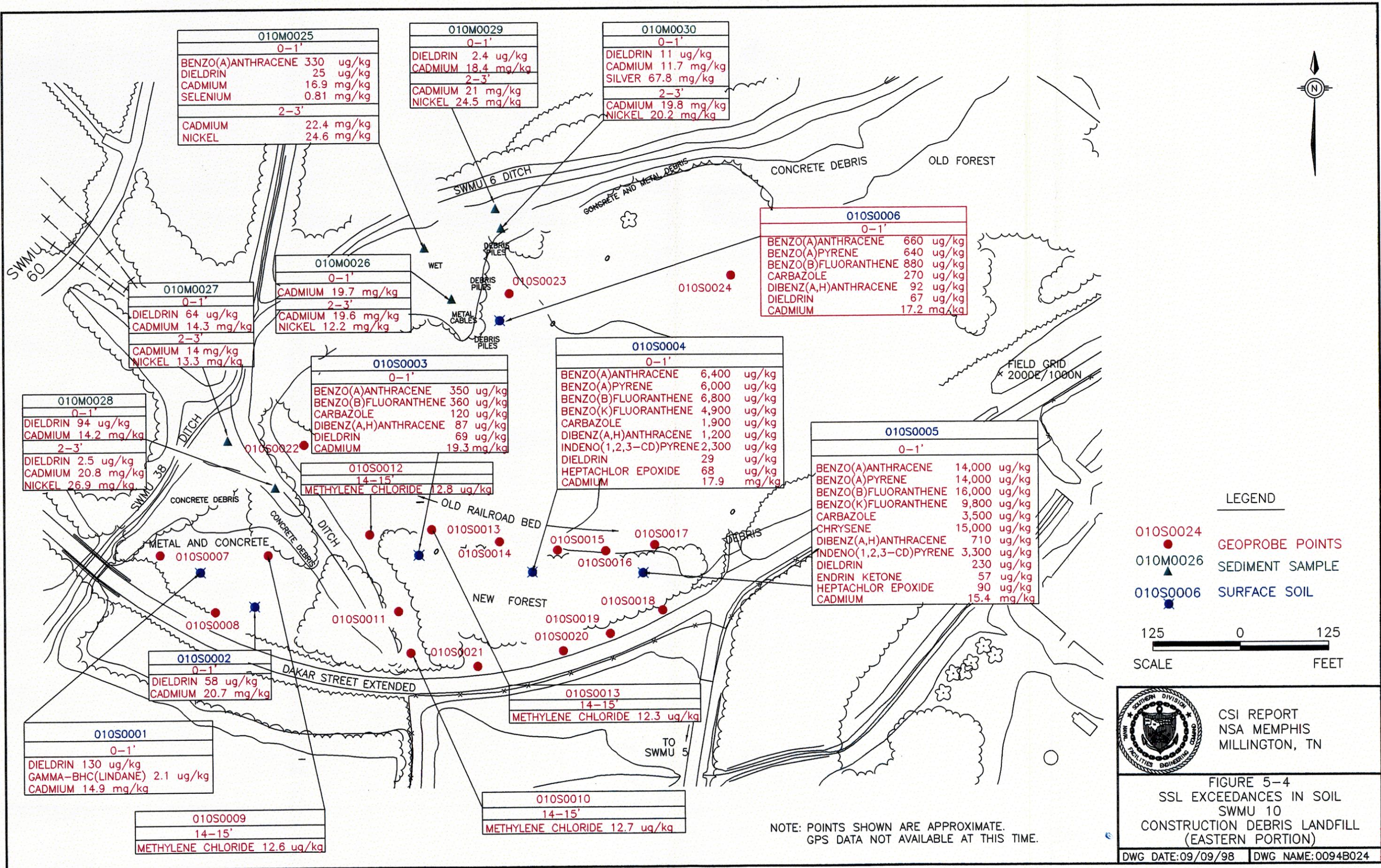
Semivolatile Organic Compounds

All SVOC concentrations detected in the surface-soil samples are listed in Table 5.3. As shown in Figures 5-3 and 5-4, polycyclic aromatic hydrocarbons (PAHs) were prevalent in the surficial soil at SWMU 10. Benzo(a)pyrene Equivalents (BEQ) were calculated for risk assessment purposes. The following describes the SVOC components of BEQ detected at SWMU 10:

- Benzo(a)pyrene, a carcinogen, was detected at a concentration exceeding the residential RBC in four of the six surface-soil samples, and exceeding the industrial RBC in two of the six samples.

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010M0025	
0-1'	
BENZO(A)ANTHRACENE	330 ug/kg
DIELDRIN	25 ug/kg
CADMIUM	16.9 mg/kg
SELENIUM	0.81 mg/kg
2-3'	
CADMIUM	22.4 mg/kg
NICKEL	24.6 mg/kg

010M0029	
0-1'	
DIELDRIN	2.4 ug/kg
CADMIUM	18.4 mg/kg
2-3'	
CADMIUM	21 mg/kg
NICKEL	24.5 mg/kg

010M0030	
0-1'	
DIELDRIN	11 ug/kg
CADMIUM	11.7 mg/kg
SILVER	67.8 mg/kg
2-3'	
CADMIUM	19.8 mg/kg
NICKEL	20.2 mg/kg

010S0006	
0-1'	
BENZO(A)ANTHRACENE	660 ug/kg
BENZO(A)PYRENE	640 ug/kg
BENZO(B)FLUORANTHENE	880 ug/kg
CARBAZOLE	270 ug/kg
DIBENZ(A,H)ANTHRACENE	92 ug/kg
DIELDRIN	67 ug/kg
CADMIUM	17.2 mg/kg

010M0027	
0-1'	
DIELDRIN	64 ug/kg
CADMIUM	14.3 mg/kg
2-3'	
CADMIUM	14 mg/kg
NICKEL	13.3 mg/kg

010M0026	
0-1'	
CADMIUM	19.7 mg/kg
2-3'	
CADMIUM	19.6 mg/kg
NICKEL	12.2 mg/kg

010M0028	
0-1'	
DIELDRIN	94 ug/kg
CADMIUM	14.2 mg/kg
2-3'	
DIELDRIN	2.5 ug/kg
CADMIUM	20.8 mg/kg
NICKEL	26.9 mg/kg

010S0003	
0-1'	
BENZO(A)ANTHRACENE	350 ug/kg
BENZO(B)FLUORANTHENE	360 ug/kg
CARBAZOLE	120 ug/kg
DIBENZ(A,H)ANTHRACENE	87 ug/kg
DIELDRIN	69 ug/kg
CADMIUM	19.3 mg/kg

010S0004	
0-1'	
BENZO(A)ANTHRACENE	6,400 ug/kg
BENZO(A)PYRENE	6,000 ug/kg
BENZO(B)FLUORANTHENE	6,800 ug/kg
BENZO(K)FLUORANTHENE	4,900 ug/kg
CARBAZOLE	1,900 ug/kg
DIBENZ(A,H)ANTHRACENE	1,200 ug/kg
INDENO(1,2,3-CD)PYRENE	2,300 ug/kg
DIELDRIN	29 ug/kg
HEPTACHLOR EPOXIDE	68 ug/kg
CADMIUM	17.9 mg/kg

010S0005	
0-1'	
BENZO(A)ANTHRACENE	14,000 ug/kg
BENZO(A)PYRENE	14,000 ug/kg
BENZO(B)FLUORANTHENE	16,000 ug/kg
BENZO(K)FLUORANTHENE	9,800 ug/kg
CARBAZOLE	3,500 ug/kg
CHRYSENE	15,000 ug/kg
DIBENZ(A,H)ANTHRACENE	710 ug/kg
INDENO(1,2,3-CD)PYRENE	3,300 ug/kg
DIELDRIN	230 ug/kg
ENDRIN KETONE	57 ug/kg
HEPTACHLOR EPOXIDE	90 ug/kg
CADMIUM	15.4 mg/kg

010S0012	
14-15'	
METHYLENE CHLORIDE	12.8 ug/kg

010S0002	
0-1'	
DIELDRIN	58 ug/kg
CADMIUM	20.7 mg/kg

010S0001	
0-1'	
DIELDRIN	130 ug/kg
GAMMA-BHC(LINDANE)	2.1 ug/kg
CADMIUM	14.9 mg/kg

010S0009	
14-15'	
METHYLENE CHLORIDE	12.6 ug/kg

010S0010	
14-15'	
METHYLENE CHLORIDE	12.7 ug/kg

010S0013	
14-15'	
METHYLENE CHLORIDE	12.3 ug/kg

LEGEND

- 010S0024 ● GEOPROBE POINTS
- 010M0026 ▲ SEDIMENT SAMPLE
- 010S0006 ■ SURFACE SOIL

125 0 125
SCALE FEET

CSI REPORT
NSA MEMPHIS
MILLINGTON, TN

FIGURE 5-4
SSL EXCEEDANCES IN SOIL
SWMU 10
CONSTRUCTION DEBRIS LANDFILL
(EASTERN PORTION)

DWG DATE:09/09/98 DWG NAME:0094B024

NOTE: POINTS SHOWN ARE APPROXIMATE.
GPS DATA NOT AVAILABLE AT THIS TIME.

00612F034

Table 5.3
SWMU 10 — Semivolatile Organic Compounds in Surface Soil — Hits only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	Industrial RBC	Residential RBC	SSL
010S000101	BEQ	95	780	87	400
	<i>Benzo(a)anthracene</i>	73 J	7,800	870	80
	<i>Benzo(a)pyrene</i>	75 J	780	87	400
	<i>Benzo(b)fluoranthene</i>	58 J	7,800	870	200
	<i>Benzo(k)fluoranthene</i>	78 J	78,000	8,700	2,000
	<i>Chrysene</i>	78 J	780,000	87,000	8,000
	<i>Indeno(1,2,3-cd)pyrene</i>	55 J	7,800	870	700
	<i>Benzo(g,h,i)perylene^a</i>	70 J	61,000,000	2,300,000	210,000
	Fluoranthene	130 J	82,000,000	3,100,000	210,000
	Phenanthrene ^a	59 J	61,000,000	2,300,000	210,000
010S000201	Pyrene	110 J	61,000,000	2,300,000	210,000
	BEQ	68	780	87	400
	<i>Benzo(a)anthracene</i>	50 J	7,800	870	80
	<i>Benzo(a)pyrene</i>	58 J	780	87	400
	<i>Benzo(b)fluoranthene</i>	44 J	7,800	870	200
	<i>Benzo(k)fluoranthene</i>	59 J	78,000	8,700	2,000
	<i>Chrysene</i>	49 J	780,000	87,000	8,000
	<i>Benzo(g,h,i)perylene^a</i>	44 J	61,000,000	2,300,000	210,000
	Fluoranthene	75 J	82,000,000	3,100,000	210,000
	Pyrene	58 J	61,000,000	2,300,000	210,000
010S000301	Acenaphthene	99 J	120,000,000	4,700,000	29,000
	Anthracene	130 J	610,000,000	23,000,000	590,000
	BEQ	521	780	87	400
	<i>Benzo(a)anthracene^b</i>	350 J	7,800	870	80
	<i>Benzo(a)pyrene^b</i>	340 J	780	87	400
	<i>Benzo(b)fluoranthene^b</i>	360 J	7,800	870	200
	<i>Benzo(k)fluoranthene</i>	260 J	78,000	8,700	2,000
	<i>Chrysene</i>	350 J	780,000	87,000	8,000
	<i>Dibenz(a,h)anthracene^b</i>	87 J	780	87	80
	<i>Indeno(1,2,3-cd)pyrene</i>	200 J	7,800	870	700
	<i>Benzo(g,h,i)perylene^a</i>	250 J	61,000,000	2,300,000	210,000
	Carbazole ^b	120 J	290,000	32,000	30
	Fluoranthene	750	82,000,000	3,100,000	210,000
	Fluorene	68 J	82,000,000	3,100,000	28,000
	Naphthalene	86 J	82,000,000	3,100,000	4,000
	Phenanthrene ^a	600	61,000,000	2,300,000	210,000
	Pyrene	640	61,000,000	2,300,000	210,000

Table 5.3
 SWMU 10 — Semivolatile Organic Compounds in Surface Soil — Hits only (µg/kg)

Sample ID	Parameter	Concentration	Residential		SSL
			Industrial RBC	RBC	
010S000401	2-Methylnaphthalene	130 J	82,000,000	3,100,000	4000
	Acenaphthene	760 J	120,000,000	4,700,000	29,000
	Acenaphthylene	46 J	—	—	—
	Anthracene	2,100	610,000,000	23,000,000	590,000
	BEQ	8,806	780	87	400
	<i>Benzo(a)anthracene</i> ^b	6,400 D	7,800	870	80
	<i>Benzo(a)pyrene</i> ^c	6,000 D	780	87	400
	<i>Benzo(b)fluoranthene</i> ^d	6,800 D	7,800	870	200
	<i>Benzo(k)fluoranthene</i> ^e	4,900 DJ	78,000	8,700	2,000
	<i>Chrysene</i> ^f	7,400 D	290,000	32,000	8,000
	<i>Dibenz(a,h)anthracene</i> ^g	1,200	780	87	80
	<i>Indeno(1,2,3-cd)pyrene</i> ^h	2,300	7,800	870	700
	Benzo(g,h,i)perylene ^a	2,400	61,000,000	2,300,000	210,000
	Carbazole ^b	1,900	290,000	32,000	30
	Dibenzofuran	510	8,200,000	310,000	—
	Fluoranthene	16,000 D	82,000,000	3,100,000	210,000
	Fluorene	830	82,000,000	3,100,000	28,000
	Naphthalene	350 J	82,000,000	3,100,000	4,000
	Phenanthrene ^a	13,000 D	61,000,000	2,300,000	210,000
	Pyrene	13,000 D	61,000,000	2,300,000	210,000
010S000501	2-Methylnaphthalene	150 J	82,000,000	3,100,000	4000
	Acenaphthene	1,300 J	120,000,000	4,700,000	29,000
	Acenaphthylene	140 J	—	—	—
	Anthracene	4,500 JD	610,000,000	23,000,000	590,000
	BEQ	18,153	780	87	400
	<i>Benzo(a)anthracene</i> ^b	14,000 D	7,800	870	80
	<i>Benzo(a)pyrene</i> ^c	14,000 D	780	87	400
	<i>Benzo(b)fluoranthene</i> ^d	16,000 D	7,800	870	200
	<i>Benzo(k)fluoranthene</i> ^e	9,800 D	78,000	8,700	2,000
	<i>Chrysene</i> ^f	15,000 D	290,000	32,000	8,000
	<i>Dibenz(a,h)anthracene</i> ^g	710	780	87	80
	<i>Indeno(1,2,3-cd)pyrene</i> ^h	3,300	7,800	870	700
	Benzo(g,h,i)perylene ^a	3,100	61,000,000	2,300,000	210,000
	Carbazole ^b	3,500	290,000	32,000	30
	Dibenzofuran	750	8,200,000	310,000	—
	Fluoranthene	32,000 D	82,000,000	3,100,000	210,000
	Fluorene	1,300	82,000,000	3,100,000	28,000
	Naphthalene	330 J	82,000,000	3,100,000	4,000
	Phenanthrene ^a	22,000 D	61,000,000	2,300,000	210,000
	Pyrene	28,000 D	61,000,000	2,300,000	210,000
bis(2-Ethylhexyl)phthalate	71 J	410,000	46,000	180,000	

Table 5.3
SWMU 10 — Semivolatile Organic Compounds in Surface Soil — Hits only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	Industrial RBC	Residential RBC	SSL
010S000601	2-Methylnaphthalene	42 J	82,000,000	3,100,000	4000
	Acenaphthene	160 J	120,000,000	4,700,000	29,000
	Anthracene	360 J	610,000,000	23,000,000	590,000
	BEQ	913	780	87	400
	<i>Benzo(a)anthracene^b</i>	660	7,800	870	80
	<i>Benzo(a)pyrene^b</i>	640	780	87	400
	<i>Benzo(b)fluoranthene^b</i>	880	7,800	870	200
	<i>Benzo(k)fluoranthene</i>	490 J	78,000	8,700	2,000
	<i>Chrysene</i>	730	290,000	32,000	8,000
	<i>Dibenz(a,h)anthracene^b</i>	92 J	780	87	80
	<i>Indeno(1,2,3-cd)pyrene</i>	210 J	7,800	870	700
	<i>Benzo(g,h,i)perylene^a</i>	200 J	61,000,000	2,300,000	210,000
	Carbazole^b	270 J	290,000	32,000	30
	Dibenzofuran	96 J	8,200,000	310,000	—
	Fluoranthene	1,600	82,000,000	3,100,000	210,000
	Fluorene	140 J	82,000,000	3,100,000	28,000
	Naphthalene	44 J	82,000,000	3,100,000	4,000
	Phenanthrene ^a	1,400	61,000,000	2,300,000	210,000
	Pyrene	1,200	61,000,000	2,300,000	210,000

Notes:

Compounds presented in bold text indicate an exceedance of the highlighted screening values.

BEQ = Benzo(a)pyrene equivalents (shown in *Italics*)

RBC = Risk-Based Concentration (USEPA, Region III, April 1, 1998).

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

a = RBC values are not published for these compounds. The RBC and SSL values for pyrene are presented as a surrogate.

b = Detected concentration exceeds the residential RBC value and/or SSL.

c = Detected concentration exceeds the residential and industrial/commercial RBC value.

d = Detected concentration exceeds the residential and industrial/commercial RBC value, and the SSL.

— = Data not available for this compound.

$\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

D = Laboratory data qualifier, indicates that the sample was diluted prior to analysis.

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit, therefore the value presented is estimated.

- Benzo(a)anthracene was detected at concentrations exceeding the residential RBC in two surface-soil samples, and exceeding the industrial RBC in one sample.
- Benzo(b)fluoranthene was detected at concentrations exceeding the residential RBC in three surface-soil samples, and exceeding the industrial RBC in one sample.
- Dibenz(a,h)anthracene was detected at concentrations exceeding the residential RBC in four surface-soil samples, and exceeding the industrial RBC in one sample.
- Indeno(1,2,3-cd)pyrene was detected at concentrations exceeding the residential RBC in two surface-soil samples.

As shown in Figure 5-3, most of the SVOCs that exceeded their RBC values were identified in samples 010S000401 and 010S000501; both are low-lying areas in the southeast portion of the site. Several PAHs were also identified in the surface soil at concentrations exceeding the SSLs, as shown in Figure 5-4. The significance of these hits is further discussed in Section 7 (Fate and Transport).

Herbicides in Soil

All concentrations of herbicides detected in the surface-soil samples are presented in Table 5.4. There were no RBC exceedances for these compounds. SSLs were not available for the detected herbicides.

Table 5.4
SWMU 10 — Herbicides in Surface Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	Industrial RBC	Residential RBC
010S000301	2,4-D	7 J	20,000,000	780,000
	Dinoseb	3 J	2,000,000	78,000
010S000501	2,4-D	8.4 J	20,000,000	780,000
010S000601	2,4-D	5.7 J	20,000,000	780,000

Notes:

- J = Estimated Value
- $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)
- RBC = Risk-Based Concentration (USEPA, Region III, April 1, 1998).

Chlorinated and Organophosphorus Pesticides/PCBs in Soil

All concentrations of pesticides and polychlorinated biphenyls (PCBs) detected in the surface-soil samples are presented in Table 5.5. Dieldrin, which is ubiquitous at NSA Memphis (*NSA Memphis Dieldrin Technical Memorandum*, E/A&H 1997 [included as Appendix C]), was detected in all six surface soil samples. Five of the six samples were at concentrations exceeding the residential RBC, but not the industrial RBC. Heptachlor epoxide in sample 010S000501 and PCB Aroclor-1260 in sample 010S000601, were detected at concentrations exceeding their respective residential RBCs. The compounds detected exceeding their respective RBC/SSL values are shown in Figures 5-3 and 5-4 and are discussed further in the Section 6 (PRE) and Section 7 (Fate and Transport).

Metals in Soil

All concentrations of metals detected in the surface-soil samples are listed in Table 5.6, along with their respective RBC values. In addition, the metals concentrations were compared to SSLs and the established RC values as discussed in Section 5.2. All metals detected above their respective RC and the RBC or SSL are shown in Figures 5-3 and 5-4.

Table 5.5
 SWMU 10 — Pesticides in Surface Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	Industrial	Residential	SSL
			RBC	RBC	
010S000101	4,4'-DDD	5.8	24,000	2,700	800
	4,4'-DDE	28	17,000	1,900	3,000
	4,4'-DDT	27	17,000	1,900	2,000
	Aldrin	1.1	340	38	20
	Dieldrin ^a	130	360	40	0.2
	Heptachlor epoxide	2.8	630	70	30
	Technical Chlordane ^b	76	16,000	1,800	500
	alpha-Chlordane ^b	19	16,000	1,800	500
	gamma-BHC (Lindane)	2.1	4,400	490	0.5
	gamma-Chlordane ^b	18	16,000	1,800	500
010S000201	4,4'-DDE	8.7	17,000	1,900	3,000
	4,4'-DDT	21	17,000	1,900	2,000
	Aroclor-1260	40	2,900	320	—
	Dieldrin ^a	58	360	40	0.2
	Endosulfan II	2.4	12,000,000	470,000	900
	Heptachlor epoxide	1.5	630	70	30
	Technical chlordane	70	16,000	1,800	500
	alpha-Chlordane ^b	6.2	16,000	1,800	500
	gamma-Chlordane ^b	5.8	16,000	1,800	500
	010S000301	4,4'-DDT	3.8	17,000	1,900
	Dieldrin ^a	69	360	40	0.2
010S000401	Dieldrin	29	360	40	0.2
	Heptachlor epoxide	68 JD	630	70	30
010S000501	Dieldrin ^a	230	360	40	0.2
	Endrin aldehyde ^c	30	610,000	23,000	50
	Endrin ketone ^c	57	610,000	23,000	50
	Heptachlor epoxide ^a	90	630	70	30
010S000601	4,4'-DDT	22	17,000	1,900	2,000
	Aroclor-1260	340	2,900	320	—
	Dieldrin ^a	67	360	40	0.2

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

- RBC = Risk-Based Concentration (USEPA, Region III, April 1, 1998).
- SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
- J = Laboratory data qualifier, indicates that the reported value was below the method detection limit; therefore, the value presented is estimated.
- JD = Estimated concentration due to dilution.
- a = Detected concentration exceeds the residential RBC value and the SSL.
- b = The RBC and SSL values presented for the various isomers of chlordane are based on the technical chlordane value.
- c = Values provided from the surrogate Endrin.
- d = Dieldrin Reference Concentration is 262 $\mu\text{g}/\text{kg}$.
- $\mu\text{g}/\text{kg}$ = micrograms per kilogram
- = RBC and/or SSL values do not exist for this compound.

Table 5.6
SWMU 10 — Metals in Surface-Soil — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Reference Concentration	Industrial RBC	Residential RBC	SSL
010S000101	Arsenic	5.7	14.6	610 (3.8)	23 (0.43)	1
	Barium	116	223.5	140,000	5,500	82
	Cadmium ^b	14.9	1.5	1,000	39	0.4
	Chromium ^d	8.3	23.9	10,000	390	2
	Cobalt	6 J	16	120,000	4,700	—
	Copper	14.6	24.2	82,000	3,100	—
	Lead ^e	46.8	26	400	400	—
	Nickel	9.5 J	20.62	41,000	1,600	7
	Tin	33.4 J	33.6	1,200,000	47,000	—
	Vanadium	16.2	45.1	14,000	550	300
	Zinc	57.7	98	610,000	23,000	620
	010S000201	Arsenic ^a	7.8	14.6	610 (3.8)	23 (0.43)
Barium		150	223.5	140,000	5,500	82
Cadmium ^b		20.7	1.5	1,000	39	0.4
Chromium ^d		12.2	23.9	10,000	390	2
Cobalt		6.7 J	16	120,000	4,700	—
Copper		14.4	24.2	82,000	3,100	—
Lead ^e		37.8	26	400	400	—
Nickel		16.9	20.6	41,000	1,600	7
Tin ^c		48.8 J	33.6	1,200,000	47,000	—
Vanadium		21.5	45.1	14,000	550	300
Zinc		51.6	98	610,000	23,000	620
010S000301		Arsenic	10.1	14.6	610 (3.8)	23 (0.43)
	Barium	119	223.5	140,000	5,500	82
	Cadmium ^b	19.3	1.5	1,000	39	0.4
	Chromium ^d	6.8	23.9	10,000	390	2
	Cobalt	7.8 J	16	120,000	4,700	—
	Copper	17.2	24.2	82,000	3,100	—
	Lead ^e	19.3	26	400	400	—
	Nickel	15.8	20.6	41,000	1,600	7
	Tin	32.9 J	33.6	1,200,000	47,000	—
	Vanadium	17.6	45.1	14,000	550	300
	Zinc	48.2	98	610,000	23,000	620
	010S000401	Arsenic ^a	13.4	14.6	610 (3.8)	23 (.43)
Barium		97.3	223.5	140,000	5,500	82
Cadmium ^b		17.9	1.5	1,000	39	0.4
Chromium ^d		6.6	23.9	10,000	390	2
Cobalt		7.5 J	16	120,000	4,700	—
Copper		15.2	24.2	82,000	3,100	—
Lead ^e		39.2	26	400	400	—
Nickel		13.2	20.6	41,000	1,600	7
Tin ^c		37.8 J	33.6	1,200,000	47,000	—
Vanadium		16.8	45.1	14,000	550	300
Zinc		50.2	98	610,000	23,000	620

Table 5.6
 SWMU 10 — Metals in Surface-Soil — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Reference Concentration	Industrial RBC	Residential RBC	SSL
010S000501	Arsenic ^a	6.7	14.6	610 (3.8)	23 (0.43)	1
	Barium	119	223.5	140,000	5,500	82
	Cadmium ^b	15.4	1.5	1,000	39	0.4
	Chromium ^d	8.1	23.9	10,000	390	2
	Cobalt	7 J	16	120,000	4,700	—
	Copper	15.1	24.2	82,000	3,100	—
	Lead ^{c,e}	34.3	26	400	400	—
	Nickel	14	20.6	41,000	1,600	7
	Tin ^e	45.3 J	33.6	1,200,000	47,000	—
	Vanadium	17.2	45.1	14,000	550	300
Zinc	54.7	98	610,000	23,000	620	
010S000601	Arsenic ^a	6.6	14.6	610 (3.8)	23 (0.43)	1
	Barium	114	223.5	140,000	5,500	82
	Cadmium ^b	17.2	1.5	1,000	39	0.4
	Chromium ^d	9.2	23.9	10,000	390	2
	Cobalt	7.1 J	16	120,000	4,700	—
	Copper	15.7	24.2	82,000	3,100	—
	Lead ^{c,e}	29.2	26	400	400	—
	Nickel	14.3	20.6	41,000	1,600	7
	Tin ^e	36.4 J	33.6	1,200,000	47,000	—
	Vanadium	18.4	45.1	14,000	550	300
Zinc	58.8	98	610,000	23,000	620	

Notes:

Compounds presented in bold text indicate an exceedance of RC and one of the other listed screening values.

RBC = Risk-Based Concentration (USEPA, Region III, April 1, 1998).

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

BDL = Below detection limit.

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.

a = RBC values presented for arsenic are non-carcinogenic and (carcinogenic).

b = Detected concentration exceeds the established RC and the SSL.

c = Detected concentration exceeds the established RC; however, SSL value was not exceeded or does not exist for this constituent.

d = RBC values presented for chromium as chromium VI.

e = RBC values do not exist for lead, 400 mg/kg is the EPA Residential Soil Lead Cleanup Level (OSWER Directive 9355.4-12, USEPA, 1993)

mg/kg = milligram per kilogram (part per million)

— = RBC and/or SSL values do not exist for this compound.

Total Petroleum Hydrocarbons

Petroleum hydrocarbons were detected in all six surface-soil samples collected during the SWMU 10 investigation. However, all concentrations (as shown in Table 5.7) were less than the applicable TDEC cleanup level of 1,000 mg/kg (as discussed in Section 5.3).

Table 5.7
SWMU 10 — TPH in Surface-Soil — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	TDEC Site Remediation Level
010S000101	TPH - Diesel Range Organics	33	1,000
010S000201	TPH - Diesel Range Organics	17	1,000
010S000301	TPH - Diesel Range Organics	15	1,000
010S000401	TPH - Diesel Range Organics	120	1,000
010S000501	TPH - Diesel Range Organics	160	1,000
010S000601	TPH - Diesel Range Organics	63	1,000

Note:
 mg/kg = milligram per kilogram (part per million)

5.3.2 Sediment Analytical Results

Sediment samples were collected in several locations from gullies along the perimeter of SWMU 10 (Figures 5-2 and 5-3) to determine if past disposal practices have been, or are presently, impacting the adjacent drainage ditches (SWMUs 6 and 38). Sediment samples were collected from 0 to 6 inches bls to determine any current impact, and subsurface-soil samples from 2 to 3 feet bls to determine any past impacts and whether contaminants are migrating downward. The detected concentrations in the sediment were then compared to the SSV presented in the *Supplemental Guidance to RAGS, Region IV Bulletins, Ecological Risk Assessment* (USEPA Region IV, November 1995). Any concentrations identified as exceeding the established SSVs are discussed below and presented in Figure 5-3. The detected concentrations in the underlying soil were compared to SSLs presented in the *USEPA Region III Risk-Based*

Concentration tables (USEPA, April 1998), and discussed in Section 5.3.3 and presented in Figure 5-4.

Volatile Organic Compounds

No VOCs were identified in the SWMU 10 sediments at concentrations exceeding SSVs. However, toluene was identified in the subsurface soil (2 to 3 feet bls) in the gully area and the concentration is presented in Table 5.13 (Section 5.3.3).

Semivolatile Organic Compounds

Several SVOCs were detected in the sediment samples collected from SWMU 10 (Table 5.8). Although none of the samples exceeded the published SSVs, benzo(a)anthracene exceeded its SSL in sample 010M002501.

Table 5.8
 SWMU 10 – Semivolatile Organic Compounds in Sediment – Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	SSV	SSL
010M002501	Indeno(1,2,3-cd)pyrene	89 J	—	700
	Benzo(a)anthracene	90 J	330	80
010M002601	Benzo(g,h,i)perylene	97 J	—	210,000
	Benzo(a)pyrene	98 J	330	400
	Benzo(k)fluoranthene	99 J	—	2,000
	Benzo(b)fluoranthene	100 J	—	200
	Phenanthrene	110 J	330	210,000
	Chrysene	140 J	330	8,000
	Pyrene	140 J	330	210,000
	Fluoranthene	220 J	330	210,000
	Total Polycyclic Aromatic Hydrocarbons (PAHs)	1,183	1684	—
	Phenanthrene	53 J	330	210,000
	Di-n-butylphthalate	150 J	—	—
010M002701	Indeno(1,2,3-cd)pyrene	47 J	—	700
	Benzo(g,h,i)perylene	48 J	—	210,000
	Benzo(b)fluoranthene	60 J	—	200
	bis(2-Ethylhexyl)phthalate (BEHP)	65 J	182	180,000

Table 5.8
SWMU 10 — Semivolatile Organic Compounds in Sediment — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	SSV	SSL
	Benzo(a)anthracene	71 J	330	80
	Benzo(a)pyrene	74 J	330	400
	Benzo(k)fluoranthene	77 J	—	2,000
	Chrysene	83 J	330	8,000
	Phenanthrene	93 J	330	210,000
	Pyrene	120 J	330	210,000
	Fluoranthene	160 J	330	210,000
	Di-n-butylphthalate	190 J	—	—
010M002801	Di-n-butylphthalate	390 J	—	—

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

SSV = Sediment Screening Value (USEPA, *Supplemental Guidance to RAGS: Region IV Bulletin, Ecological Risk Assessment*, November 1995).

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

— = SSV or SSL does not exist.

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.

$\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Herbicides

Several herbicides were detected in the sediment samples collected at SWMU 10. However, no SSVs or SSLs exist for the detected compounds. Table 5.9 lists the concentrations of the identified herbicides.

Table 5.9
SWMU 10 — Herbicides in Sediment — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Concentration	Parameter	SSV	SSL
010M002501	4	2,4,5-TP (Silvex)	—	—
010M002601	6.1	2,4,5-TP (Silvex)	—	—
	10	2,4-DB	—	—
	1200 J	MCPA	—	—
010M002701	3.5 J	2,4,5-TP (Silvex)	—	—
	950 J	MCPA	—	—

Table 5.9
 SWMU 10 — Herbicides in Sediment — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Concentration	Parameter	SSV	SSL
010M002801	2.7	2,4,5-TP (Silvex)	—	—
	4.9 J	2,4-DB	—	—
010M002901	5.2	2,4,5-TP (Silvex)	—	—
	17 J	2,4-DB	—	—
010M003001	20 J	2,4-DB	—	—

Notes:

- J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.
 — = SSV or SSL does not exist
 $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Pesticides/PCB

The chlorinated pesticide compounds DDD, DDT, and chlordane, and the PCB Aroclor-1260 were detected in sediments at concentrations exceeding published SSVs and SSLs (Table 5.10). Figures 5-3 and 5-4 show the locations of the samples. These compounds are discussed in Section 7 (Fate and Transport) and Section 8 (ERA).

Table 5.10
 SWMU 10 — Pesticides/PCBs in Sediments — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	SSV	SSL
010M002501	4,4'-DDD	3.1 J	3.3	800
	4,4'-DDE ^a	5.9 J	3.3	3,000
	4,4'-DDT ^a	8.9 J	3.3	2,000
	Dieldrin ^{a,c}	25 J	3.3	0.2
010M002701	gamma-Chlordane ^{a, b}	2.7	1.7	500
	alpha-Chlordane ^{a, b}	3.8	1.7	500
	4,4'-DDE ^a	8.9	3.3	3,000
	4,4'-DDT ^a	12	3.3	2,000
	Dieldrin ^{a,c}	64	3.3	0.2

Table 5.10
SWMU 10 — Pesticides/PCBs in Sediments — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration		SSV	SSL
010M002801	Heptachlor epoxide	2.7	J	—	30
	4,4'-DDE	3	J	3.3	3,000
	gamma-Chlordane^{a,b}	13	J	1.7	500
	alpha-Chlordane^{a,b}	30	J	1.7	500
	Technical Chlordane^{a,b}	82	J	1.7	500
	Dieldrin^{a,c}	94	D	3.3	0.2
010M002901	Dieldrin^{a,c}	2.4	J	3.3	0.2
010M003001	Dieldrin^{a,c}	11		3.3	0.2

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

SSV = Sediment Screening Value (USEPA, *Supplemental Guidance to RAGS: Region 4 Bulletin, Ecological Risk Assessment*, November 1995).

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

a = Value exceeds the SSV.

b = SSVs for the individual chlordane isomers (gamma-chlordane and alpha-chlordane) do not exist. The presented value is for technical chlordane.

c = Value exceeds the SSL.

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.

D = Laboratory data qualifier, sample was diluted by the laboratory, value is estimated.

— = SSV does not exist.

$\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Metals

Cadmium was detected at concentrations exceeding the SSV at several locations in the sediments at SWMU 10 (Table 5.11). SWMU 10 metals concentrations have been compared to the background concentration established for the SWMU 38 ditch system (E/A&H, January 1997).

Table 5.11
 SWMU 10 — Metals in Sediment — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Background Concentration ^a	Sediment Screening Value	SSL
010M002501	Arsenic	9 J	41.8	7.24	1
	Barium	124	638J	—	82
	Beryllium	0.49 J	2	—	3
	Cadmium	16.9	1.9J	1.0	0.4
	Chromium	12	22.5	52.3	2
	Copper	19.8	33.7	18.7	—
	Lead	22.7	94J	30.2	—
	Nickel	16	58.2	15.9	7
	Selenium	0.81 J	0.71	—	0.3
	Vanadium	19.6	83.2	—	300
Zinc	58.8	77.9	124	620	
010M002601	Arsenic	6.1 J	41.8	7.24	1
	Barium	181	638J	—	82
	Beryllium	0.57 J	2	—	3
	Cadmium	19.7	1.9J	1.0	0.4
	Chromium	14.8	22.5	52.3	2
	Cobalt	9.7 J	46.5	—	—
	Copper	22.5	33.7	18.7	—
	Lead	11.1	94J	30.2	—
	Nickel	28.4	58.2	15.9	7
	Vanadium	22.6	83.2	—	300
Zinc	47.3	77.9	124	620	
010M002701	Arsenic	5.3 J	41.8	7.24	1
	Barium	88.4	638J	—	82
	Beryllium	0.32 J	2	—	3
	Cadmium	14.3	1.9J	1.0	0.4
	Chromium	10.2	22.5	52.3	2
	Copper	16.3	33.7	18.7	—
	Lead	15.6	94J	30.2	—
	Nickel	16	58.2	15.9	7
	Vanadium	16.6	83.2	—	300
	Zinc	44.1	77.9	124	620
010M002801	Arsenic	7.7 J	41.8	7.24	1
	Barium	104	638J	—	82
	Beryllium	0.4 J	2	—	3
	Cadmium	14.2	1.9J	1.0	0.4
	Chromium	9.7	22.5	52.3	2
	Copper	14.5	33.7	18.7	—
	Lead	13.9	94J	30.2	—
	Nickel	12.2	58.2	15.9	7
	Vanadium	18.7	83.2	—	300
	Zinc	39.4	77.9	124	620

Table 5.11
SWMU 10 — Metals in Sediment — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Background Concentration ^a	Sediment Screening Value	SSL
010M002901	Arsenic	8.2 J	41.8	7.24	1
	Barium	89.7	638J	—	82
	Beryllium	0.39 J	2	—	3
	Cadmium	18.4	1.9J	1.0	0.4
	Chromium	11.6	22.5	52.3	2
	Cobalt	9.2 J	46.5	—	—
	Copper	16.2	33.7	18.7	—
	Lead	14.3	94J	30.2	—
	Nickel	10.2 J	58.2	15.9	7
	Vanadium	24.2	83.2	—	300
010M003001	Zinc	39.3	77.9	124	620
	Arsenic	3.8 J	41.8	7.24	1
	Barium	77.3	638J	—	82
	Beryllium	0.34 J	2	—	3
	Cadmium	11.7	1.9J	1.0	0.4
	Chromium	8.8	22.5	52.3	2
	Copper	13.7	33.7	18.7	—
	Lead	10.6	94J	30.2	—
	Nickel	12.9	58.2	15.9	7
	Silver	67.8	—	2.0	2
Vanadium	15.8	83.2	—	300	
Zinc	30.6	77.9	124	620	

Notes:

Compounds presented in bold text indicate an exceedance of the Reference Concentration, the SSV, or the SSL.

a = Background concentrations taken from SWMU 38 as established in E/A&H, January 1997.

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

SSV = Sediment Screening Value (USEPA, *Supplemental Guidance to RAGS: Region IV Bulletin, Ecological Risk Assessment*, November 1995).

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit, therefore the value presented is estimated.

— = SSV or SSL does not exist.

mg/kg = milligram per kilogram (part per million)

Total Petroleum Hydrocarbons

Petroleum hydrocarbons were detected at three of the six sediment-sample locations (Table 5.12), all in the 0- to 6-inch interval; however, none exceeded the applicable TDEC TPH Soil Cleanup Level of 1,000 mg/kg (as discussed in Section 5.3).

Table 5.12
SWMU 10 — Total Petroleum Hydrocarbons in Sediment — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	TDEC Soil Cleanup Level
010M002701	TPH - Diesel Range Organics	6.4	1,000
010M002901	TPH - Diesel Range Organics	12	1,000
010M003001	TPH - Diesel Range Organics	21	1,000

Note:
mg/kg = milligrams per kilogram (part per million)

5.3.3 Subsurface-Soil Analytical Results

Subsurface-soil samples were collected from two intervals. Samples collected from above the loess soil-water interface were analyzed by the onsite laboratory for VOCs, including benzene, toluene, ethylbenzene, and xylene. Samples collected from the gullies (2 to 3 feet bls) were submitted to an offsite laboratory for FSA to determine if downward migration of surficial contaminants have impacted the underlying soil.

Subsurface-soil data have been compared to the SSLs for the protection of groundwater as presented in the USEPA Region III RBC tables. In addition to the SSLs, the soil metals data have been compared to RCs discussed in Section 5.1. Figure 5-3 shows the location, sample depth, and concentration of all compounds or metals identified as exceeding both their respective SSLs and RCs.

Volatile Organic Compounds

One compound, methylene chloride, was identified at four subsurface soil locations (Figure 5-4) at concentrations exceeding the SSL established for the protection of groundwater (Table 5.13). This compound is discussed further in Section 7 (Fate and Transport).

Table 5.13
SWMU 10 — VOC Analytical Results in Subsurface-Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Depth (feet bis)	Parameter	Concentration	SSL
010S000915	15	Methylene Chloride^a	12.6	1
010S001015	15	Methylene Chloride^a	12.7	1
010S001215	15	Methylene Chloride^a	12.8	1
010S001315	15	Methylene Chloride^a	12.3	1
010M002503	3	Toluene	3 J	600

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

$\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit, therefore, the value presented is estimated.

a = Detected concentration exceeds SSL.

Semivolatile Organic Compounds

SVOCs were detected in two subsurface samples collected from the gullies on the northeast border of the site (Figure 5-4). Table 5.14 presents the identified SVOCs, all PAHs, and their associated concentrations. None of the identified PAHs exceeded its associated SSL (Table 5.14).

Table 5.14
SWMU 10 — Semivolatile Organic Compounds in Subsurface-Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	SSL
010M002603	Di-n-butylphthalate	68 J	270,000
010M002703	Indeno(1,2,3-cd)pyrene	42 J	700
	Benzo(g,h,i)perylene ^a	45 J	210,000
	Benzo(b)fluoranthene	54 J	200
	Benzo(k)fluoranthene	67 J	2,000
	Benzo(a)anthracene	68 J	80
	Benzo(a)pyrene	69 J	400
	Chrysene	77 J	8,000
	Phenanthrene	92 J	210,000
	Pyrene	110 J	210,000
	Fluoranthene	160 J	210,000

Notes:

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

a = SSL for benzo(g,h,i)perylene does not exist; SSL for pyrene was used as a surrogate.

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.

$\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Herbicides

Herbicides were identified in all six subsurface-soil samples collected from the gullies at SWMU 10 (Figure 5-4). Table 5.15 lists the identified compounds and their associated concentrations. SSLs do not exist for these compounds.

Table 5.15
 SWMU 10 — Herbicides in Subsurface-Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration
010M002503	2,4,5-TP (Silvex)	4.8 J
	2,4-DB	9 J
	2,4,5-T	12 J
	MCPA	720 J
010M002603	2,4,5-T	6.5
010M002703	2,4,5-TP (Silvex)	7.4
	2,4-DB	16
010M002803	2,4,5-TP (Silvex)	7.4
	2,4,5-T	10
	Dinoseb	19
	2,4-DB	27 J
	MCPA	1,400 J
010M002903	2,4,5-TP (Silvex)	6.7
	2,4,5-T	9
	Dinoseb	22
010M003003	2,4,5-TP (Silvex)	3.8
	2,4-DB	29 J
	Dinoseb	30

Notes:

- J = Laboratory data qualifier indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.
- = SSL does not exist.
- $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Pesticides/PCBs

The chlorinated pesticide dieldrin was identified in a subsurface-soil sample collected at one location at SWMU 10 (Figure 5-4) at a concentration exceeding the SSL (Table 5.16). The PCB Aroclor-1260 was also identified at this site; however, an SSL value for this compound does not exist.

Table 5.16
SWMU 10 — Pesticides/PCBs in Subsurface-Soil — Hits Only ($\mu\text{g}/\text{kg}$)

Sample ID	Parameter	Concentration	SSL
010M002803	Dieldrin	2.5 J	0.2
010M002903	Aroclor-1260	39.0 J	—

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

- SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).
- J = Laboratory data qualifier indicates that the reported value is less than the method detection limit; therefore, the value presented is estimated.
- = SSL does not exist.
- $\mu\text{g}/\text{kg}$ = microgram per kilogram (part per billion)

Metals

Two metals, cadmium and nickel, were identified in the subsurface-soil samples at concentrations exceeding both the SSL and the RC (Table 5.17). Figure 5-4 shows the locations and depths of the samples. The relevance of these metals are discussed in Section 7 (Fate and Transport).

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Table 5.17
 SWMU 10 — Metals in Subsurface-Soil — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Reference Concentration	SSL
010M002503	Arsenic	6.5 J	20.3	1
	Barium	261	265	82
	Beryllium	0.67 J	1.0	3
	Cadmium*	22.4	3.2	0.4
	Chromium	14.1	28.3	2
	Cobalt	14.2	14.4	—
	Copper	21.2	35.5	—
	Lead	9	19.8	400 ^b
	Nickel*	24.6	—	7
	Vanadium	29.9	43.7	300
	Zinc	62.5	109	620
010M002603	Arsenic	10.1 J	20.3	1
	Barium	71.2	265	82
	Beryllium	0.45 J	1.0	3
	Cadmium*	19.6	3.2	0.4
	Chromium	11.9	28.3	2
	Copper	18.3	35.5	—
	Lead	11.7	19.8	400 ^b
	Nickel*	12.2	—	7
	Vanadium	25.8	43.7	300
		Zinc	41.3	109
010M002703	Arsenic	4.1 J	20.3	1
	Barium	96.4	265	82
	Beryllium	0.35 J	1.0	3
	Cadmium*	14	3.2	0.4
	Chromium	8.3	28.3	2
	Copper	13.5	35.5	—
	Lead	11.8	19.8	400 ^b
	Nickel*	13.3	—	7
	Vanadium	15.8	43.7	300
		Zinc	37.9	109
010M002803	Arsenic	8.8 J	20.3	1
	Barium	242	265	82
	Beryllium	0.47 J	1.0	3
	Cadmium*	20.8	3.2	0.4
	Chromium	10.9	28.3	2
	Cobalt	8.6 J	14.4	—
	Copper	22.2	35.5	—
	Lead	13.8	19.8	400 ^b

Table 5.17
SWMU 10 — Metals in Subsurface-Soil — Hits Only (mg/kg)

Sample ID	Parameter	Concentration	Reference Concentration	SSL
	Nickel ^a	26.9	—	7
	Vanadium	21.5	43.7	300
	Zinc	57.5	109	620
010M002903	Arsenic	10.1 J	20.3	1
	Barium	166	265	82
	Beryllium	0.44 J	1.0	3
	Cadmium ^a	21	3.2	0.4
	Chromium	12.9	28.3	2
	Cobalt	10.3 J	14.4	—
	Copper	24.5	35.5	—
	Lead	12.3	19.8	400 ^b
	Nickel ^a	24.5	—	7
	Vanadium	22	43.7	300
	Zinc	54.3	109	620
010M003003	Arsenic	5.8 J	20.3	1
	Barium	124	265	82
	Beryllium	0.49 J	1.0	3
	Cadmium ^a	19.8	3.2	0.4
	Chromium	12	28.3	2
	Copper	20.2	35.5	—
	Lead	13.4	19.8	400 ^b
	Nickel ^a	20.2	—	7
	Vanadium	21.8	43.7	300
	Zinc	47.5	109	620

Notes:

Compounds presented in bold text indicate an exceedance of both the RC and SSL.

SSL = Soil Screening Levels (Transfers from Soil to Groundwater) from the May 1996 Generic Screening Levels (May 1996, USEPA/OSWER SSL Guidance Document, EPA/540/R-95/128).

a = Value exceeds both the RC and the SSL.

b = RBC values do not exist for lead, 400 mg/kg is the EPA Residential Soil Lead Cleanup Level (OSWER Directive 9355.4-12, USEPA, 1993)

J = Laboratory data qualifier, indicates that the reported value is less than the method detection limit, therefore the value presented is estimated.

— = SSL does not exist.

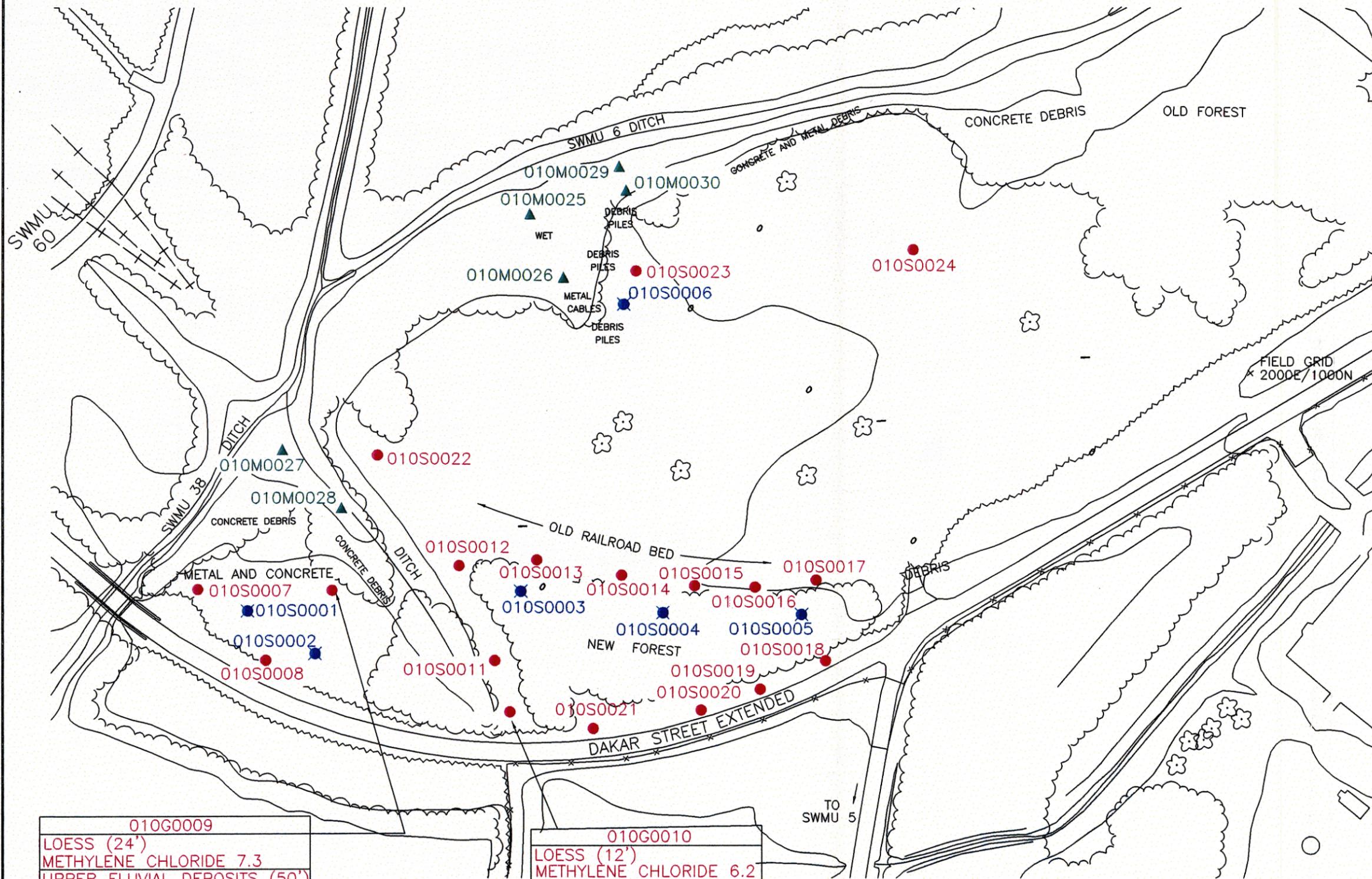
mg/kg = milligram per kilogram (part per million)

5.4 Groundwater Analytical Results

As discussed in Section 4, groundwater samples were collected from both the loess and the upper part of the fluvial deposits using a Geoprobe sampler. Samples were submitted to the onsite laboratory for VOC analysis. The USEPA Maximum Contaminant Levels (MCLs) (USEPA, February 1996), USEPA Region III tap water RBCs (USEPA, April 1998), and TDEC Cleanup Level for benzene (TDEC, August 1996) are provided with the sample results for comparison.

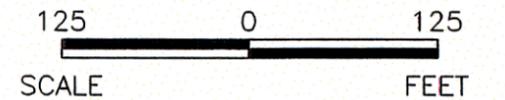
The analytical results presented in Table 5.18 indicate that benzene was identified in the loess groundwater at one location (010G002420) at a concentration (2.9 micrograms per liter [$\mu\text{g/L}$]) greater than the tap water RBC (0.36 $\mu\text{g/L}$), but less than both the TDEC Cleanup Level (70 $\mu\text{g/L}$) and the MCL (5 $\mu\text{g/L}$). Methylene chloride was identified in both the loess (010G000924, 010G001012) and upper fluvial deposits (010G000950), as well as in subsurface-soil samples (010S000915, 010S001015, 010S001215, 010S001315) collected from the same locations (see Section 5.3.3). The loess and upper fluvial deposits groundwater had methylene chloride concentrations slightly exceeded the MCL and tap water RBC (4.1 $\mu\text{g/L}$). Toluene was also identified in both groundwater units, but at concentrations far less than all screening and action levels.

The locations and concentrations of the detected compounds are shown in Figure 5-5. As shown on the figure, the spatial distribution of the methylene chloride contaminated sample locations is relatively small when compared to the rest of the site. The parameters detected at SWMU 10 are discussed in Section 6 (PRE) and Section 7 (Fate and Transport).



LEGEND

- 010S0024 ● GEOPROBE POINTS
- 010M0026 ▲ SEDIMENT SAMPLE
- 010S0006 ■ SURFACE SOIL
- RED - EXCEEDS BOTH THE MCL AND TAP WATER RBC (ug/L)



010G0009
LOESS (24')
METHYLENE CHLORIDE 7.3
UPPER FLUVIAL DEPOSITS (50')
METHYLENE CHLORIDE 6.1

010G0010
LOESS (12')
METHYLENE CHLORIDE 6.2



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FIGURE 5-5
MCL AND TAP WATER RBC
EXCEEDANCES IN GROUNDWATER
SWMU 10
CONSTRUCTION DEBRIS LANDFILL
(EASTERN PORTION)

NOTE: POINTS SHOWN ARE APPROXIMATE.
GPS DATA NOT AVAILABLE AT THIS TIME.

DWG DATE: 09/29/98 DWG NAME: 0094B023

00612F04Y

Table 5.18
SWMU 10 — Groundwater Analytical Results — Hits Only ($\mu\text{g/L}$)

Sample ID	Parameter	Concentration	MCL	Tap Water RBC
Loess				
010G000924	Methylene Chloride^b	7.3	5	4.1
010G001012	Methylene Chloride^b	6.2	5	4.1
010G001220	Toluene	2.1	1,000	750
010G001320	Toluene	4.3	1,000	750
010G001420	Toluene	4.6	1,000	750
010G002420	Benzene	2.9	5^a	0.36
	Toluene	2.5	1,000	750
Upper Fluvial Deposits				
010G000950	Methylene Chloride^b	6.1	5	4.1
010G001150	Toluene	3.5	1,000	750
010G001250	Toluene	4.8	1,000	750
010G001450	Toluene	2.0	1,000	750
010G001550	Toluene	4.7	1,000	750
010G001650	Toluene	5.2	1,000	750

Notes:

Compounds presented in bold text indicate an exceedance of one of the listed screening values.

$\mu\text{g/L}$ = micrograms per liter (part per billion)

MCL = Maximum contaminant level as published in *Drinking Water Regulations and Health Advisories* (USEPA, 1996).

RBC = Tap water Risk-Based Concentration as published in USEPA Region III, *Risk-Based Concentration Table* (April 1, 1998).

a = The MCL for benzene is the same as the TDEC Groundwater Cleanup Level for benzene of 5 $\mu\text{g/L}$ as published in the *Environmental Assessment Guidelines* (TDEC, 1996).

b = Detected concentration exceeds the MCL and the tap water RBC.

5.5 Summary of Nature and Extent

The investigation of SWMU 10 focused on four media — surface soil, subsurface-soil, sediment, and groundwater. The concentrations and location for each detection exceeding both their respective screening and/or regulatory levels and RCs (metals) are shown in Figures 5-3, 5-4, and 5-5. The relevance of each compound is discussed in Section 6 PRE (where applicable) and Section 7 Fate and Transport sections of this report.

Surface Soil

Analysis of soil samples collected from the surface of the landfill identified exceedances for the following compounds:

- Benzo(a)pyrene, benzo(a) anthracene, and benzo(b)fluoranthene exceeding both the residential and industrial RBCs.
- Dibenz(a,h)anthracene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dieldrin, heptachlor epoxide, and Aroclor-1260 exceeding the residential RBCs.
- Arsenic (as a carcinogen) exceeding the RC, residential RBC, and the industrial RBCs.
- Cadmium, lead, and tin exceeding their RCs.

Sediment

Sediment samples collected from the gullies on the northwestern boundary of SWMU 10 identified the following compounds that exceeded their respective SSLs, SSVs and RCs (metals).

- Benzo(a)anthracene exceeded its SSL.

- 4,4' -DDE, 4,4' -DDT, chlordane (alpha, gamma, and technical) and dieldrin exceeding the SSVs. Dieldrin also exceeded its SSL.

- Cadmium exceeding the background concentration and its SSV, selenium exceeded the background concentration and its SSL, and silver exceeded its SSV and its SSL.

Subsurface Soil

Subsurface samples were collected from both the main portion of the landfill and from the gullies on the northwestern boundary of SWMU 10. The sample data indicate the following:

- Methylene chloride (dichloromethane) and dieldrin exceeded their SSLs.

- Cadmium and nickel exceeded their SSLs and cadmium exceeded its RC.

Soil samples collected from the subsurface of SWMU 10 indicated the possible presence of methylene chloride at concentrations exceeding the SSL. The relevance of this compound is discussed in Section 7 Fate and Transport. The loess and fluvial deposits groundwater located in the same area also contained methylene chloride.

Groundwater

Sample data collected from the loess groundwater and the upper fluvial deposits groundwater indicate the following:

- Methylene chloride was identified in both the loess and fluvial groundwater at concentrations exceeding both the USEPA MCL and tap water RBC. The subsurface soil located above groundwater also contained methylene chloride. At concentrations exceeding the SSL.
- Benzene was identified in the loess groundwater at a concentration exceeding the tap water RBC.

6.0 PRELIMINARY RISK EVALUATION

In accordance with *Guidance on Preliminary Risk Evaluations for the Purpose of Reaching a Finding of Suitability to Lease* (USEPA, November 1994), a PRE was conducted for SWMU 10 using data collected from groundwater samples. Surface soil and sediment data were previously examined in a PRE; however, further evaluation of these media is currently unnecessary in light of the recent alterations of onsite surface soil condition (i.e., the mixing/diluting of contaminated soil by the clearing, grubbing, grading, and introduction of new topsoil). Groundwater samples from the loess and the upper part of the fluvial deposits were analyzed for VOCs only. The PRE identifies contaminants of potential concern (COPCs) from the original set of detected chemicals; calculates the risk ratio for each COPC; and interprets those results.

COPCs were identified by comparing the maximum concentration of each detected chemical with its corresponding RBC value. Inorganics were also compared to RCs listed in *Technical Memorandum Reference Concentrations* (E/A&H, August 1997). If the maximum detected concentration of an inorganic was greater than both the RC and the corresponding RBC, the inorganic chemical was retained as a COPC. Likewise, if the maximum detected concentration of an organic was greater than the corresponding RBC, the organic compound was retained as a COPC. This methodology was employed to focus the PRE on source contaminants that may pose a human health risk and to eliminate those that occur naturally or pose minimal threat due to concentrations being less than RBCs. The RBCs are based on a target Incremental Lifetime Excess Cancer Risk (ILCR) of 10^{-6} and a target Hazard Quotient (HQ) of 1.0. Noncarcinogenic-based RBCs were adjusted from a target HQ of 1.0 to 0.1 in accordance with USEPA Region IV *Supplemental Guidance to RAGS Bulletin 1*, November 1995. The cumulative ILCR threshold is $1E-04$ and the cumulative hazard index (HI) threshold is 1.0, in accordance with the USEPA Region IV Memorandum, November 1994. Ecological risk is addressed in Section 8.

Risk-based screening, as opposed to calculating risk and hazard for each chemical present in site samples, should not affect the conclusions of the PRE. Carcinogens eliminated based on the target ILCR of 1E-06 would not be expected to contribute significantly to the cumulative ILCR because the cumulative threshold is 1E-04. Likewise, noncarcinogens would not be expected to significantly contribute to the HI because the target HQ of 0.1 is less than the cumulative threshold of 1.0. In effect, this method provides insight into which contaminants pose the most significant threats to human receptors, helps to identify areas of concentrated contamination (“hot spots”), and eliminates those chemicals which are naturally occurring, are not source contaminants, or would not significantly affect the conclusions of the PRE. Table 6.1 presents COPCs identified in groundwater samples and shows the calculated risk associated with the detected concentrations.

Proportionate risk was calculated for each COPC using the ratio between the maximum reported concentration and the corresponding RBC. A risk ratio is calculated for each contaminant by one of the following two equations:

$$\text{Carcinogenic Risk Ratio: } RR = \frac{\text{media concentration} * TR}{\text{screening value}}$$

$$\text{Noncarcinogenic Risk Ratio: } RR = \frac{\text{media concentration} * THQ}{\text{screening value}}$$

where:

RR	=	the risk ratio
Media Concentration	=	the maximum concentration of a site chemical
Screening Value	=	the RBC value for that particular chemical
TR	=	target risk used to calculate RBCs for carcinogens (10 ⁻⁶)
THQ	=	target HQ used to calculate RBCs for noncarcinogens (0.1)

The risk ratios for each chemical are summed separately for both residential and industrial scenarios to determine the overall site risk for each scenario.

Table 6.1
Preliminary Risk Evaluation – Carcinogens

Chemical	Maximum Concentration Groundwater	RBC		Risk Ratio	
		Residential Groundwater	Industrial Groundwater	Residential Groundwater	Industrial Groundwater
Benzene	2.9	0.36	1.44	8.1E-06	2.0E-06
Methylene chloride	7.3	4.1	16.4	1.8E-06	4.5E-07
			Risk Sum by Use Scenario	9.9E-06	2.5E-06

Notes:

All concentrations for groundwater are in micrograms per liter ($\mu\text{g/L}$).

RBC = Risk-Based Concentrations (RBCs) were taken from the April 1998 Risk-Based Concentration Table (April 1, 1998 USEPA Region III RBC memorandum).

In accordance with USEPA Region IV's November 1994 memorandum, the property is considered suitable to lease for the specified land use scenario if neither threshold is exceeded. Cumulative threshold exceedances may indicate the need for further investigation or discussion.

Uncertainty

The PRE for SWMU 10 is based on the maximum reported concentrations of each COPC and includes future residential and industrial scenarios. The conservative approach includes these sources of uncertainty and variability:

- Exposure to maximum reported concentrations will be uniform, regardless of sample location, which creates a theoretical hot spot. The PRE was based on a minimum number of samples. Use of the maximum concentration potentially overestimates exposure, especially if the maximum detected concentration is in a hot spot. Likewise, exposure could be underestimated if a hot spot were missed during sampling.

- The landfill property is to be transferred to the City of Millington for conversion into commercial and/or industrial only. Residential use is not planned for the site (RKG Associates, 1995); however, the residential scenario was incorporated into the PRE to provide a conservative representation of future risk or hazard. Consequently, a residential scenario for SWMU 10 overestimates exposure for a commercial and/or industrial land use.
- Cumulative effects will occur, regardless of target organs and mechanisms of action, which could either overestimate or underestimate exposure.
- Grubbing the soil entails removing all vegetation from the area, including trees. After surface vegetation is removed, the land surface is leveled to provide the flat topography required when in the clear zone of the air field. This affected soil conditions and altered the site as it was originally sampled.

Conclusions and Recommendations

Based on the information gathered during the investigation, the following conclusions and recommendations have been reached based on a PRE performed on data from groundwater samples:

Residential Land Use

- *Carcinogens*: The cumulative risk for the residential scenario was estimated to be $9.9E-6$, indicating suitability for lease for residential land use, in accordance with USEPA Region IV's November 1994 memorandum.
- *Noncarcinogens*: No noncarcinogenic constituents were detected at levels requiring a PRE.

Industrial Land Use

- *Carcinogens:* The cumulative risk for the industrial scenario was estimated to be $2.5E-6$, indicating suitability for lease for industrial land use in accordance with USEPA Region IV's November 1994 memorandum.
- *Noncarcinogens:* No noncarcinogenic constituents were detected at levels requiring a PRE.

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7.0 CONTAMINANT FATE AND TRANSPORT

Physical characteristics of SWMU 10 and contaminant distribution in each environmental medium were discussed in previous sections. In this section, SWMU characteristics and contaminant distribution are used to discuss the fate and transport of contaminants in each medium in four parts:

- Source definition, specifically the contaminants detected during the investigation and the contaminants of concern for each medium, are discussed in Section 7.1.

- Potential migration routes are discussed for each medium in Section 7.2.

- Contaminant persistence in soils, surface water and sediment, and groundwater is considered in Section 7.3. For each class of compounds, the general fate and transport characteristics of the relevant contaminants are summarized because their chemical and physical properties affect contaminant migration and fate.

- Contaminant migration is presented in Section 7.4, with an overview of factors affecting movement.

In Section 5, the results of the confirmatory sampling were described for all compounds detected at SWMU 10, focusing on the primary contaminants detected in various media onsite. The primary contaminants, for purposes of fate and transport discussions, are defined as those compounds in groundwater or soil in which the maximum detected concentration exceeds the SSL, and any inorganic contaminant in which the maximum detected concentration exceeds the RBC and background RC, or any contaminant in sediment which exceeds its SSV.

7.1 Source Definition

A brief description of the landfill operations at SWMU 10 is explained in Section 2. Soil contaminant groups identified at the site include VOCs, SVOCs, herbicides, pesticides/PCBs, metals, and petroleum hydrocarbon. These contaminant groups were also identified in sediment samples. Groundwater contaminants identified at the site include only benzene, toluene, and methylene chloride.

7.2 Potential Routes of Migration

This section delineates the potential routes of migration for contaminants both within and from SWMU 10. Potential migration pathways in SWMU 10 are considered for each of the four available media:

- Air emissions, specifically the dispersion of contaminants from soil and surface water bodies (Section 7.2.1).
- Soil, primarily the potential leaching of contaminants from soil to underlying groundwater and nearby surface water, and the potential erosion of surface soil into adjacent surface water (Section 7.2.2).
- Surface water and sediment, including transport of surface water and sediment downstream, and the potential transport of contaminants to groundwater via infiltration from any onsite water bodies (Section 7.2.3).
- Groundwater, including potential migration to NSA Memphis potable supply wells, and potential transport of contaminants to surface water via discharge of groundwater to lakes or streams (Section 7.2.4).

7.2.1 Air Emissions

Volatile contaminants in near-surface soil and surface water may migrate to the air by volatilization. Soil samples were collected from the surface interval (0 to 1 foot bls) at SWMU 10. Contaminants identified in these surface soil samples include VOCs, SVOCs, herbicides, pesticides/PCBs, metals, and petroleum hydrocarbons. Of these contaminant groups, only VOCs pose a threat to the air due to volatilization, due to their relatively high vapor pressure and Henry's law constant (discussed later). However, none of the VOCs detected in surface soil exceeded any of the standard reference values and are therefore not considered a threat at SWMU 10.

7.2.2 Soil

As discussed in Section 2, SWMU 10 is a 13- to 20-acre landfill that operated as a disposal area from approximately 1951 to 1986. Based on investigation data, this area is a potential source within the unsaturated zone. Contaminants found in soil at SWMU 10 could be released to the environment by one of the following mechanisms:

Volatilization: As indicated in Section 7.2.1, volatilization of contaminants from soils is not considered a migration pathway.

Erosion and Surface Runoff: Surface soil contaminants could be transported by erosion of surficial materials during and after precipitation. A section of SWMU 38 borders the west side of SWMU 10 and a section of SWMU 6 borders the north side of the landfill. Drainage ditches associated with these SWMUs have received runoff from the airfield and were subject of the Assembly B RFI. As described in Section 1, confirmatory sediment sampling in the SWMU 10 gullies has been conducted and those results are presented in Section 5.

Leaching: The principal processes that control contaminant migration by leaching are sorption and solubility. Soil contaminants can leach into groundwater from any depth in the unsaturated zone. Contaminants appear to have leached into SWMU 10 groundwater based on the contaminants detected in soil above groundwater. Of the three contaminants detected in groundwater (benzene, toluene, and methylene chloride), two also appeared in subsurface soil (toluene and methylene chloride), and one appeared in surface soil (toluene). Of these, only benzene and methylene chloride exceeded any of the standard reference values.

The potential fate and migration of the noted contaminants via the identified pathways are discussed in detail in Section 7.4.

7.2.3 Surface Water and Sediment

No surface water has been identified within the boundary of SWMU 10. As stated before, SWMU 38 drainage ditches border the west side of SWMU 10 and a section of SWMU 6 borders the north side. Sediment has been sampled from SWMU 10 gullies due to the presence of petroleum-related constituents in SWMU 38 drainage ditch sediments; however, the SWMU 10 sediment samples did not seem to indicate a relationship to the contaminants detected at SWMU 38. Since then, the gullies at SWMU 10, where the sediment samples were taken, have been filled and additional soil has been spread over the site.

7.2.4 Groundwater

Only methylene chloride was detected at concentrations exceeding its MCL (5 $\mu\text{g/L}$) and tap water RBC (4.1 $\mu\text{g/L}$) in both the loess and upper fluvial deposits groundwater at SWMU 10. Benzene was detected in loess groundwater at concentrations less than its MCL, but greater than its RBC. Toluene was also detected in loess and upper fluvial deposits groundwater, but not at concentrations exceeding its MCL or RBC. The concentrations of methylene chloride and benzene

were relatively low and show a correlation to the contaminants present in the overlying soil. The spatial distribution of these contaminants is limited to a relatively small area of the site.

Potential pathways for migration of contaminants from groundwater are:

- Advective transport to nearby downgradient shallow domestic supply well, (none are known to exist).
- Advective transport to the underlying Memphis aquifer.

The potential fate and migration of contaminants by the above potential pathways are discussed in detail in Section 7.4.

7.3 Contaminant Persistence

Persistence measures how long a given chemical will be present in a specific medium. Contaminant persistence in environmental media is a function of physical and chemical properties of a given class of compounds, the specific chemicals within each class found in the environment, and properties of the medium of concern.

Persistence of contaminants detected in SWMU 10 soil and groundwater is discussed below. Relevant classes of compounds are VOCs, SVOCs, herbicides, pesticides/PCBs, and inorganics (metals).

7.3.1 Chemical and Physical Properties

The following briefly describes physical and chemical properties used in discussing contaminant persistence, along with the significance of each property to volatilization, sorption, diffusion, dispersion, biodegradation, and other attenuation processes. Chemical and physical properties

relevant to evaluation of fate and transport of organic contaminants include water solubility, vapor pressure, Henry's law constant, specific gravity, octanol-water partition coefficient, and half-life. Water solubility, adsorption coefficient, and oxidation-reduction processes are properties of interest for inorganic contaminants.

Water Solubility: The solubility of a chemical in water is the maximum amount that will dissolve at a specified temperature. Chemicals with high solubility generally are relatively mobile in water and are more likely to leach from soil. These chemicals tend to have low volatilization potential but may be biodegradable. Chemicals with low water solubility are more apt to adsorb on soil and are not readily biodegradable.

Vapor Pressure: The vapor pressure of a liquid or solid is the pressure of the gas in equilibrium with respect to the liquid or solid at a given temperature. It represents a compound's tendency to evaporate. From soil, the vapor pressure determines the volatilization of a chemical to the atmosphere. A chemical with a vapor pressure less than 10^6 millimeters of mercury (mm Hg) will tend to associate with particulate matter, whereas at a higher vapor pressure, the chemical tends to associate with the vapor phase. Compounds with high water solubilities show little volatilization from water or moist soil unless they have a high vapor pressure.

Henry's Law Constant: Henry's law states that the amount (i.e., the mole fraction) of a slightly soluble gas dissolved in a liquid is proportional to the partial pressure of the gas. The Henry's law constant, with units of atmospheres-cubic meter per mole ($\text{atm}\cdot\text{m}^3/\text{mole}$), describes a linear relationship between vapor pressure and water solubility, providing a measure of a chemical's ability to move from water or soil to air. The following describes the relative volatilization that can be expected from a chemical based on the Henry's law constant:

- Greater than 10^{-3} will readily volatilize
- 10^{-3} to 10^{-5} moderate volatilization
- Less than 10^{-5} limited volatilization

Specific Gravity: Specific gravity is the ratio of a fluid's density to a standard reference density. For liquids and solids, the reference is the density of pure water. Specific gravity can be used to predict the vertical extent of the immiscible portion of a chemical in water.

Organic Carbon Partition Coefficient: The partition coefficient (K_{oc}) measures the degree to which an organic substance will preferentially dissolve in water or in an organic solvent. The typical range of K_{oc} values is 1 to 10^7 milliliters per gram (ml/g), with higher values indicating a greater tendency to remain sorbed. A chemical moving through the subsurface will alternately sorb or desorb from available organic matter in the soil matrix, therefore, the organic content of the soil is critical to predicting the state of contaminants in a soil matrix. The higher the K_{oc} values, the lower the mobility in the subsurface due to a chemical's tendency to sorb to the fraction of organic carbon (f_{oc}) in soil.

Distribution Coefficient: The mobilization, volatilization, and transformation reactions of a contaminant in the unsaturated zone are due to the partitioning (adsorption-desorption) of the contaminant to the phases existing in the zone. Soil physical and chemical properties affect the ability of a chemical to be adsorbed to soil surfaces. Important in governing the extent to which an organic contaminant will be adsorbed are specific aspects of its chemical structure including molecular size, hydrophobicity, molecular charge, organic molecular fragments that undergo hydrogen bonding, the three-dimensional arrangement, and molecular fragments that undergo coordination bonding. The partition coefficient (or distribution coefficient) mathematically expresses this partitioning. The distribution coefficient (K_d) is a valid representation of the

partitioning between liquid and solids, or the ratio of the mass of contaminant in soil to the mass of contaminant dissolved in the groundwater, and is used to model contaminant movement through the subsurface. The larger the K_d value, the greater the sorption to the solid phase. The simplest method for acquiring a K_d value for a specific contaminant is to obtain it from a K_{oc} value listed in literature sources. K_{oc} is analogous to K_d , except that the adsorbing material is considered to be the organic carbon (oc) in the soil as opposed to the entire soil matrix. By normalizing K_d on the basis of the soil's organic carbon content (typically 0.2% to about 3%) a great deal of the variation observed among K_d over different soils can be eliminated; thus, K_d can be estimated from the K_{oc} of the chemical and the amount of oc (f_{oc}) in the soil:

$$K_d = K_{oc} f_{oc}$$

K_{oc} values can be used directly as the K_d value for a specific contaminant if the necessary soil data are not available; however, a more accurate estimation can be obtained when adjusting the values with f_{oc} as described above.

Retardation Factor: During transport processes, some degree of contaminant mass transfer by adsorption from the pore water to the solid part of the porous medium while flow occurs will retard the advance rate of the contaminant front. The retardation of the contaminant front relative to the bulk mass density of the porous medium is described by the following equation:

$$R = 1 + \frac{P_b}{n} K_d$$

where:

- R = retardation factor, dimensionless
 p_b = bulk mass density of the porous medium, g/cm³
n = porosity, fraction
 K_d = solid-liquid partition coefficient, ml/g

A retardation factor of 10 would imply that the contaminant plume moves 10 times slower than the local groundwater velocity.

Half Life: A half life is the time required for the concentration of a substance to decrease by one-half its initial concentration. The decrease may be caused by various processes, including biodegradation. The half-life values listed for contaminants at SWMU 10 may not be representative of conditions there, but give a relative indication of the chemical's persistence in the subsurface.

Oxidation and Reduction Processes: Oxidation-reduction (redox) reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized, and the other reactant is reduced. The terms pe and E_H are used to characterize redox conditions. Graphs that show the equilibrium occurrence of ions or minerals as domains relative to pe or E_H are known as pe - E_H diagrams. These diagrams help describe the state of inorganics in the subsurface, i.e., whether they remain in a solid state (immobile) or an aqueous state (mobile).

7.3.2 Volatile Organic Compounds

Physical and chemical characteristics of VOCs render them mobile in the environment, with the potential to volatilize to the atmosphere, leach to groundwater, erode with surface sediment or soil to surface water, and move with groundwater. Relative to other compound classes, VOCs have

low molecular weights and high water solubilities, vapor pressures, and Henry's law constants, along with correspondingly low K_{oc} . While increasing the mobility of VOCs in the environment, these properties all enhance the potential for degradability of VOCs. Relative to chemicals in other classes, many VOCs tend to have relatively short half-lives in groundwater. VOCs have a limited tendency to sorb to soil and, thus, can be expected to be moderately to highly mobile in the environment. Table 7.1 displays those VOCs which are considered for fate and transport discussion at SWMU 10.

Table 7.1
Contaminants of Concern – VOCs

Parameter	Parameter is a COC in...	Reason
Methylene Chloride	Subsurface soil Loess Groundwater Upper Fluvial Deposits Groundwater	Exceeded its soil-to-groundwater SSL at 4 locations Exceeded its MCL and Tap Water RBC Exceeded its MCL and Tap Water RBC
Benzene	Loess Groundwater	Exceeded its Tap Water RBC

Chemical and physical properties of benzene and methylene chloride are summarized in Table 7.2.

Table 7.2
Chemical/Physical Properties of Benzene and Methylene Chloride

Property	Benzene	Methylene Chloride
Molecular Weight ^{a,b}	78.11	84.93
Vapor Pressure (mm Hg @ T°C) ^{a,b}	75 @ 20	350 @ 20
Solubility in Water (mg/L @ T°C) ^{a,b}	1,780 @ 20	1.67 x 10 ⁴ @ 25
Specific Gravity ^{a,b}	0.86	1.33
K_{oc} (ml/g) ^{a,b}	83	47.9
Henry's Law Constant (atm-m ³ /mole) ^b	5.55 x 10 ⁻³	3.19 x 10 ⁻³ @ 25

Table 7.2
Chemical/Physical Properties of Benzene and Methylene Chloride

Property	Benzene	Methylene Chloride
Half-Life — Soil (hours) ^c	high = 384 low = 120	high = 672 low = 168
Half-Life — Groundwater (hours) ^c	high = 17,280 low = 240	high = 1,344 low = 336
Soil Screening Level Transfers from Soil to Groundwater (mg/kg) ^d	0.002	0.001

Notes:

- a = Howard, *Fate and Exposure Data*, Lewis Publishers, Chelsea MI, 1993, Merck & Co., *The Merck Index*, Merck & Co., Rahway, NJ, 1983.
- b = Knox, Sabatini, Canter, *Subsurface Transport and Fate Processes*, Lewis Publishers, Chelsea, MI, 1993.
- c = Howard, *Environmental Degradation Rates*, Lewis Publishers, Chelsea, MI, 1993.
- d = USEPA, *1996 Risk-Based Concentration Table*, USEPA Region III, 1996.

Benzene is a clear, colorless, highly flammable liquid with a characteristic odor, is primarily used to manufacture medicinal chemicals, dyes, and many other organic compounds. It also is a constituent in the manufacture of gasoline. Benzene released to soil will volatilize rapidly near the surface; that which does not evaporate will be highly mobile in soil and may leach to groundwater. Benzene is biodegradable in soil, and is subject to biodegradation in groundwater, but probably not under anaerobic conditions.

Methylene chloride is a colorless liquid used primarily in aerosols, paint removers, and chemical processing. When released to soil, methylene chloride would be expected to evaporate from near-surface soil into the atmosphere due to its relatively high vapor pressure. Although little work has been done on the adsorption of methylene chloride in soil, it is expected to have a low adsorptivity to soil. The half-life of methylene chloride in groundwater is relatively short, indicating it is not persistent in this medium and any migration in groundwater would result in decreased concentrations downgradient.

7.3.3 Semivolatile Organic Compounds

SVOCs generally have higher molecular weights and lower solubilities, vapor pressures, and Henry's law constants than VOCs. Because of a higher K_{oc} , SVOCs tend to sorb to solids and are relatively immobile in the environment, leading to a likelihood of greater persistence (thus lower mobility) than VOCs. Table 7.3 displays those SVOCs which are considered for fate and transport discussion at SWMU 10.

Table 7.3
Contaminants of Concern – SVOCs

Parameter	Parameter is a COC in...	Reason
Benzo(a)anthracene	Surface soil Sediment	Exceeded its soil-to-groundwater SSL at 4 locations Exceeded its soil-to-groundwater SSL in sediment at 1 location
Benzo(a)pyrene	Surface soil	Exceeded its soil-to-groundwater SSL at 3 locations
Benzo(b)fluoranthene	Surface soil	Exceeded its soil-to-groundwater SSL at 4 locations
Benzo(k)fluoranthene	Surface soil	Exceeded its soil-to-groundwater SSL at 2 locations
Carbazole	Surface soil	Exceeded its soil-to-groundwater SSL at 4 locations
Chrysene	Surface soil	Exceeded its soil-to-groundwater SSL at 1 location
Dibenz(a,h)anthracene	Surface soil	Exceeded its soil-to-groundwater SSL at 4 locations
Indeno(123-cd)pyrene	Surface soil	Exceeded its soil-to-groundwater SSL at 2 locations

Table 7.4 lists the chemical and physical properties of the SVOCs.

Table 7.4
Chemical/Physical Properties of SVOCs

Property	B(a)P	B(b)F	B(k)F	Carbazole	Chrysene	D(a,h)A	I(1,2,3-cd)P
Molecular Weight	252.32	252.3	252.3	167.2	228.3	278.36	276.34

Table 7.4
Chemical/Physical Properties of SVOCs

Property	B(a)P	B(b)F	B(k)F	Carbazole	Chrysene	D(a,h)A	I(1,2,3-cd)P
Vapor Pressure (mm Hg)	5.6×10^{-9}	5×10^{-7}	9.5×10^{-11}	4×10^2	6.3×10^{-9}	1×10^{-10}	1×10^{-10}
Solubility (mg/L)	3.9×10^{-3}	1.4×10^{-2}	5.5×10^{-4}	3.8×10^{-3}	1.8×10^{-3}	5×10^{-3}	6.2×10^{-2}
Specific Gravity	1.4	1.4	1.4	1.1	1.27	1.28	1.27
K_{oc} (ml/g)	1.77×10^6	5.5×10^5	4.37×10^6	no data	2.45×10^5	1.66×10^6	3.09×10^7
Henry's Law Constant (atm-m ³ /mole)	2.4×10^{-6}	1.2×10^{-5}	1.04×10^{-3}	no data	7.26×10^{-20}	7.33×10^{-9}	2.96×10^{-20}
Half-Life Soil (hours)	high=12720 low=1368	no data	no data	no data	no data	no data	no data
Half-Life Groundwater (hours)	high=25440 low=2736	no data	no data	no data	no data	no data	no data
SSL (mg/kg)	0.4	0.2	2	0.03	8	0.08	0.7

Notes:

- B(a)P = Benzo(a)pyrene
- B(b)F = Benzo(b)fluoranthene
- B(k)F = Benzo(k)fluoranthene
- D(a,h)A = Dibenz(a,h)anthracene
- I(1,2,3-cd)P = Indeno(1,2,3-cd)pyrene
- a = Howard, *Fate and Exposure Data*, Lewis Publishers, Chelsea, MI, 1993. Merck & Co., *The Merck Index*, Merck & Co., Rahway, NJ, 1983.
- b = Knox, Sabatini, Canter, *Subsurface Transport and Fate Processes*, Lewis Publishers, Chelsea, MI, 1993.
- c = Howard, *Environmental Degradation Rates*, Lewis Publishers, Chelsea, MI, 1993.
- d = USEPA, *1996 Risk-Based Concentration Table*, USEPA Region III, 1996.
- mg/L = milligram per liter

None of the SVOCs which exceeded either their soil-to-groundwater SSL or their SSV was also detected in groundwater. As discussed earlier, SVOCs are not expected to be mobile in soil (as compared to VOCs), therefore, they are not expected to readily leach to underlying groundwater. Since adsorption is the main transport process, precipitation forming sediments at the subsurface plays an important role in transporting SVOCs at the surface. However, SWMU 10 was recently cleared of vegetation, and clean fill material brought in to level the ground surface. Ravines where sediment samples were obtained are now filled with clean soil, and any surface

contamination has now been mixed with clean fill material. Due to this recent work at the site, it is unlikely that any SVOCs will become mobile during precipitation events.

7.3.4 Pesticides/PCBs

Scientific literature on pesticides suggests several important soil-related variables that are critical to the mobility and persistence of pesticides in soil. Generally, pesticides are "relatively immobile." However, these compounds may move by diffusion and mass transport. The presence of an electrical charge in the soil matrix, the soil pH, and the f_{oc} all affect the adsorbent efficiency of pesticides. Nearly all pesticides, and many other organic substances released to the land surface and into the soil zone undergo biochemical degradation. A major influence on the dissipation of pesticides/PCBs at the soil surface will be the plant material that covers the soil. This plant material is an excellent source of nutrients for microorganisms and microbial activity. Pathways and rates of degradation will differ depending on the presence of localized aerobic or anaerobic conditions. Once in groundwater, pesticide/PCB movement is retarded by the sorption to soil particles. Sorption to organic matter or soil particles is the primary mechanism. Since little organic matter is normally found in the saturated zone of the loess, movement of pesticides/PCBs in this zone is essentially the same as the groundwater movement. Table 7.5 displays those pesticides/PCBs which are considered for fate and transport discussion at SWMU 10.

Table 7.5
Contaminants of Concern – Pesticides/PCBs

Parameter	Parameter is a COC in...	Reason
Dieldrin	Surface soil	Exceeded its soil-to-groundwater SSL at 6 locations
	Subsurface soil	Exceeded its soil-to-groundwater SSL at 1 location
	Sediment	Exceeded its SSV at 4 locations; SSL at 5 locations
Endrin ketone	Surface soil	Exceeded its soil-to-groundwater SSL at 1 location
alpha-Chlordane	Sediment	Exceeded its SSV at 2 locations

Table 7.5
Contaminants of Concern — Pesticides/PCBs

Parameter	Parameter is a COC in...	Reason
gamma-BHC (Lindane)	Surface soil	Exceeded its soil-to-groundwater SSL at 1 location
gamma-Chlordane	Sediment	Exceeded its SSV at 2 locations
Technical Chlordane	Sediment	Exceeded its SSV at 1 location
Heptachlor epoxide	Surface soil	Exceeded its soil-to-groundwater SSL at 2 locations
4,4'-DDE	Sediment	Exceeded its SSV at 2 locations
4,4'-DDT	Sediment	Exceeded its SSV at 2 locations

Table 7.6 summarizes the chemical and physical properties of pesticides that are of concern at SWMU 10.

Table 7.6
Chemical/Physical Properties of Pesticides/PCBs

Property	Dieldrin	Endrin Ketone	α- Chlordane	γ-BHC (Lindane)	γ- Chlordane	Heptachlor epoxide	4,4'-DDE	4,4'-DDT
Molecular Weight	380.91	380.92	409.78	290.82	409.78	389.32	319.03	354.49
Vapor Pressure (mm Hg)	1.8×10^{-7}	7×10^{-7}	1×10^{-5}	6.7×10^{-5}	1×10^{-5}	2.6×10^{-6}	6.5×10^{-6}	1.9×10^{-7}
Solubility (mg/L)	2×10^{-1}	2.3×10^{-1}	5.6×10^{-2}	7.5	5.6×10^{-2}	3.5×10^{-1}	4×10^{-2}	5×10^{-3}
Specific Gravity	1.8	1.7	1.6	1.6	1.6	1.6	1.5	1.6
K_{oc} (ml/g)	1.34×10^4	8.32×10^3	4.95×10^4	1.21×10^3	4.95×10^4	2.09×10^4	2.45×10^5	3.87×10^5
Henry's Law Constant (atm-m ³ /mole)	2×10^{-5}	5×10^{-7}	4.8×10^{-5}	3.25×10^{-6}	4.8×10^{-5}	3.2×10^{-5}	2.34×10^{-5}	4.89×10^{-5}
Half-Life Soil (hours)	high = 25, 920 low = 4,200	no data	no data	no data	no data	no data	no data	no data

Table 7.6
Chemical/Physical Properties of Pesticides/PCBs

Property	Dieldrin	Endrin Ketone	α - Chlordane	γ -BHC (Lindane)	γ - Chlordane	Heptachlor epoxide	4,4'-DDE	4,4'-DDT
Half-Life Groundwater (hours)	high = 51,840 low = 24	no data	no data	no data	no data	no data	no data	no data
SSL (mg/kg)	0.0002	no data	0.5	0.0005	0.5	0.03	3	2

Notes:

- a = Howard, *Fate and Exposure Data*, Lewis Publishers, Chelsea MI, 1993. Merck & Co., *The Merck Index*, Merck & Co., Rahway, NJ, 1983.
 - b = Knox, Sabatini, Canter, *Subsurface Transport and Fate Processes*, Lewis Publishers, Chelsea, MI, 1993.
 - c = Howard, *Environmental Degradation Rates*, Lewis Publishers, Chelsea, MI, 1993.
 - d = USEPA, *1996 Risk-Based Concentration Table*, USEPA Region III, 1996.
- mg/L = milligram per liter

Of the nine pesticides shown in Table 7.5, only dieldrin exceeded its soil-to-groundwater SSL in surface and subsurface soil. However, this was limited to only one of six sample locations. The presence of dieldrin may be attributed to base-wide aerial application in the 1960's. The remaining pesticides remain present in surface soil or sediment, and are not moving vertically to deeper depths. As discussed previously, pesticides are relatively immobile in soil, therefore, the likelihood of impact to groundwater is minimal.

Further migration in soil is hindered by the addition of soil, specifically in low lying areas, at SWMU 10. Ravines once serving as migration pathways for sediments no longer exist due to the addition of soil, therefore, pesticides detected in surface soil and sediment are not expected to migrate by erosion created by wind or precipitation.

7.3.5 Herbicides

All concentrations of herbicides detected in surface soil samples were below RBC values, and there are no soil-to-groundwater SSL values for those herbicides detected in surface soil. For those herbicides detected in sediment and subsurface soil, no SSV or soil-to-groundwater SSL exists.

Since no SSVs or soil-to-groundwater SSLs exist for the herbicides detected in sediment, surface and subsurface soil, no numerical comparison can be made to discuss their transport in the environment. Regarding the fate of herbicides in the environment, herbicides can be expected to have a fate similar to that of pesticides.

7.3.6 Inorganics

Unlike organic compounds, inorganic compounds do not degrade in the environment, but they may change chemical form. They are generally considered to be indefinitely persistent. Metals may interact with soil or other solids by ion exchange, adsorption, precipitation, or complexation. These processes are affected by pH; composition, leachate, groundwater redox processes; and the type and amount of organic matter, minerals, and clay present. Extreme pH and Eh (oxidation-reduction) conditions can significantly increase the solubility and mobility of metals. Therefore, the availability of the metal in the medium, the composition of groundwater, and the adsorption capacity of the soil determine the fate and transport of the metal in the environment.

Metals have fairly limited mobility in groundwater because of cation exchange or sorption on the surface of soil mineral grains. They can also form precipitates of varying solubility under specific Eh-pH conditions. Metals are mobile in groundwater if soluble ions exist and the soil has a low cation-exchange capacity. They can also be mobile if they are chelated or attached to a mobile colloid. Conditions that promote mobility include an acidic, sandy soil with low organic and clay content. Discharge of a metal in an acidic solution would keep the metal soluble and promote mobility. Table 7.7 displays those inorganics which are considered for fate and transport discussion at SWMU 10.

Table 7.7
Contaminants of Concern – Inorganics

Parameter	Parameter is a COC in...	Reason
Cadmium	Surface soil	Exceeded both its SSL and RC at 6 locations
	Subsurface soil	Exceeded both its SSL and RC at 6 locations
	Sediment	Exceeded its SSV at 6 locations
Nickel	Subsurface soil	Exceeded both its SSL and RC at 6 locations
Selenium	Sediment	Exceeded its soil-to-groundwater SSL at 1 location
Silver	Sediment	Exceeded its soil-to-groundwater SSL at 1 location

Chemical and physical properties of cadmium, nickel, selenium, and silver are summarized in Table 7.8.

Table 7.8
Chemical/Physical Properties of Inorganics

Property	Cadmium	Nickel	Selenium	Silver
Molecular Weight ^{a,b}	112.4	58.71	78.96	107.9
Vapor Pressure (mm Hg @ T°C) ^{a,b}	1 @ 393	1 @ 1800	no data	no data
Solubility in Water (mg/L @ T°C) ^{a,b}	insoluble	insoluble	insoluble	insoluble
Specific Gravity ^{a,b}	8.64	8.9	4.26	10.49
K _{oc} (ml/g) ^{a,b}	no data	no data	no data	no data
Henry's Law Constant (atm-m ³ /mole) ^b	no data	no data	no data	no data
Half-Life – Soil (hours) ^c	no data	no data	no data	no data
Half-Life – Groundwater (hours) ^c	no data	no data	no data	no data
Soil Screening Level Transfers from Soil to Groundwater (mg/kg) ^d	0.4	7	0.3	2

Notes:

- a = Howard, *Fate and Exposure Data*, Lewis Publishers, Chelsea MI, 1993. Merck & Co., *The Merck Index*, Merck & Co., Rahway, NJ, 1983.
- b = Knox, Sabatini, Canter, *Subsurface Transport and Fate Processes*, Lewis Publishers, Chelsea, MI, 1993.
- c = Howard, *Environmental Degradation Rates*, Lewis Publishers, Chelsea, MI, 1993.
- d = USEPA, *1996 Risk-Based Concentration Table*, USEPA Region III, 1996.

The geographic occurrence of inorganic contamination at SWMU 10 is limited, with the exception of cadmium which was detected at 6 locations where its soil-to-groundwater SSL and background RC was exceeded. Since groundwater at SWMU 10 was analyzed for VOCs only, a determination about vertical migration, beyond the depths sampled, cannot be made. However, based on the chemical and physical properties of inorganics in general, they are not expected to leach to underlying groundwater. Upon reaching groundwater, the mobility of inorganics would be hindered by reactions that cause them to adsorb or precipitate, or chemistry that tends to keep metals associated with soil particles and prevent them from dissolving. These mechanisms can retard their movement in groundwater.

Again, due to the addition of soil to fill low areas, the possibility of inorganic contaminant migration in surface soil and sediment is further limited.

7.4 Contaminant Migration

The transport of dissolved contaminants in the environment is controlled by advection, diffusion, and dispersion. Other parameters controlling transport include solubility and sorption; both were described earlier. The principal component of migration is advection, the movement of dissolved contaminants with groundwater flow. The remaining two processes, diffusion and dispersion, are both physical and chemical processes affected by site-specific factors. These factors are groundwater velocity, formation heterogeneity, and the chemical's retardation factor.

This section discusses the processes affecting transport of contaminants in soil, surface water, sediment, and groundwater. As no surface water was observed within the SWMU 10 boundary, the discussion will focus solely on transport of contaminants in soil, sediment, and groundwater.

7.4.1 Factors Affecting Contaminant Migration

Advective transport is the movement of contaminants along with flowing groundwater in porous media. Diffusion is a molecular mass-transport process in which solutes move from areas of higher concentration to areas of lower concentration. The diffusion process is independent of groundwater flow. Dispersion is a mixing process caused by velocity variations in the porous media. Dispersion causes sharp fronts of contaminants to spread, diluting the solute at the advancing edge of the front. In most environmental settings, including SWMU 10, advection is the dominant process that drives contaminant migration in groundwater.

7.4.2 Contaminant Migration in Soil

As detailed in Section 7.3, soil contamination at SWMU 10 is limited to localized concentrations of VOCs, SVOCs, herbicides, pesticides/PCBs, and metals. Because most inorganic contaminants tend to sorb to soil, these contaminants are generally expected to persist in soils over time. Migration within the soil medium is essentially negligible after gravity drainage of liquids and leachable fractions of contaminants have been removed. VOCs, SVOCs, herbicides, and pesticides/PCBs tend to be more mobile in soil than inorganic contaminants.

Three potential contaminant migration pathways are recognized from soil to other media: (1) volatilization of VOCs, (2) erosion and surface runoff of surface-soils, and (3) leaching to groundwater via infiltration of precipitation.

As discussed in Section 7.2, contaminant transport by volatilization and air movement is not an important migration pathway at SWMU 10. The potential exists for contaminant migration in surface soils by surface water transport or erosion. As discussed in Section 7.2.2, contaminants bound to sediments could move with surface water flow, particularly during and following periods of intense precipitation, however the addition of clean soil to low lying areas or ravines at

SWMU 10 greatly reduces the potential of migration of sediments. As discussed in Section 7.3, SVOCs, PCBs, and inorganics are very persistent in soil based on their relatively low vapor pressure and high K_{oc} value, thus are not expected to be very mobile.

Leaching to groundwater is discussed below (see 7.4.4, Infiltration).

7.4.3 Contaminant Migration in Surface Water and Sediment

Contaminant migration to surface waters is not discussed; however, there is a potential for transport of sediments by erosional processes (most likely surface water runoff due to precipitation). The dominant transport process would be during and following periods of intense precipitation causing sediment to become mobile. Contaminants such as SVOCs, which have a strong tendency to adhere to soil particles, would also become mobile. However, this is not likely to occur given the filling of low lying areas at SWMU 10 with additional soil.

7.4.4 Contaminant Migration in Groundwater

Previous sections have described the geology and hydrogeology in the SWMU 10 area and discussed the nature and extent of contaminants found in groundwater. Groundwater is the most complex environmental medium investigated during the CSI and is the transport medium in which most contaminants could migrate. As detailed in Sections 7.3.2, 7.3.3, and 7.3.4, groundwater contamination includes VOCs, primarily benzene and methylene chloride. It should be noted that out of the 14 loess groundwater samples, benzene was only detected at one loess sample location and methylene chloride was only detected at two loess sample locations. Likewise, out of the 18 fluvial deposits groundwater samples, methylene chloride was only detected at one fluvial deposits sample location, which corresponds to the same location of a detection in the loess groundwater.

The transport of VOCs in groundwater depends primarily on the chemical solubility and the organic content of the soils. Methylene chloride and benzene have relatively high solubilities and low K_{oc} values, rendering them very mobile.

Infiltration: Precipitation falling at SWMU 10 can move vertically through subsurface materials, form leachate, and migrate into the unsaturated zone and groundwater. VOCs were detected in both the loess and fluvial deposits groundwater, as well as in the subsurface soil (see Section 5.3.3). These data indicate that water percolating through SWMU 10 subsurface materials may serve as a source for organic and inorganic contaminants in groundwater.

Advective Flow: Migration of dissolved constituents is the most probable pathway for movement of contaminants in loess and fluvial deposits groundwater. VOC contaminants are discussed below by geographic source areas.

VOCs in Groundwater: Methylene chloride occurs in loess and upper fluvial deposits groundwater, and benzene occurs in loess groundwater only. Methylene chloride, compared to other VOCs, has a very short half-life. Thus, concentrations of methylene chloride in groundwater are expected to decline at a much faster rate.

7.4.5 Potential Receptors

The primary receptor impacted at SWMU 10 is fluvial deposits groundwater, which is not used as a source of drinking water in the NSA Memphis area. The relatively low concentrations of the contaminants and the amount of dilution (specifically the organic compounds) reduce the impact to any potential receptors.

The physical adsorption of the contaminants to soil particles and organic material greatly limits horizontal migration. If the VOCs detected in SWMU 10 groundwater are associated with the site, they are likely to undergo dilution and possibly natural filtration before reaching a potential receptor.

8.0 ECOLOGICAL RISK ASSESSMENT

Introduction

The purpose of this ecological risk assessment is to assess the actual or potential effects to ecological receptors due to contamination at SWMU 10. A specific focus on the terrestrial ecosystem associated with SWMU 10 has been made. This assessment considers surface-soil contaminant concentrations and distributions, media-specific physicochemical conditions, and exposure pathways which could result in unacceptable levels of exposure to ecological receptors now or in the future. The approach to this assessment is based on USEPA's *Risk Assessment Guidance for Superfund Volume II-Environmental Evaluation Manual* (1989) and *Interim Final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997).

8.1 Site Description

SWMU 10 is a 13- to 20-acre construction-debris landfill on the NSA Memphis Northside (Figure 1-1) that operated as a disposal area from approximately 1951 to 1986. The area is approximately 300 feet north of SWMU 5 (Aircraft Fire Fighting Training Facility) and 500 feet east of SWMU 60 (Northside Landfill [Western Portion]). SWMU 10 and the surrounding area are primarily non-industrial, agricultural, and undeveloped land because they are located in the runway's clear zone. A section of SWMU 38, the Miscellaneous Industrial Drainage Ditches, borders the west side of SWMU 10 and a section of SWMU 6 (N-126 Plating Shop Storm Sewer and Ditch) borders the north side of the landfill. In late 1989, surface soil excavated from the NSA Memphis housing area was used to fill and level SWMU 10. In the spring of 1998, the site was cleared and grubbed and the area was graded, removing the site relief that created the ravine. According to Espey, Huston and Associates of Nashville, Tennessee, approximately 1,500 to 1,600 cubic yards of soil was brought in from the north end of the runway and spread over the site.

8.2 Threatened and Endangered Species

According to U.S. Fish and Wildlife threatened and endangered species survey conducted in 1997, no federal listed species occur at NSA Memphis. One state listed species, the white walnut tree or Butternut (*Juglans cinerea*) was found at the northwest end of the clear zone of the main runway and is not associated with SWMU 10.

8.3 Ecosystem Risk

In order to maintain the runway protection zone, the Millington Airport Authority, cleared/grubbed an area including SWMU 10 in the spring of 1998. The available habitat was removed by grubbing and the site was leveled, seeded, and will be maintained as a mowed lawn. Therefore, no future, quality habitat will be present at SWMU 10, eliminating receptors and thus exposure.

8.4 Assessment Endpoint Recommendations

No further action is recommended for SWMU 10 based on the current use plans. The NSA Memphis BCT concurred with this decision at the October 28, 1997 meeting. The quality of the present and future habitat was substantially diminished when the site was leveled, thereby creating an incomplete exposure pathway from contaminants to suitable assessment endpoints.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The CSI at SWMU 10 focused on the landfill surface (exposure risk evaluation, leaching potential), landfill subsurface (soil and groundwater contamination, leaching potential) and the gully sediments (runoff-associated migration, leaching potential). The following conclusions are based on the data collected and on recent changes to site conditions.

In the spring of 1998, the site was cleared and grubbed and the area was graded, removing the site relief that created the ravine. According to Espey, Huston and Associates of Nashville, Tennessee, approximately 1,500 to 1,600 cubic yards of soil was brought in from the runway grading project and spread over the site. This topsoil was then seeded. The intended site use will be open land that is part of the runway protection zone and will remain a mowed field.

Surface-Soil

Soil samples collected from the surface of the landfill identified three compounds (PAHs) exceeding the residential and industrial RBCs and nine compounds exceeding the residential RBCs. In addition, 13 compounds exceeded the SSLs. Since the sampling, surface soil conditions have been significantly altered by the recent clearing and grubbing of the site.

Sediment

Sediment samples collected from the gullies on the northwestern boundary of SWMU 10 identified six compounds exceeding the SSVs and two compounds exceeding the SSLs. None of the detected contaminants seemed to indicate a correlation between SWMU 10 and SWMU 38. The gullies have now been graded and filled.

Subsurface-Soil

Subsurface samples were collected from both the main portion of the landfill, and from the gullies on the northwestern boundary of SWMU 10. The sample data indicate that the following compounds exceeded their respective SSLs: cadmium, nickel, dieldrin, and methylene chloride. Methylene chloride was also found in groundwater; however, it has a relatively short half-life ranging from 168 to 672 hours in soil and was detected in relatively low concentrations. The impact of subsurface soil on the site has been altered by the recent changes to the site condition.

Groundwater

Groundwater samples collected from both the loess and the upper fluvial deposits indicated that methylene chloride was present at concentrations exceeding both the USEPA MCL and tap water RBC; however these contaminants were only detected in two out of 14 loess samples and one out of 18 fluvial deposits samples. Detected concentrations were low and methylene chloride has a short half-life ranging from 336 to 1,344 hours, diminishing the risk for future exposure. In addition, benzene was detected in one of the 14 loess groundwater samples at a concentration exceeding the tap water RBC.

As explained in the USEPA's RBC table, the tap water RBC ($4.1 \mu\text{g/L}$) is based on residential land use and a target cancer risk of $1\text{E-}6$. The maximum concentration reported for methylene chloride at SWMU 10 was $7.3 \mu\text{g/L}$; therefore the risk estimate would be approximately $1.8\text{E-}6$ ($7.3 \mu\text{g/L} \times 1\text{E-}6 \div 4.1 \mu\text{g/L}$). This is within USEPA's acceptable risk range of $1\text{E-}6$ to $1\text{E-}4$ and below the risk threshold of $1\text{E-}4$ recommended by USEPA Region IV to be used in preliminary risk evaluations when determining suitability for lease.

Preliminary Risk Evaluation

A PRE was performed (Section 6), based on the data obtained, to evaluate the risk associated with SWMU 10. Based on this PRE, the excess risk associated with SWMU 10 groundwater does not exceed the risk threshold for a residential or industrial scenario. In addition, the current land use plans and the availability of a public water supply do not indicate that fluvial deposits or loess groundwater would be used.

Fate and Transport

Based on the physical characteristics and the distribution of the contaminants identified in SWMU 10 soil, sediment, and groundwater, they do not appear likely to reach a potential receptor.

Ecological Risk

The quality of future habitat has been substantially diminished since the clearing of the site and plans to keep it mowed have created an incomplete exposure pathway. Therefore, no ERA was performed.

SWMU 38

The original intent of this investigation was to determine if a release had occurred at SWMU 10 and to determine if past operations or conditions at SWMU 10 had contributed to the SVOC concentrations identified in the SWMU 38 sediments during previous investigations. Evidence does not indicate that SWMU 10 has had a recent impact on the sediment at SWMU 38 because PAHs, SVOCs, and TPH in SWMU 10 sediment samples had a low frequency of detection.

Recommendations

A recommendation of no further action for SWMU 10 is based on the following:

- Short half-life of methylene chloride
 - Soil = 168 to 672 hours
 - Groundwater = 336 to 1,344 hours

- Relatively low detected concentrations of methylene chloride
 - Maximum subsurface soil concentration = 12.8 mg/kg
 - Maximum loess groundwater concentration = 7.3 $\mu\text{g/L}$
 - Maximum fluvial deposits groundwater concentration = 6.1 $\mu\text{g/L}$

- Relatively low frequency of detections of methylene chloride
 - Subsurface soil = 4 detections out of 18 samples
 - Loess groundwater = 2 detections out of 18 samples
 - Fluvial deposits groundwater = 1 detection out of 18 samples

- Close proximity of contaminated samples to one another relative to the rest of the site.

- Planned reuse of this parcel is a non-residential, industrial/commercial scenario. Present land-use profile of the site as a runway protection zone precludes the development of permanent structures.

- Because the landfill ceased operations in 1986 and is not believed to have received industrial or hazardous waste, current landfill closure requirements do not apply. However, coordination with the TDEC Division of Solid Waste is recommended to determine whether additional cover or other closure actions will be required for the landfill.

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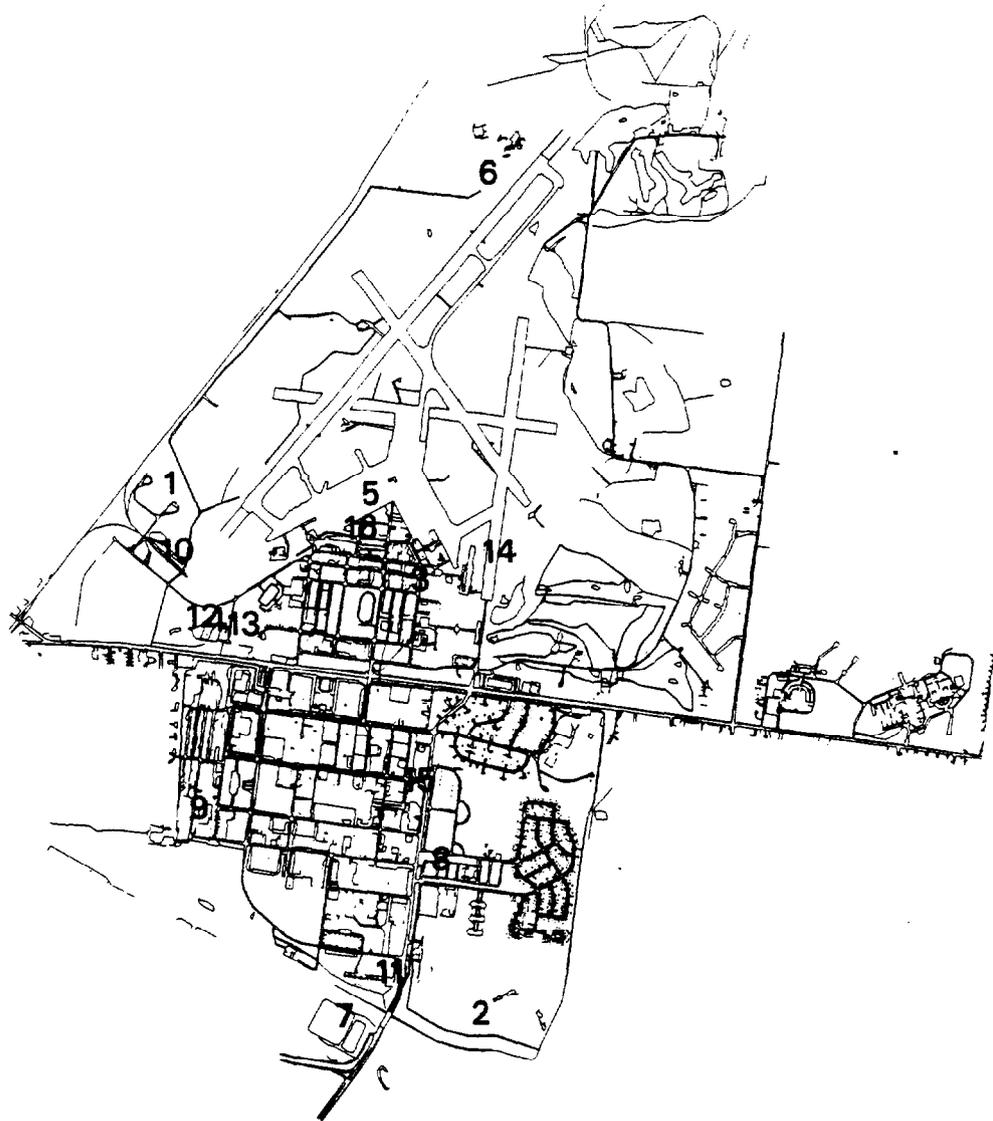
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Appendix A
Loess Permeability Data Summary

Table A.1
Loess/Shallow Alluvium Permeability Data Summary
NSA Memphis

Reference No.	Sample ID	Site	Depth	Date	Coefficient of Permeability (cm/sec)
1	NFFS005517	North Fuel Farm		03/17/97	2.20e-06
2	002S003019	002	19	02/26/96	2.30e-06
	002S002919	002	19	02/28/96	6.80e-07
3	003S000420	003	20	02/27/95	1.40e-07
4	005S000620	005	20	02/27/95	1.40e-07
5	007S000922	007	22	03/13/95	9.50e-07
6	008G02FL05	008	05	03/13/95	3.00e-08
7	009S01DA18	009	18	02/29/96	9.60e-07
8	014S01LF10	014	10	02/22/96	4.20e-07
9	059S03UF15	059	15	03/22/96	5.70e-07
10	060S003022	060	22	02/27/95	1.70e-07
11	065S06DA16	065	16	03/01/96	4.80e-06
12	MW-02	UST 1508	7	10/92	8.40e-08
	MW-02	UST 1508	11	10/92	8.60e-07
13	MW-11	UST 1489	7	10/92	6.30e-08
	MW-11	UST 1489	11	10/92	5.50e-08
14	SB-8	Former Flying Club	10	6/93	1.10e-06
15	SB-5	Bldg. S-50	8.5	8/93	3.80e-08
	SB-5	Bldg. S-50	13	8/93	1.30e-05
16		UST 304/1239		2/95	8.30e-06
		Minimum Value			3.00e-08
		Maximum Value			1.30e-05
		Average Value			1.84e-06



LEGEND

1 SITE REFERENCE NUMBER

0 feet 6000



**RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE**

**FIGURE 1
SITE LOCATION AND
REFERENCE**

Appendix B
Geophysics Investigation of SWMU 10

TECHNICAL MEMORANDUM

**Geophysics Investigation of SWMU 10
Naval Support Activity Memphis, Millington, Tennessee**

CTO-94

Contract No. N62467-89-D-0318

For:

**The Department of the Navy
Southern Division Naval Facilities Engineering Command
North Charleston, South Carolina**

By:

**EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, TN 38134
(901) 383-9115**

January 8, 1997

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Attachment A	Environmental Applications of the FDEM Technique
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Purpose of the Study

As a part of a Confirmatory Sampling Investigation at solid waste management unit (SWMU) 10, a geophysical study was performed by EnSafe/Allen & Hoshall (E/A&H). The objectives were to identify areas containing buried metal or which may have been landfilled, and to determine the areal extent of landfilling activity. The geophysics work was designed to help focus locations for subsequent soil and groundwater sampling at Naval Support Activity (NSA) Memphis in Millington, Tennessee.

Methodology Used

The frequency domain electromagnetics (FDEM) method used in this survey traditionally is used for mapping landfills, buried drums, tanks, utility lines, old trenches, and construction rubble. The Geonics Ltd. EM-31 instrument used for the work consists of a 2-meter long boom with a transmitting antenna at one end and a receiving antenna at the other. The transmitting antenna is energized by a current pulse, which propagates into the ground as an electromagnetic field. As the downward-traveling pulse encounters electrically responsive materials in the ground, the signal received at the surface in the receiving antenna is distorted. These distortions can then be interpreted as a graphical image of the subsurface.

FDEM is primarily a profiling method, averaging all the ground response to about 6 meters deep. It provides little vertical resolution, although vertical changes in subsurface electrical properties can be estimated by varying the instrument height and dipole orientation. Resolution in plan view is often to within a meter or so.

Two parameters are measured with FDEM: conductivity and in-phase. Conductivity measures how well the earth conducts electrical current. Dry materials yield low conductivities, while wet materials yield high conductivities. Saturated clays are particularly conductive. When present, buried metals may also increase the effective conductivity. Conductivity data have units of milliSiemens per meter (mS/m).

The in-phase component is a ratio of the secondary to primary field strengths (the primary field is the generated signal and the secondary is the ground's response). The in-phase component is primarily sensitive to metals, not soil moisture, and can be negative or positive over metallic objects, depending on the relative geometries of the conductor and instrument. In-phase has units of parts per thousand (ppt) of the primary field strength.

FDEM was used on this project to detect disturbed soil and buried metals related to landfilling. Soil disturbance may cause higher interstitial moisture retention than surrounding, undisturbed soil, making the landfill show up as a conductive feature. In addition, landfills often contain metal objects which may affect the in-phase parameter. The attachment following this report describes the FDEM method in more detail.

Field Logistics

A 100-foot by 100-foot grid with an arbitrarily chosen grid north was surveyed for this project. This larger grid was used to obtain data on a 10-foot by 10-foot grid spacing by flagging intermediate lines to be walked during data acquisition. After completion of the fieldwork, two grid nodes were surveyed with the E/A&H global positioning satellite system to facilitate transformation of data locations to state plane coordinates.

Field work was done over six days in April 1996.

Quality Control

A standard set of quality assurance and quality control procedures was followed in this work. Issues of short-term data precision and long-term instrument drift were given special attention. These are explained more fully in the attachment.

A base station was established for quality assurance tests. Equipment was calibrated at the base station according to the manufacturer's instructions before data acquisition. Although an

absolute calibration is done at the factory, the field calibrations ensure that the instrument is functioning at the expected level of accuracy and precision. Equipment calibration was normal at this site.

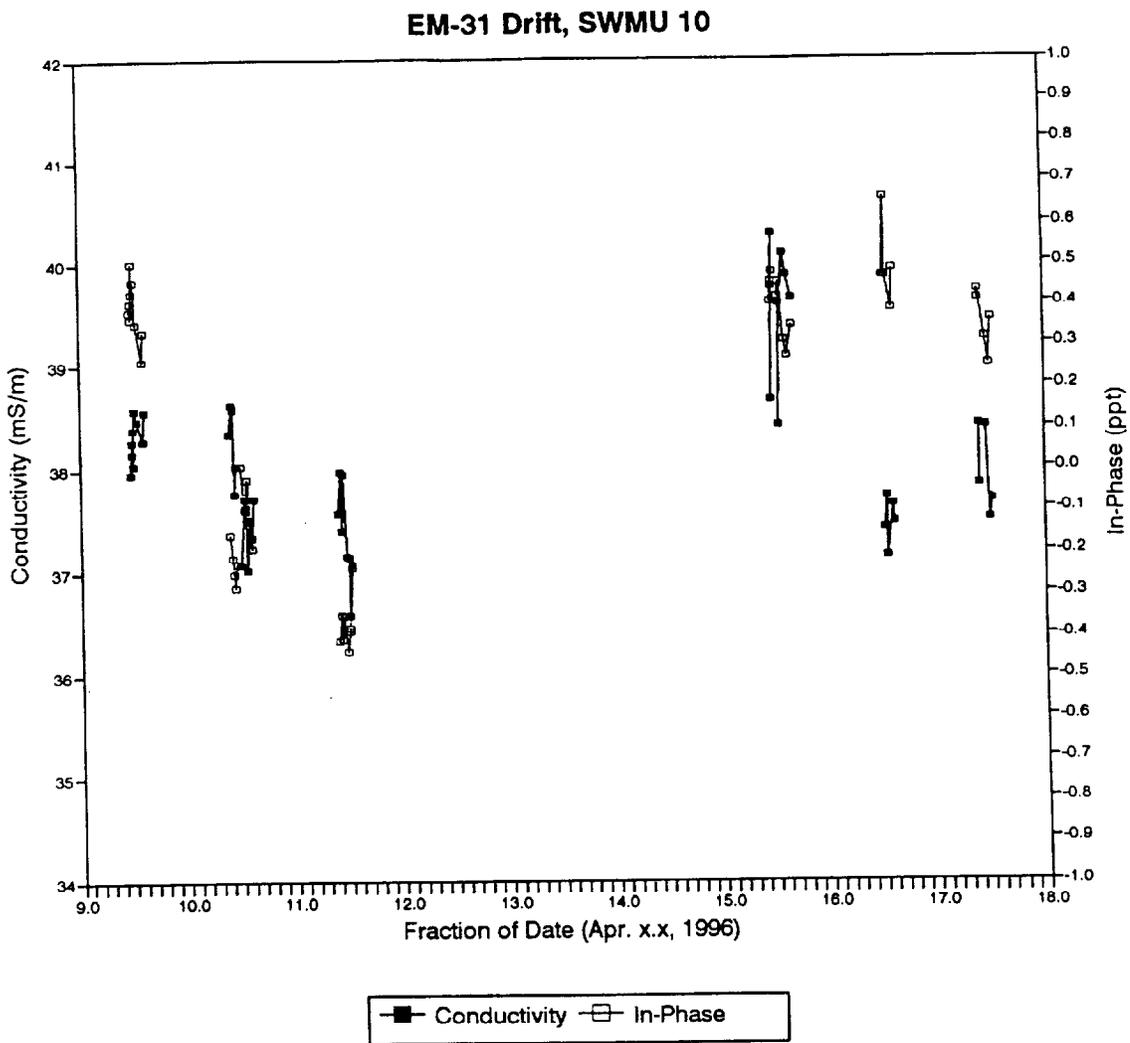
Part of the quality control process for this survey was to determine how reliably a small, subtle anomaly could be detected by the survey. To make this determination, two factors were considered: (1) the inherent instrument precision, determined by a burst of sequential measurements at the base station; and (2) the short-term instrument drift, determined from periodic repeats at the base station and normalized to a 10-minute period. Table 1 shows the results of these tests. Precision is smaller than average for the EM-31 and is less than the benchmarks; short-term drift is higher than usual and, in the case of conductivity, approached the desired minimum resolution of the survey on one occasion. However, nearly all the drift data fall within acceptable bounds, and drift does not appreciably affect the data interpretation.

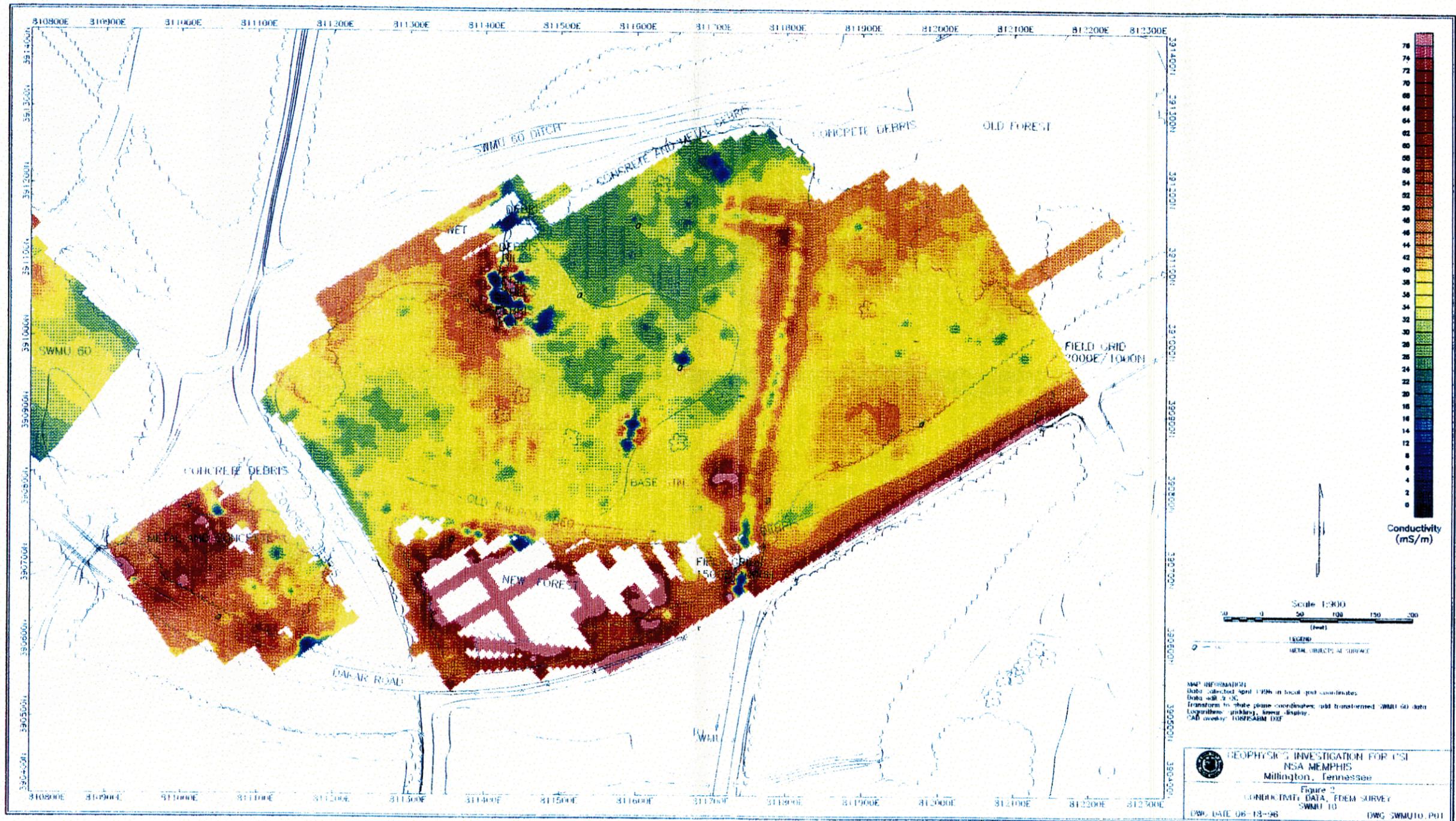
Figure 1 shows the longer-term instrument drift over the six days of data acquisition. Drift is well within the acceptable range ($\pm 10\%$ of conductivity, ± 1 ppt for in-phase). Since long-term drift is a less serious problem than short-term drift, yet still is within acceptable limits, this data set does not require drift correction. Only subtle effects of drift are noticeable in plan view plots.

Data Interpretation

The plan-view conductivity and in-phase data are shown in Figures 2 and 3. Site features are drawn in black. Data coverage is complete in areas relatively clear of vegetation; patchwork data with gaps (white spaces) were obtained in areas of dense vegetation. The data patch at SWMU 60 (far left of the plots) is from a previous survey at that site, and is included here as an indicator of a typical "background" response. Conductivity data show background anomalies of about 25 to 40 mS/m, which is typical for NSA Memphis. Broad, subtly changing responses are probably caused by changes in soil moisture or minor soil disturbances.

Figure 1 Long-term instrument drift for FDEM data collected at SWMU 10. Drift is well within acceptable bounds.





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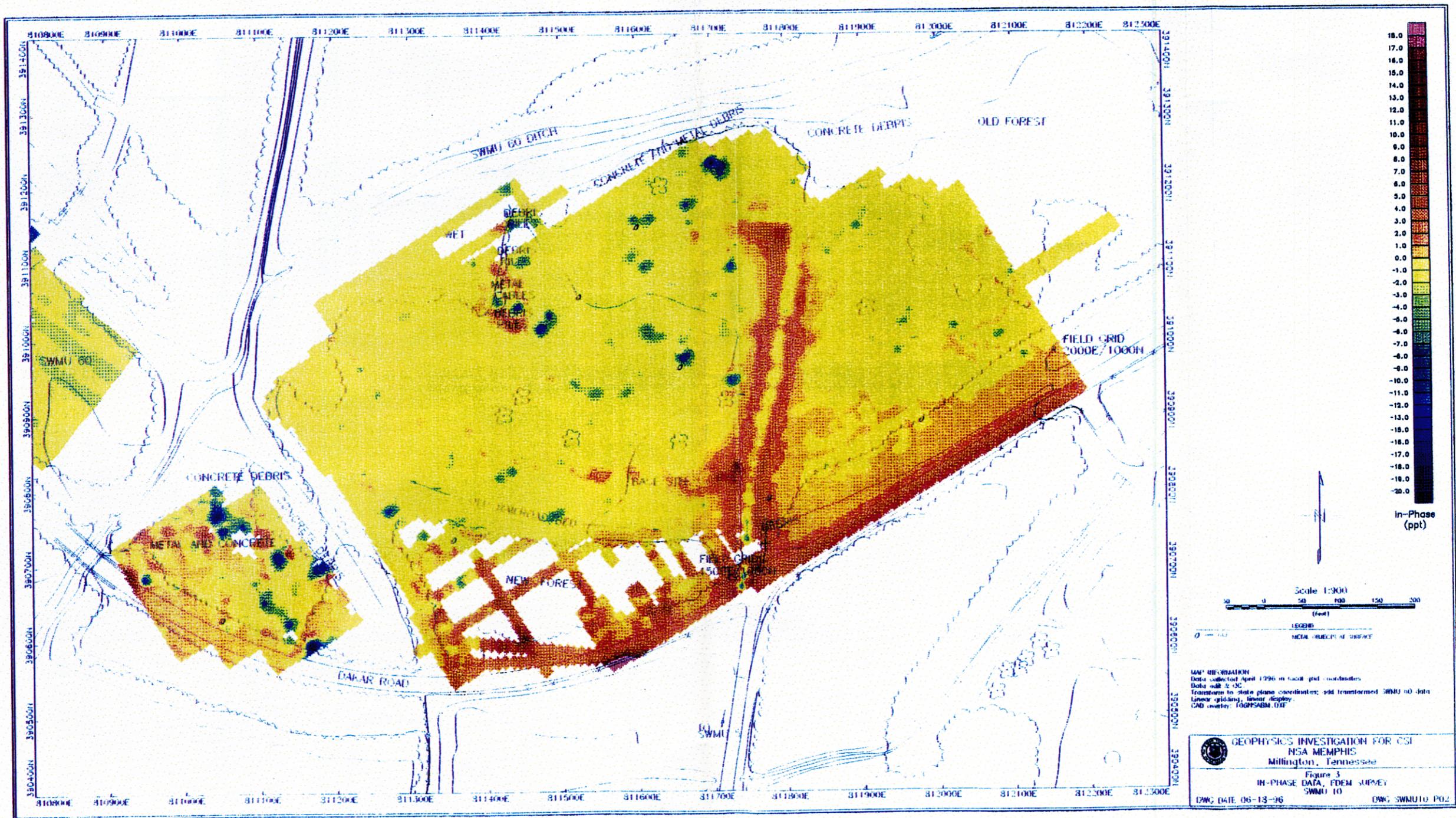


Table 1
 Data Precision Tests

Test	Conductivity (mS/m)	In-Phase (ppt)
Instrument Precision Error		
Base Station	±0.154	±0.025
Instrument Drift Error (Short-Term)*		
Base Station	+1.000	4466
Benchmarks		
Desired Minimum Resolution	±1.0	±1.0
Minor Landfill Anomaly	±5	±5
Typical Drum Response	±5	±5

Note:

* = Worst-case drift over 10-minute period.

The background responses in both data sets are cut by numerous minor anomalies and a few significant ones. The strongest, most pervasive conductivity response occurs in the newly forested area on the south-central part of the site. High conductivities suggest soil disturbance related to landfilling activities. However, most in-phase responses in this area are nominal, indicating that little metal is probably buried here.

In the north-central part of the plot are strong, highly variable responses in conductivity and in-phase. These are situated over a series of hummocks which contain partly buried steel cables, metal cans, and other landfill debris.

More isolated anomalies are scattered across the site. In most cases, no surface debris was observed at these anomalies, indicating limited burial of debris and/or soil disturbance.

A prominent linear anomaly extends northward from Dakar Road, then bends west and terminates. Both conductivity and in-phase data are affected. Aerial photographs indicate a road-like feature following the linear anomaly and a small building at the terminus. Thus, the anomaly is probably a small metal pipe, still in place, which is related to past activities at this

site. A similar, far subtler conductive anomaly that extends to the west parallel to the old railroad bed may be an artifact of a previous trail; no buried metal is suggested.

The isolated data block west of the main area shows strong anomalies, many of which are probably caused by concrete and metal surface rubble. Some burial seems to have occurred here, as some of the anomalies are outside the area of debris.

Conclusions

Three significant anomalies were observed in this work:

- The main area of landfilling appear to have occurred in the newly forested south-central part of the investigated area. Soil excavation and fill, rather than extensive buried metals, appear to characterize this zone. These observations are consistent with the response of a debris and construction materials landfill.
- Surface and possibly some buried debris are present on the southwest block of Figures 2 and 3.
- Strongly localized FDEM anomalies, hummocky terrain, and observation of buried metals (including 5-gallon cans) make the small anomalous zone on the north-central portion of SWMU 10 worthy of further investigation.

Other, local anomalies may indicate buried materials, but are less indicative of a deliberate landfilling operation.

Attachment A
Environmental Applications of the FDEM Technique

SUPPLEMENTAL INFORMATION

Environmental Applications of the Frequency Domain Electromagnetics Geophysical Technique

Frequency domain electromagnetics (FDEM) is a geophysics tool used to investigate subsurface conditions prior to drilling. The technique is used to map landfills, buried metal objects such as drums, former excavations, leachate plumes, utilities, and shallow geology. This document describes how FDEM works and how it is applied to environmental investigations.

1.0 Why Use FDEM?

The heart of an environmental investigation for subsurface contamination is the direct sampling of soil and groundwater. To do this, media must be extracted from the subsurface by invasive action such as drilling, trenching, or excavation. Inherent in the invasive process are certain risks to worker safety and potential spreading of surface contaminants through the borehole. In addition, drilling and sampling are expensive, requiring a delicate balance between getting enough information to fully characterize and clean up a site and the need to keep costs under control. Without prior information on where problems might be in the ground, it is possible that contaminant "hot spots" can be missed or their size and location inadequately determined. Conversely, it is also possible that too many samples may be obtained, resulting in unnecessary costs.

available cations within an unrestricted flow path. Such a material is said to be conductive. If cation availability or mobility are small, the material is said to be resistive.

The ability to conduct current is often expressed by a parameter called *conductivity*, which has units of Siemens per meter (S/m), often converted in environmental work to milliSiemens per meter (mS/m). Older literature may use the unit "mho," which has been replaced by the Siemen. A high conductivity value is associated with a good conductor. Another parameter, *resistivity*, is not used in FDEM work but is common to other geophysical techniques. Resistivity has units of ohm-meters ($\Omega \cdot m$), which is the inverse of conductivity (i.e., $1 \text{ S/m} = 1/\Omega \cdot m$).

Since water lets conducting cations move freely and dry rock inhibits them, it is hardly surprising that the rock matrix material itself is a poor conductor (some exceptions are described later). Instead, it is the geometry of the rock's pore spaces, which contain water, that has a dominant effect on conductivity. *Porosity* describes the relative percentage of the rock volume occupied by pore space. In simple materials such as clean sands, the conductivity σ_w of the interstitial water may be related to the matrix porosity φ by Archie's law:

$$\sigma_w = a\sigma_r \varphi^{-m} \quad (1)$$

where:

a is the coefficient of saturation (typically 0.6 to 1.0)

σ_r is the conductivity of the rock matrix itself

m is the cementation factor (typically 1.4 to 2.2).

Thus, pore fluid conductivity is strongly tied to the porosity. Two other factors are also important. The interconnectivity of the pores, known as *permeability*, is also an important factor. Materials with well-connected pores are better conductors than materials which have equal porosity but disconnected pores. The *degree of saturation* naturally has an important influence on conductivity, and in undersaturated materials the details of how the pore spaces are wetted may also play a role.

The conductivity difference between dry and wet materials can be several orders of magnitude. Thus, the conductivity of the vadose zone may be much different from that of the saturated zone or its capillary fringe, even though the soil type may be constant.

Table 1
Conductivity (σ) Ranges
of Near-Surface Materials

Material	σ Range (mS/m)*
WATER	
rainwater	1-30
100 ppm TDS	22
1,000 ppm TDS	200
SOIL	
dry sand and gravel	<0.1
sandy soil	0.5-5
clayey soil	5-100
loam	15-200
glacial till	0.1-100
ROCK	
chalk	10-100
limestone	<0.1-20
dolomite	0.2-5
shale	0.5-50
sandstone	<0.1-20
conglomerate	0.1-1
argillite	1-100
granite	<0.1-5
graphitic schist	10-1,000
gneiss	<0.1
basalt	0.1-50

*Conductivity (σ) is expressed in milliSiemens per meter (mS/m). Data sources: McNeill (1980, 1990), Ward (1990), and unpublished work by EnSafe.

TDS = total dissolved solids.

to the strength of the field in the ground. If the ground is not conductive, the signal is relatively small; if it is quite conductive (e.g., in saturated clays), the signal is larger. Hence, as the antennas are moved across the ground, an image of subsurface conductivity patterns can be obtained. These patterns are then interpreted as geologic or man-made changes in the subsurface.

In general, the relationship between magnetic field strength and ground conductivity is complex, but FDEM instruments operate on the "low induction number" principle, which simplifies the

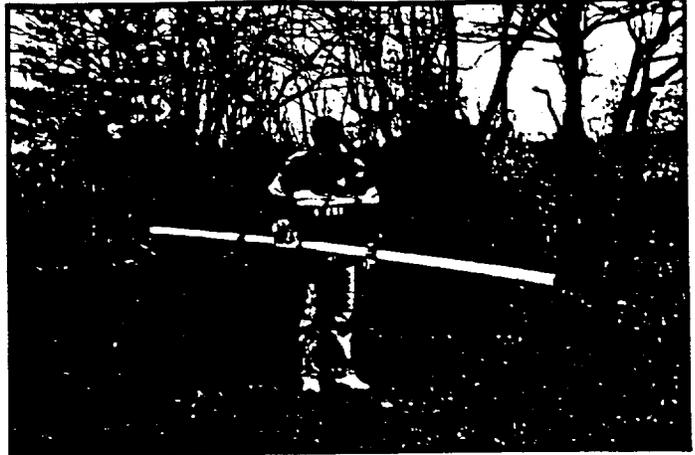


Fig. 1. A typical FDEM instrument, the EM-31. The long pole has a transmitting antenna at one end and a receiving antenna at the other.

larger. Geologic changes rarely produce strong in-phase anomalies, but buried and aboveground metal conductors do. Thus, the in-phase component can be thought of as a metal-detector.

The simplest way to run FDEM is to use a horizontal boom with an antenna at each end, separated by a fixed distance (Figure 1). This is the design used in the Geonics EM-31, which is very commonly used in North America for environmental work. The EM-31 can be operated with vertical or horizontal antenna modes ("vertical" and "horizontal" refer to the direction of electromagnetic field propagation and not the physical orientation of the wires). In vertical dipole mode, penetration is 6 meters; in horizontal mode, it is 3 meters.

FDEM logistics are straightforward. After the survey design is matched to the project objectives (see Section 4), the required data density is determined. A grid is presurveyed to establish survey lines or nodes at which data are to be collected. The instrument is then taken for a quick walkover of the site to locate an area of nominal "background" response, where a base station is established. The instrument is carefully calibrated at the base station, and in most cases data are recorded periodically at the base station during a survey to check instrument drift (see Section 5).

The instrument is then advanced to the first survey line, and conductivity and in-phase are read along with position information. Normally the data are sent directly to a data recorder. The instrument is then advanced to subsequent data stations in a logical sequence to complete data collection.

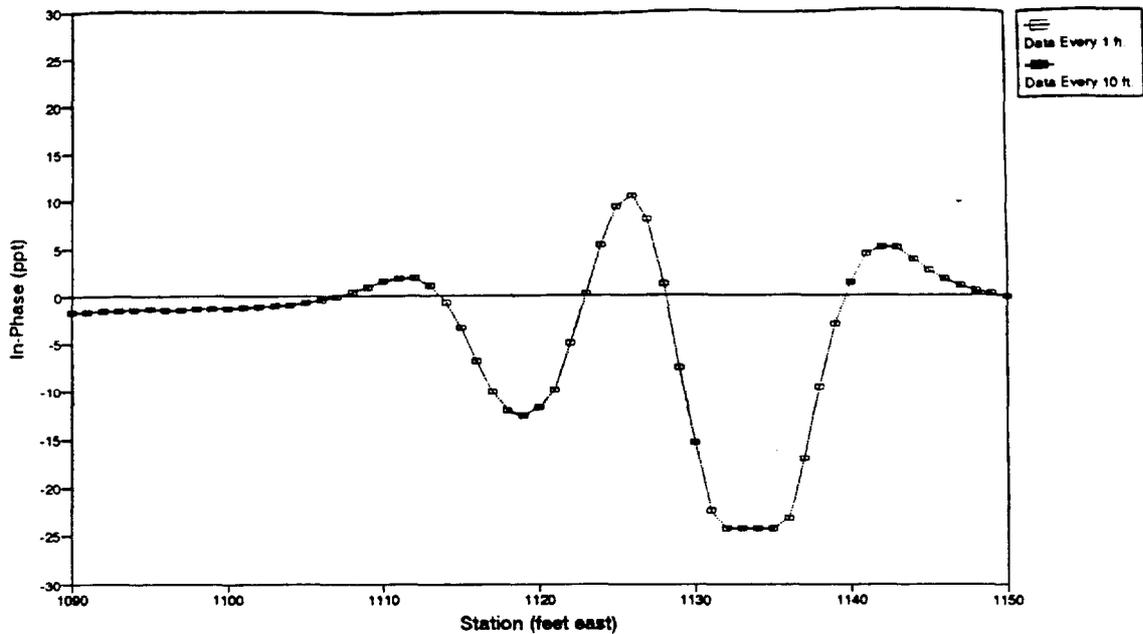


Fig. 2. Spatial aliasing of 1-foot data (not aliased) versus 10-foot data (severely aliased) in data obtained over a small anomaly.

Figure 2 shows an example of aliasing over a small, well-defined conductivity anomaly. The data at 1-foot intervals (open boxes) show two low-phase lobes flanking a central high. If data had been taken at 10-foot intervals (black boxes), the anomaly would look like a broad low-phase zone. It would be detected, but the character of the anomaly would be lost by aliasing. In this particular case, data were collected at 5-foot intervals, providing an effective balance between resolution and survey economics.

It is important to note that, even when sampling density is sufficient to resolve a small object, the presence of noise may still defeat the imaging process. In the above example, the 5-foot data set images the anomaly, but consider what would happen if large anomalies occurred every foot or so due to lots of buried metal trash. The trash would add to the anomaly in a sporadic way, and the anomaly would not be recognized. Thus, aliasing is a function not only of target size but the amplitude and spatial frequency of the noise sources.

Sampling density must be carefully considered in light of a project's objectives. To demonstrate that a data set is not aliased to the extent of compromising project objectives, a spatial aliasing

position of the edge. With care, the interpreter can resolve the edge within one or two meters, but no increase in data density will improve this determination further.

To some degree, resolution can be improved by decreasing the instrument height. The instrument is normally carried waist-high (about 1 meter), but can be set on the ground to improve resolution. However, such a configuration biases the results according to the ground material near the antennas, and greater care must be exercised in survey design.

If fine-scale resolution is essential, alternative geophysical techniques should be considered. Figure 4 compares data collected with an EM-31 with those collected with an EM-61 time-domain electromagnetic (TDEM) metal detector. Ignoring the values but just looking at the patterns, one can readily see a vast improvement in resolution for the EM-61, which has a smaller, more focused antenna. At the site where these data were collected, the survey objective

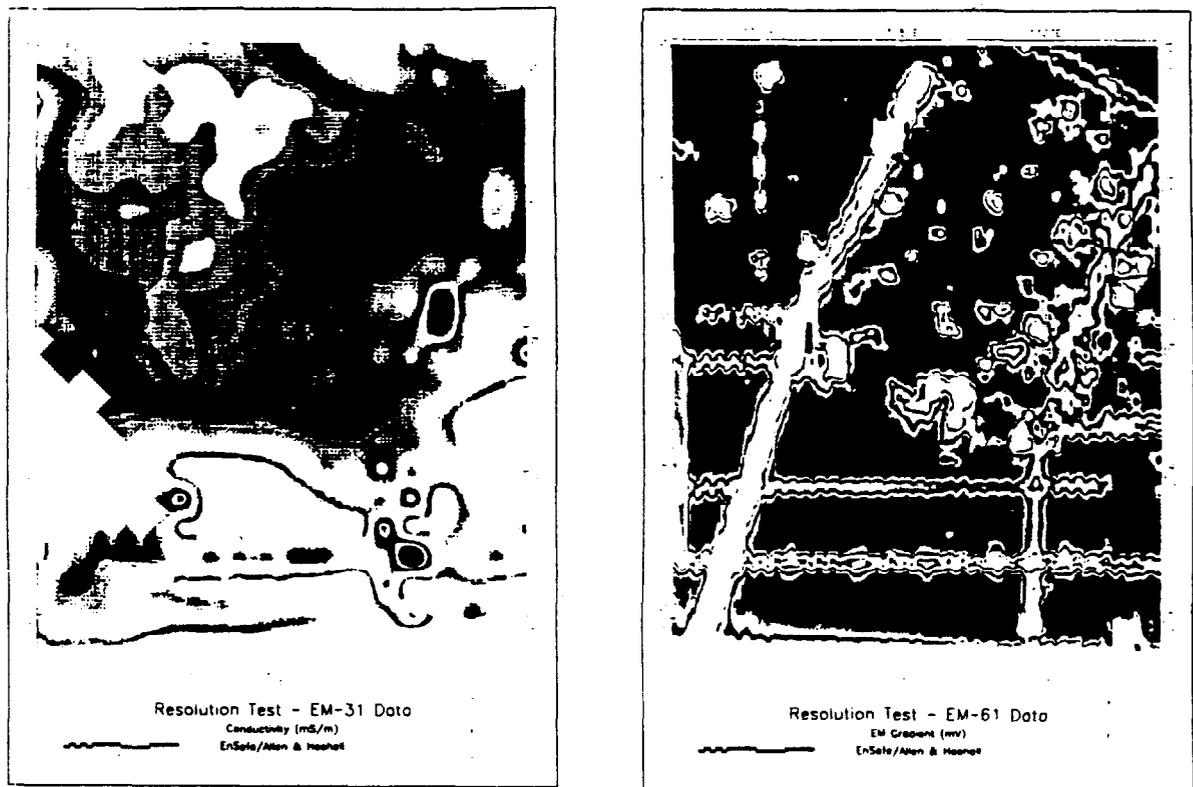


Fig. 4. Resolution difference between FDEM and TDEM data over some narrow metal pipes and debris. On a per site basis, TDEM data cost at least five times as much as FDEM data, and penetration is about half as deep; further, TDEM works only over metal, not over disturbed soil and other conductivity changes. Thus, suitability depends on project specifics.

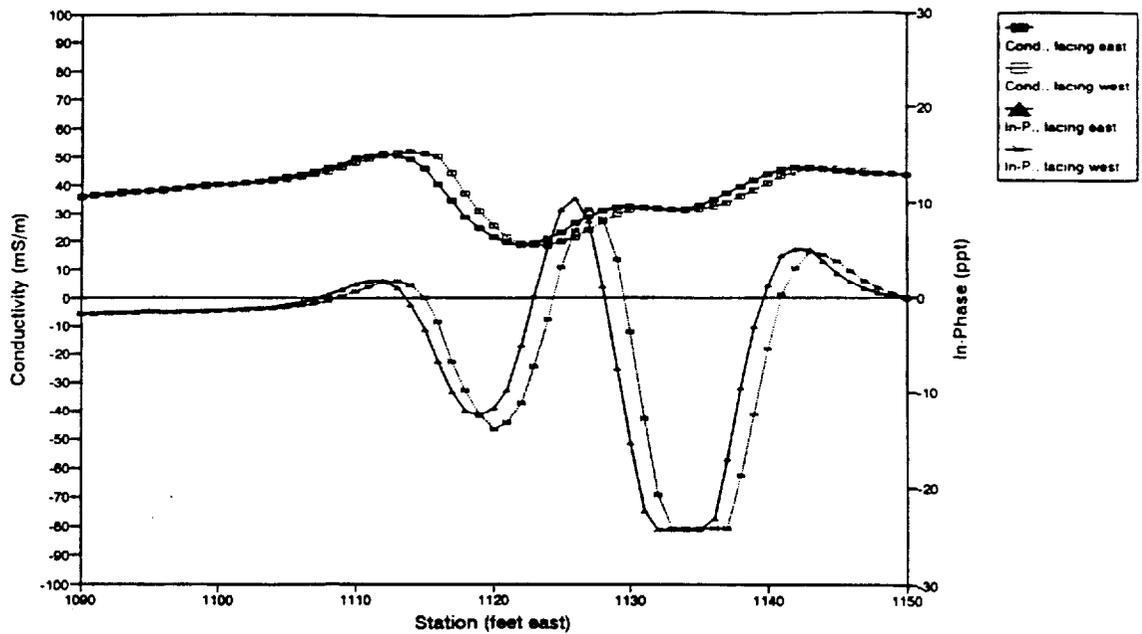


Fig. 5. Reciprocity bias over an anomaly. Data with reversed transmitter-receiver dipole positions give different results and shift the spatial positions of anomalies. When reciprocity compromises survey integrity, it can be avoided by always walking the same direction while acquiring data.

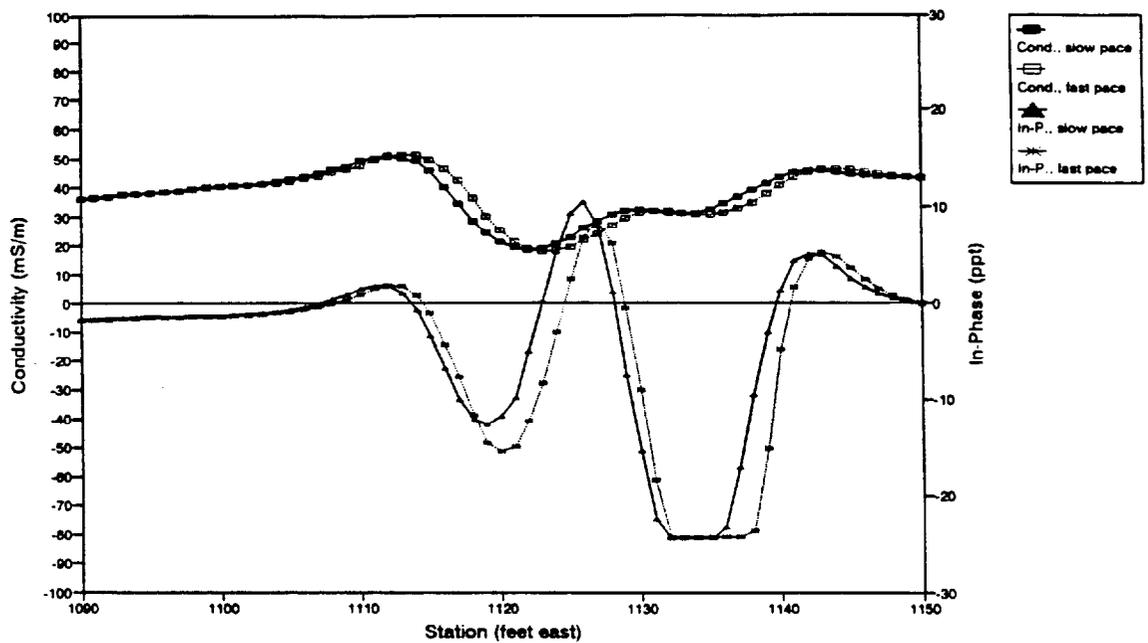


Fig. 6. Response-time bias over the anomaly of Figure 5. Data obtained at a fast pace "drags" the anomaly forward, as explained in the text. The solution is to walk more slowly, but this is not always necessary when searching for extended features such as landfills.

The obvious solution to the response-time problem is to slow down while taking the measurements. However, when large anomalies are to be characterized or anomaly edges and positions only need to be roughly known, a certain amount of response time bias may be acceptable considering the greater speed of data acquisition.

Spatial anisotropy is the variation in instrument response with the direction the antennas are pointed. When obtaining data over a linear, buried object, the signal will couple better to the object with one antenna orientation versus the other. For example, consider a north-south oriented, buried pipe. Anomalies using a parallel antenna axis (receiver and transmitter antennas on a north-south line) will be narrower and more clearly defined than those obtained with a perpendicular antenna axis, and the amplitudes will differ considerably. In contrast, measurements will be the same for both orientations over the center of a large sheet-like anomaly, such as a large concrete slab.

Anisotropy can be investigated by making measurements at two or more orientations and looking at the differences. For example, one can calculate a quantity known as the coefficient of anisotropy $C_a = \sigma_1/\sigma_2$, where 1 and 2 indicate the two instrument orientations. A rough approximation is made by taking the difference rather than the ratio between the two measurements.

Anisotropy is rarely of concern unless spatial aliasing is also a problem, since a sufficient sampling density will define most buried conductors regardless of the antenna-to-object orientation. However, the coefficient of anisotropy can be a helpful parameter when mapping two-dimensional features or when separating linear features from point-source features.

5.0 Quality Control Procedures

A standard set of quality assurance/quality control procedures is followed to determine the quality of the data in meeting project objectives.

Data accuracy is far less important than data precision for most types of geophysical work, since relative changes in field response are being sought. However, accuracy is not to be ignored altogether. Instrument accuracy for the conductivity parameter is set by factory calibration, but field adjustments are made at the beginning of each day to ensure that the measurements maintain this accuracy. Because the in-phase component has no fixed reference value, accuracy is not an issue in its measurement; instead, daily adjustments ensure a near-zero reference for this parameter.

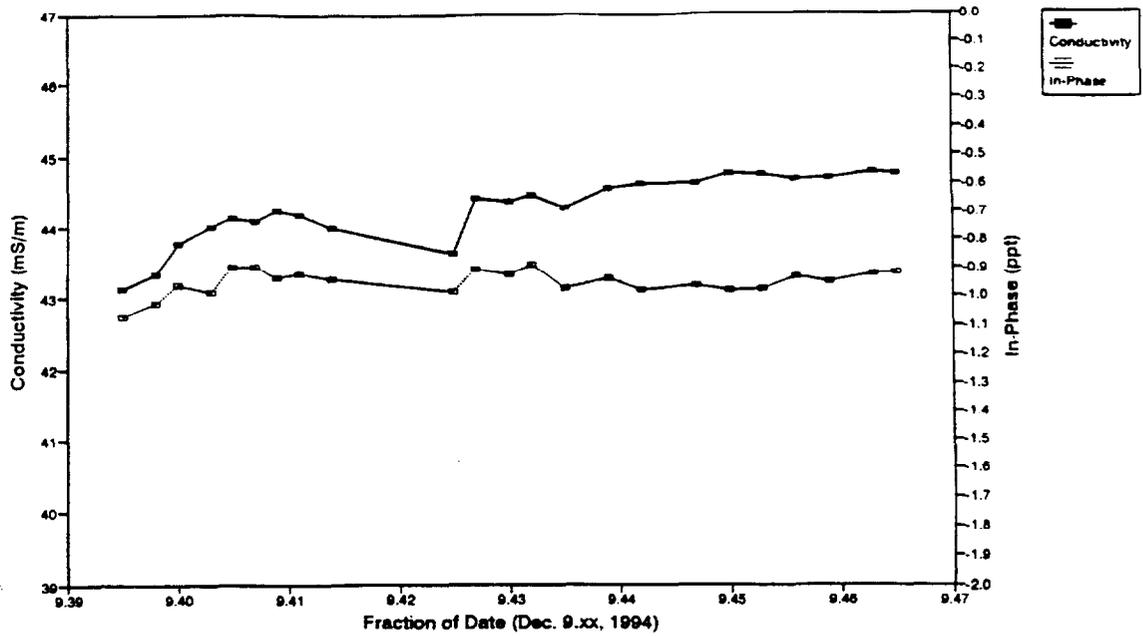


Fig. 8. Typical drift in the EM-31, from data at a base station repeatedly occupied during the work. Although a trend in the drift is clear, note that the discontinuities make a linear drift correction subject to error.

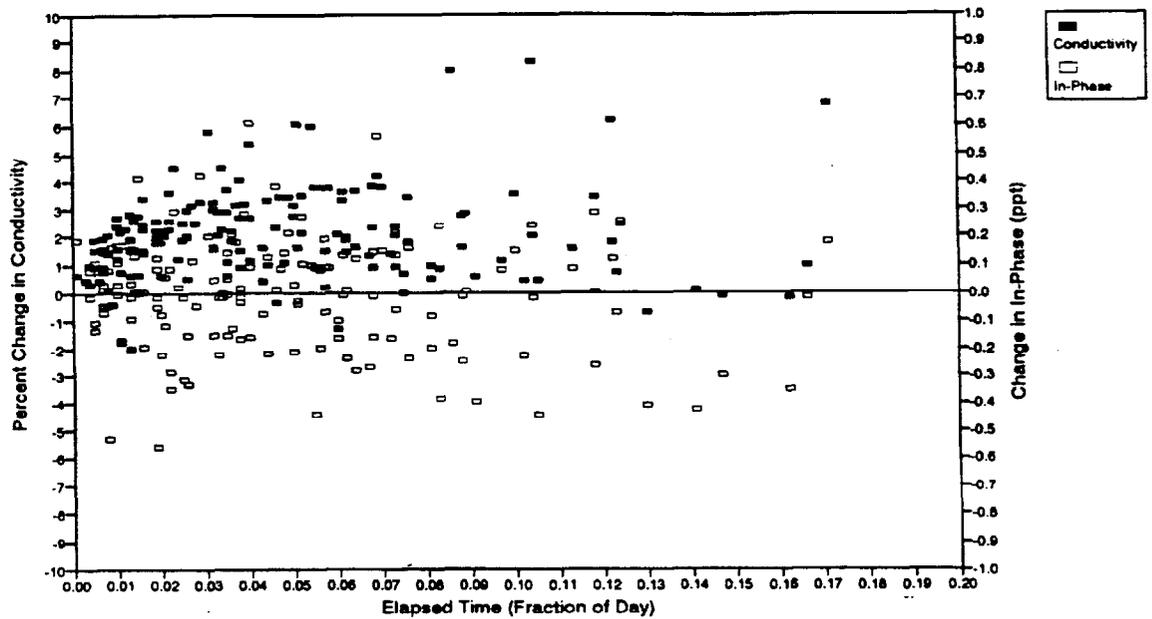


Fig. 9. Drift of base station data at 14 sites in two states, showing that drift is not predictable from site to site.

error into this calculation, so only an approximate correction is possible. In addition, the correction can be time-consuming, so it is rarely done unless it will significantly improve the results. A simpler approach can be useful at times. When data are collected simultaneously at two orientations (e.g., north-facing and east-facing antennas), each measurement has the same amount of drift, and their difference will be drift-free. Difference data should be nonzero only over two- and three-dimensional objects, which are the usual targets in FDEM investigations; hence, difference data are both drift-corrected and are diagnostic of key targets.

6.0 Data Interpretation

Compared to many other geophysical techniques, FDEM can be interpreted simply and quickly. Following acquisition, the data are downloaded to a computer, edited to correct field errors, and then plotted as plan maps. Because utilities and other man-made structures (collectively called *culture*) can cause severe distortions in the measurements, site features are routinely plotted with the data to assist the interpretation.

The interpretation process boils down to distinguishing data patterns caused by the target (drums, landfills, etc.) from those caused by noise (unimportant soil changes, culture, etc.). To do this, the geophysicist looks at two factors: relative anomaly amplitudes and anomaly spatial patterns.

Anomaly amplitudes can vary substantially due to site characteristics and the type, size, and depth of the buried material. There is no single amplitude "signature" that would identify, for example, a drum. However, Table 2 shows "typical" amplitudes from buried materials, based on field experience. Note that significant anomalies can be either positive or negative. For example, excavated soil in landfills generally should be conductive due to increased soil porosity, but can be resistive if imported soil replaces more conductive indigenous clays. Also note that light and dense non-aqueous phase liquids (LNAPLs and DNAPLs), which are often listed as contaminants of primary interest, are poor targets in most circumstances. As a general rule-of-thumb, FDEM is better at finding contaminant sources (such as drums) than finding the contaminants themselves (such as fuel spilled from the drums). A major exception is leachate fluid, which often increases the ground conductivity appreciably.

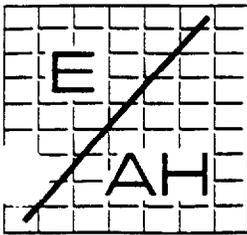
While anomaly amplitude is important, the key to FDEM interpretation is recognizing significant spatial patterns in the data. Large, extended targets such as landfills, plumes, and buried building foundations can be recognized by their spatial extent. Small objects can often be recognized by their small "footprint" as well as characteristic overshoot and undershoot effects at their edges.

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- Spies, B.R., and Frischknecht, F.C. (1991) *Electromagnetic Sounding*, *in* Nabighian, M.N. (ed.), *Electromagnetic Methods in Applied Geophysics*, v.2, part A: Society of Exploration Geophysicists, 285-426.

Appendix C

Surface Soil Background Dieldrin Concentrations at NSA Memphis



EnSafe / Allen & Hoshall

a joint venture for professional services

TECHNICAL MEMORANDUM

TO: Mark Taylor/David Porter, SOUTHDIV
Tonya Barker/Rob Williamson, NSA Memphis
Jack Carmichael, USGS
Brian Donaldson, EPA
Jim Morrison, TDEC
Brenda Duggar, MSCHD
E/A&H Project Team

FROM: Brian Mulhearn, EnSafe/Allen & Hoshall

DATE: January 9, 1997

RE: Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis

During the July 24, 1996 BRAC Cleanup Team (BCT) meeting, the BCT decided that the June 2, 1995 *Soil Dieldrin Technical Memorandum* should be re-submitted and finalized to clarify the anthropogenic background reference concentration (RC) to be used for dieldrin screening comparisons. Two-times the arithmetic mean soil dieldrin concentrations, resulting in a background reference concentration (RC) of 0.262 mg/kg for dieldrin, will be used in baseline risk assessments to determine if dieldrin is a chemical of potential concern. The maximum dieldrin concentration reported at a site will be compared to the RC, and exceedances will be discussed. Dieldrin will not be identified as a chemical of potential concern unless the average reported concentration exceeds the RC. However, site-specific exceedances will be noted and discussed as is appropriate. Sample locations the BCT determines to be hot spots will be addressed on a site-specific basis. The dieldrin RC was determined as discussed in the June 2 memo, which is the source of the text below.

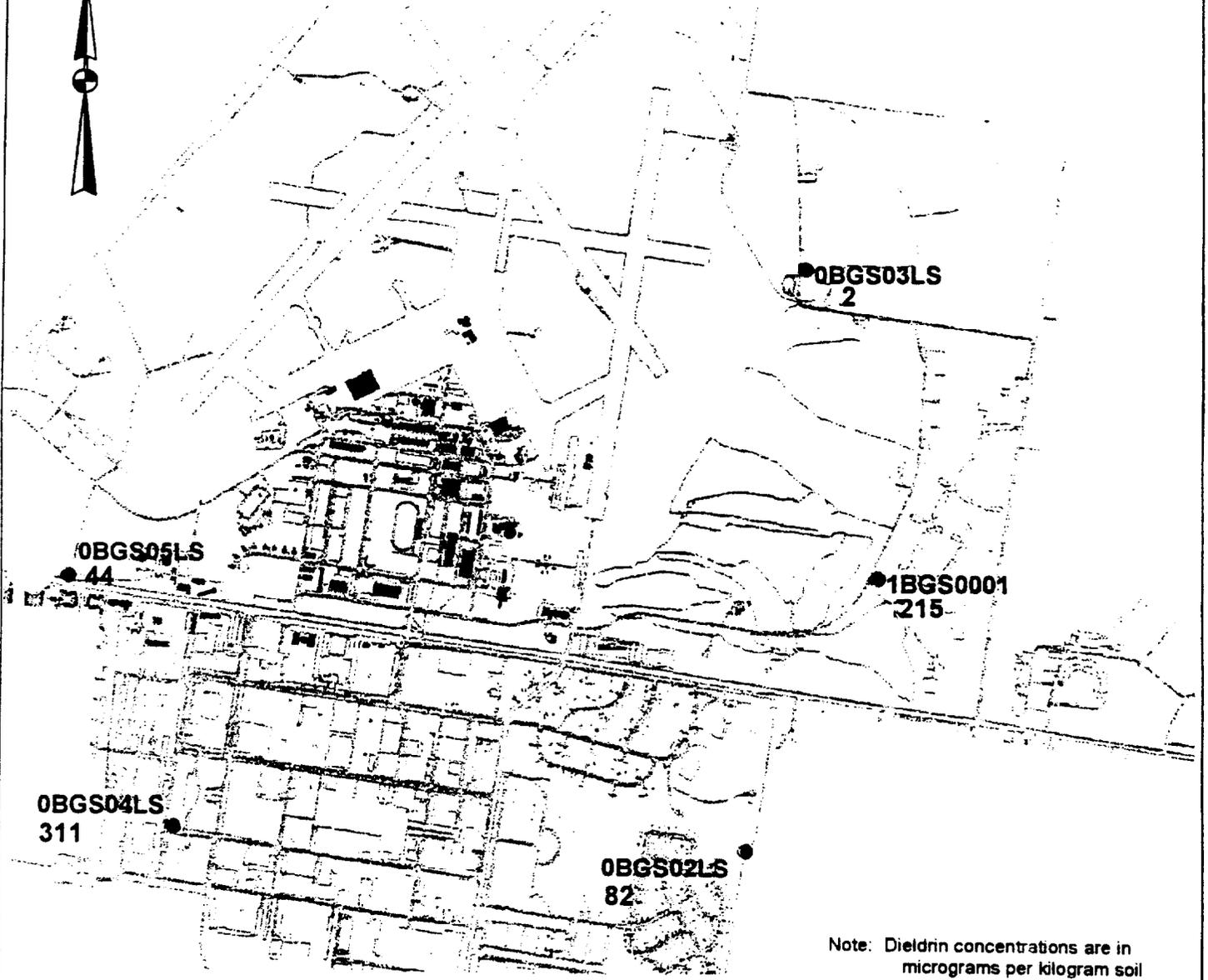
Chlorinated pesticides (specifically dieldrin) were used extensively in the 1950s and 1960s during a U.S. Department of Agriculture white fringed beetle quarantine. NSA Memphis has record that the agents were applied aerially for their intended purpose over the majority of the facility. During the RCRA

Facility Investigation, dieldrin and other chlorinated pesticides were detected in most surface soil and some subsurface soil samples collected at both SWMUs and background locations. Due to the ubiquitous presence of dieldrin in site soil, the following assessment was performed to support risk management decisions to be made by the BCT. Figure 1 shows reported surface soil dieldrin concentrations at background locations.

Table 1 shows concentrations ranged from below quantitation limits to 0.311 mg/kg with a mean of 0.131 mg/kg at background locations. Standard risk assessment methods were used to evaluate the significance of the reported concentrations. Default assumptions for residential and occupational exposure scenarios were used to project dieldrin-related carcinogenic risk through incidental ingestion and dermal contact soil pathways, which were detailed in the November 15, 1996 Technical Memorandum, *General Human Health Risk Assessment (HHRA) Approach for NSA Memphis*. For each exposure scenario, risk was estimated using the maximum and mean SWMU-specific dieldrin concentrations. The results of this process are provided in Table 2, including concentrations at SWMUs ranging from below quantitation limits to 0.609 mg/kg (e.g., average of the duplicate results at SWMU 5, boring 4).

As shown in Table 2, SWMU 5 had the highest projected soil pathway risk associated with dieldrin at maximum concentrations ($2.2E-5$). The SWMU 5 risk estimate was approximately twice that of the corresponding background. When mean concentrations were used as the exposure point concentration, SWMU 8 dieldrin risk was found to be the highest although it did not differ appreciably from background. In no instance (onsite or background) did dieldrin risk projections exceed $1E-4$. This finding indicates that dieldrin concentrations reported at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors. USEPA's generally acceptable range for carcinogenic risk is $1E-6$ to $1E-4$.

Soil dieldrin is not expected to pose a substantial threat to shallow groundwater at any SWMU or background location. This conclusion is based on the strong soil binding properties of the compound as well as empirical data for subsurface soil that show significant vertical migration has not occurred.



Note: Dieldrin concentrations are in micrograms per kilogram soil

1000 0 1000 2000 Feet



Figure 1

Surface Soil Dieldrin Concentrations
Reported in Background Samples
NSA Memphis

Table 1
Summary of Dieldrin Concentrations
Reported at NSA Memphis
Background Locations

Location	Concentration (mg/kg)	Qualifier
IBGS000101	0.215	D
OBGS02LS01	0.082	D
OBGS03LS01	0.004	U
OBGS04LS01	0.311	D
OBGS05LS01	0.044	

Note:

D = sample diluted by Laboratory

U = analyte not detected

The arithmetic mean dieldrin concentration (i.e., 0.131 mg/kg) was calculated assuming one-half of the detection limit was present in sample OBGS03LS01.

Table 2
NSA Memphis Dieldrin Risk Estimates

Location	Maximum Dieldrin (mg/kg)	Mean Dieldrin (mg/kg)	Residential Risk-Based Max.	Residential Risk-Based Mean	Occupational Risk-Based Max.	Occupational Risk-Based Mean
SWMU 1	0.192	NA	7.04E-6	NA	1.12E-6	NA
SWMU 3	0.023	0.0072	8.43E-7	2.64E-7	1.34E-7	4.19E-8
SWMU 5	0.609	0.126	2.23E-5	4.62E-6	3.54E-6	7.33E-7
SWMU 7	0.055	0.0095	2.02E-6	3.48E-7	3.20E-7	5.52E-8
SWMU 8	0.471	0.144	1.73E-5	5.28E-6	2.74E-6	8.37E-7
SWMU 60	0.069	0.0155	2.53E-6	5.68E-7	4.01E-7	9.01E-8
Background	0.311	0.131	1.14E-5	4.80E-6	1.81E-6	7.62E-7

Note: the calculations above are based on a slope factor of 16 kg-day/mg.

A historical use discussion is also helpful to provide a frame of reference for evaluating reported soil dieldrin (and other chlorinated pesticide) concentrations. Information provided by NSA Memphis states that chlorinated pesticides (primarily chlordane) were previously used until the late 1980's for termite control around buildings. Although chlordane was used as a single active ingredient application, mixtures including dieldrin, aldrin, and heptachlor were also common in the pest control trade. Standard application rates resulted in soil concentrations of 500 to 1,000 mg/kg total chlorinated pesticides. For comparison, a 10:1 chlordane:dieldrin mixture used for general subterranean termite control would have resulted in residual soil dieldrin concentrations of 50 to 100 mg/kg. These residual application concentrations are 50 to 100 times higher than the maximum soil dieldrin concentration reported in NSA Memphis surface soil.

This memo is intended to provide an RC for dieldrin and a risk-based framework for decision making regarding how the dieldrin issue is resolved. Although standard risk assessment techniques are applied, final resolution of this issue will require a consensus risk management decision. Of paramount importance is the determination of what level of risk is acceptable in light of the extent of dieldrin. EnSafe/Allen & Hoshall as the contractor can only provide the facts and suggestions for a viable risk management strategy. The following paragraph outlines suggestions based on currently available information and the preceding risk evaluation.

Dieldrin was used at NSA Memphis as intended, which has been documented and has resulted in dieldrin's widespread extent. Consequently, institutional controls are considered to be the most appropriate means of dealing with the dieldrin issue from a human health perspective. These controls may include (but are not limited to) public/worker awareness, access restrictions and maintenance of adequate vegetative cover to minimize contact. The focus of future investigative efforts should center around prevention of further migration (i.e., surface runoff), and evaluation of sensitive ecological receptor points (i.e., terrestrial habitats, drainage systems, streams, and lakes.) These areas should be emphasized as little control can be exercised over the animals who use them.

Appendix D
Validation Report

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Attachment A Data Validation Summary Narratives

1.0 INTRODUCTION

This report presents the analytical data collected during the Confirmatory Sampling Investigation (CSI) at Naval Support Activity (NSA) Memphis and the quality assurance/quality control (QA/QC) evaluation of those data. The data were evaluated to verify that the QC requirements of the data set have been met and to characterize the uncertainties of the data.

The Solid Waste Management Unit (SWMU) 10 soil and groundwater samples were collected in May 1996. This sampling event consisted of collecting soil and groundwater during a geo-probe investigation of the former SWMU 10 Construction Debris Landfill and 90-day Hazardous Waste Accumulation Point. Forty percent of the investigative samples were submitted to National Environmental Testing Inc. (NET) Laboratory in Bedford, Massachusetts, and reported using U.S. Environmental Protection Agency (USEPA) data deliverable levels III and IV.

Level III data consist of the following:

- Case narratives
- Sample results
- Analytical sequences
- Preparation logs
- GC/MS tuning data
- Calibration information
 - Percent relative standard deviation
 - Percent difference from calibration
- Method blanks
- MS/MSDs
- GC/MS internal standard areas and retention times
- Inorganic spikes/duplicates
- Laboratory control samples
- ICP check standards
- ICP interference check samples
- ICP serial dilutions
- Atomic absorption spike recoveries

Legend:

GC/MS = gas chromatography/mass spectrometry
MS/MSD = matrix spike/matrix spike duplicate
ICP = inductively coupled plasma

Level IV data consist of all level III QC information, plus all raw data, bench sheets, and instrument printouts. Sixty percent of the investigative samples were analyzed by an onsite laboratory provided by Transglobal Environmental Geochemistry (TEG) of Atlanta, Georgia, and reported using USEPA data deliverables level II. Level II data are analyzed using the more stringent QC criteria for level III data; however, the reported hardcopy deliverables are limited and consist of sample results, method blanks, and surrogate recoveries. The analytical methods and laboratory deliverables for this phase of the CSI are summarized in Table 1-1.

Table 1-1
NSA Memphis Analytical Program

Analytical Method	USEPA Method Reference
Volatile Organic Compounds	SW-846 8240
Semivolatile Organic Compounds	SW-846 8270
Pesticides/Polychlorinated Biphenyls	SW-846 8081/8082
Chlorinated Herbicides	SW-846 8151
Organophosphorus Pesticides	SW-846 8141
Metals	40 CFR Part 264 Appendix IX (SW-846 6010/7060/7421/7470/7740)
Cyanide	SW-846 9010
Gasoline Range Organics	SW-846 Modified 8015/TN GRO
Diesel Range Organics	SW-846 Modified 8015/TN DRO

Note:

TN GRO/DRO = Tennessee Method for Gasoline Range Organics and Diesel Range Organics

The references for the methods listed in Table 1-1 were from:

- USEPA Office of Solid Waste and Emergency Response (OSWER), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, Third Edition, revised July 1992.
- Data Quality Objectives for data deliverables as cited in: *USEPA Data Quality Objectives for Remedial Response Activities*, EPA-540/G-87/003, March 1987.

Data were validated using the following documents (as appropriate):

- *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, OSWER, February 1994 (EPA-540/R-94/012). (Organic Functional Guidelines).
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER, February 1994 (EPA-540/R-94/013). (Inorganic Functional Guidelines).

The NSA Memphis data were validated by EnSafe personnel or EnSafe's subcontractor, Validata Chemical Services Inc. (Validata) of Norcross, Georgia. Of the samples submitted to NET, 13 were validated at level III while six were validated at level IV. All samples analyzed by TEG were validated at level II. The data validation findings were summarized separately for each individual sample delivery group (SDG). Each SDG usually contained 20 investigative samples of one matrix type, i.e., either solid (soil and/or sediment) or water (groundwater and/or surface water) samples, except for QC samples, which were not counted as investigative samples. All

validation summary reports are included in Attachment A to this appendix. All data summary tables are included in Appendix E of this document.

Samples collected at NSA Memphis were evaluated for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticide/polychlorinated biphenyls (PCBs), herbicides, organophosphorus (OP) pesticides, appendix IX metals, cyanide, diesel range organics (DRO), and gasoline range organics (GRO).

1.1 Organic Evaluation Criteria

The USEPA methods listed in Table 1-1 define QC criteria that the laboratory must meet, although they do not address data evaluation from a user's perspective. Evaluation criteria available in the Organic Functional Guidelines were used throughout the data evaluation process when the analytical methods did not address data usability.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Laboratory control and duplicate samples
- GC/MS instrument performance checks
- Blank analysis
- Surrogate spike recoveries
- Internal standard performance
- Instrument calibration
- Field duplicate precision
- Matrix spike and matrix spike duplicates
- Compound quantitation

When the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding deficient compounds, as outlined in Organic Functional

Guidelines. The data from SWMU 10 were evaluated using this approach. The following flags were used to annotate data with laboratory and/or field deficiencies or problems:

Validation Qualifiers

U Undetected — The analyte was present in a sample, but at a concentration less than 10 times the blank concentration for common organic constituents (methylene chloride, acetone, 2-butanone, and phthalate esters), or five times the blank concentration for other constituents; the associated value shown is the quantitation limit after evaluation of the blank.

J Estimated Value — At least one QC parameter was outside control limits.

UJ Undetected and Estimated — The target analyte was analyzed for, but not detected above the listed estimated quantitation limit; the quantitation limit is estimated because at least one QC parameter was outside control limits.

D Diluted Result — The result was obtained from a diluted sample.

R/UR Unusable Data — At least one QC parameter grossly exceeded control limits.

These flags were applied to data where deficiencies were noted during validation. Because the laboratory uses some of the same qualifiers during analyses, laboratory qualifiers "U" and "J" remained on the data, unless superseded by a validation qualifier (e.g., "UJ," "UR"). Laboratory qualifiers that remained on the data after validation are described below:

Laboratory Qualifiers

- U Undetected** — The target analyte was not detected above the Practical Quantitation Limit (PQL).
- J Estimated Value Below PQL** — The analyte was detected below the PQL and is estimated.

Appendix E includes tables of all qualified data.

1.1.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. The sample holding time depends on the type of analysis and whether the sample was preserved. The holding time for preserved VOC and GRO analysis is 14 days from the collection date. SVOC, pesticide/PCB, OP pesticide, and chlorinated herbicide water samples must be extracted within seven days (14 days for DRO) and analyzed within 40 days of extraction.

1.1.2 GC/MS Mass Calibration (Instrument Performance Checks)

Tuning and performance criteria are established to ensure that the data produced by the instrument can be correctly interpreted according to method requirements. These criteria are not sample-specific; conformance is determined using standard materials, and therefore must be met in all circumstances. The performance standards for VOC (bromofluorobenzene) and SVOC (decafluorotriphenylphosphine) are analyzed to determine if the data produced by each instrument can be correctly interpreted according to the method requirements. The performance standards must be analyzed within 12 hours of sample analysis, and the results must be within the established criteria.

1.1.3 Surrogate Spike Recoveries

Surrogate compounds are added to samples and laboratory blanks prior to extraction and sample preparation to evaluate the effect of the sample matrix on extraction and measurement procedures. Surrogates are organic compounds chemically similar to analytes of interest, but those not normally found in environmental samples. Three surrogate compounds are added to samples for VOC analysis, eight are added to samples for SVOC analysis, two are added to pesticide/PCB samples, and one each is added to OP pesticide, chlorinated herbicide, DRO, and GRO analyses. Percent recovery (%R) of the surrogates is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample.

The following surrogate compounds are recommended by the SW-846 methods:

VOC Surrogates	SVOC Surrogates	Pesticide/PCB Surrogates
Toluene-d8	Nitrobenzene-d5	Tetrachloro-m-xylene
Bromofluorobenzene	2-Fluorobiphenyl	Decachlorobiphenyl
1,2-Dichloroethane-d4	Terphenyl-d14	
	2,4,6-Tribromophenol	
	Phenol-d5	
	2-Chlorophenol-d4	
	1,2-Dichlorobenzene-d4	
	2-Fluorophenol	
Herbicide Surrogate	GRO Surrogate	DRO Surrogate
2,4-Dichlorophenylacetic acid	m3-Toluene	o-Terphenyl
Organophosphorus Pesticide Surrogate		
4-Chloro-3-Nitrobenzotrifluoride		

1.1.4 Instrument Calibration

Instruments are initially and continually calibrated with standard solutions to verify that they can produce acceptable quantitative data for the compounds.

Initial calibration (GC/MS): The instrument is initially calibrated at the beginning of the analytical run to check its performance and to establish a linear five-point calibration curve. The initial calibration is verified by calculating the relative response factor (RRF) and the %RSD for each compound. An RRF less than 0.05 or a %RSD greater than 30% is outside the QC limits for the initial calibration.

Continuing calibration (GC/MS): Standard solutions are run periodically to check the instrument's daily performance and to establish the 12-hour RRF on which the sample quantitations are based. The continuing calibration is verified by calculating the RRF and the %D for each compound. An RRF less than 0.05 or a %D or %drift greater than 25% is outside the QC limits for the continuing calibration.

Initial calibration (GC): For single-component pesticides, two separate standard mixes are used, five-point calibrations are analyzed, and calibration factors (CF) are established. The CF for single-component pesticides must be no more than 20%.

The multicomponent pesticide toxaphene and all PCBs (or Aroclors) are analyzed separately. Retention times and CFs are determined for three to five primary peaks. The only review criterion for multicomponent compounds is to verify that these steps were taken.

A five-point initial calibration is analyzed for GRO, DRO, herbicides, and OP pesticides. Two methods for calibration may be used: response factor or linear regression methods. For the

response factor method, the initial calibration may be verified by calculating the RRF and the %RSD for each compound. An RRF less than 0.05 or a %RSD greater than 20% is outside the QC limits for the initial calibration. If linear regression is used, the correlation coefficient must meet or exceed 0.995 before the samples can be analyzed.

Continuing calibration (GC): Calibration verification, performed to confirm the calibration and evaluate instrument performance for single-component pesticides, consists of the analysis of instrument blanks, performance evaluation mixtures, and the midpoint concentration of the two standard mixes. The %D between the calculated amount and the true amount must not exceed 15% on the primary column.

Multicomponent compounds do not require continuing calibration.

For GRO, DRO, herbicides and OP pesticides, the continuing calibration is verified by calculating the RRF and the %D for each compound. An RRF less than 0.05 or a %D greater than 15% is outside the QC limits for the continuing calibration.

1.1.5 Matrix Spikes/Matrix Spike Duplicates

The MS, which is used to determine the accuracy of the analysis for a given matrix, consists of adding a known quantity of stock solution to the sample before its preparation and analysis. Evaluating the MS data involves two calculations. First, the %R is calculated by comparing the amount of the compound recovered by the analysis to the amount added to the sample. In addition, the RPD between the MS and the MSD samples is calculated and assessed. No specific requirements have been established for qualifying MS/MSD data. However, criteria for applying professional judgment are discussed in Organic Functional Guidelines.

1.1.6 Laboratory Control and Duplicate Samples

Some GC methods may require that a laboratory control sample (LCS) and laboratory duplicate be analyzed with each SDG. The LCS is used to monitor the overall performance of each step during analysis, including sample preparation. All aqueous LCS %R results must fall within the control limits established by the laboratory. Laboratory duplicate samples are used to demonstrate acceptable method precision at the time of analysis. The RPD between the sample and the duplicate sample is calculated. Although no guidelines are established for organic laboratory duplicates, sample qualification is left to professional judgment.

1.1.7 Blank Analysis

Laboratory method blanks: Method blanks are used to assess the presence and magnitude of potential contamination introduced during analysis. Additionally, *field blanks* may be collected to assess any contamination introduced during sample collection, as well as ambient field conditions. When chemicals are present in both samples and laboratory blanks analyzed within the same 12-hour period, **and/or** field-derived blanks, the usability of the data depends on the reviewer's judgment and the blank's origin. According to Organic Functional Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds 10 times the amount in **any** blank for common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and common phthalate esters), or five times the amount for other constituents. These amounts are referred to as *action levels* (ALs). Sample weight, volume, and dilution should be considered when calculating ALs because blank samples may not be prepared using the same weight, dilution, or volume of sample. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.

- If the sample concentration is greater than the AL, the concentration may be used unqualified.
- If the sample concentration is less than the quantitation limit and less than the AL, the sample is reported as nondetect at the quantitation limit.

Example (using 10X rule):

Water Sample		Diluted Water Sample	
Blank result	1	Blank result	1
Blank AL	10	Dilution Factor	5
PQL	5	Blank AL	50
Sample result	4J	Diluted PQL	25
Final result	5U	Sample result	4J
		Final result	25U

In this example, data are not reported as 4U because they are less than the PQL. The dilution factor is used to calculate an AL of 50 (1 x 5 x 10).

- If the sample concentration is greater than the quantitation limit, but less than the AL, then the concentration is reported as nondetect "U."

Example (using 10X rule):

Water Sample		Soil Sample		Diluted Soil Sample	
Blank result	6	Blank result	6	Blank result	6
Blank AL	60	% Solids	80	% Solids	80
PQL	5	Blank AL	75	Dilution Factor	5
Sample result	50	PQL	5	Blank AL	375
Final result	50U	Sample result	50	PQL	25
		Final result	50U	Sample result	250
				Final result	250U

In this example, water sample results less than 60 (or 10 x 6) would be qualified as nondetect. Soil results of less than 75 would be qualified as nondetect because percent solids are used to calculate the AL: $[(6 \div 0.8) \times 10]$. In the diluted soil sample, results less than 375 would be qualified as nondetect because dilution factors and percent solids are used to calculate the AL: $[(6 \div 0.8) \times 10 \times 5]$.

Field-derived blanks: For this project, three types of field-derived blanks were collected: the *field blank*, the *equipment rinsate blank* (also called a *rinsate blank*), and the *trip blank*. The field blank is a sample of the source water used onsite, primarily to decontaminate equipment. The equipment rinsate blank is a sample of runoff water from one or more pieces of the decontaminated equipment used to collect samples. The trip blank is a 40-milliliter volatile organic analysis vial filled at the laboratory with certifiable water to assess cross-contamination during VOC sample container shipment and handling, both before and after the sample collection.

The frequencies for collecting these QC samples were defined in Section 4 of the NSA Memphis *Comprehensive RFI Work Plan* (EnSafe/Allen & Hoshall, October 1994) as follows:

- *Field blanks* — one per source of water per sampling event
- *Rinsate blank* — one per week
- *Trip blank* — one per shipment containing VOC samples

For data validation, each trip blank is associated only with the samples from the same shipment/cooler. The field blanks and rinsate blanks apply to a larger number of samples because only one is collected per source of water per sampling event. Because field-derived blanks are used with method blanks to assess potential cross-contamination of field investigative samples, no action is taken if contamination is detected in the method blanks associated with the field-derived blanks.

1.1.8 Internal Standard Performance

GC/MS internal standards are added to samples to ensure the stability of the instrument's sensitivity and response during each analytical VOC and SVOC run. Internal standard area counts for samples and blanks must not vary by more than a factor of two (-50% to +100%) from the

associated calibration standard. If an internal standard area count is outside this window, action should be taken.

Listed below are the IS compounds recommended by the methods.

VOC IS Compounds
Bromochloromethane
1,4-Difluorobenzene
Chlorobenzene-d5

SVOC IS Compounds
1,4-Dichlorobenzene-d4
Naphthalene-d8
Acenaphthene-d10
Phenanthrene-d10
Chrysene-d12
Perylene-d12

1.1.9 Field Duplicate Precision

One field duplicate was collected at NSA Memphis for each 10 water and/or soil or sediment samples collected. Field duplicate samples are analyzed to evaluate overall precision. Field duplicates measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates that measure only laboratory performance.

For the NSA Memphis CSI, RPDs between the samples and duplicates were calculated during the validation processes for sample results exceeding the PQL. If the results for any compounds did not meet RPD criteria of less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for the sample and duplicate only. If one value was nondetect and the other value exceeded the PQL, the positive result was flagged as estimated "J," and the nondetect result as estimated "UJ."

1.1.10 Compound Quantitation

For organic analytes, the data evaluator must assess the usability of values when multiple sample results are reported by the laboratory. The following paragraphs describe actions taken by the validator in these cases.

Reanalyzed Samples: Occasionally, organic samples may require reanalysis because of method requirements or poor QC results. Examples of poor QC results are samples analyzed outside 12-hour tuning periods, extremely low surrogate %Rs, and IS retention times and/or area counts outside QC limits. In these instances, the laboratory may report results for the original and reanalyzed sample. During validation, the reviewer evaluates QC associated with the original and reanalyzed sample and assesses which sample represents the preferable quality. The sample with the preferable QC should be used for interpretation. The preferred analysis is reported as a primary sample in EnSafe's database and analytical tables.

Diluted Samples: When an analyte response exceeds the linear calibration range of the instrument or is off-scale, the laboratory will dilute the sample. If one or more compounds are outside the calibration range during initial analysis, the laboratory will flag the analyte "E." When diluted, the sample results will be flagged "D." Generally, values from the initial analysis will be used except where they exceeded the calibration range. Values exceeding the calibration range in the initial analysis will be replaced by the diluted value to ensure the most representative data. The "D" flag will remain on the value to alert the data user that the value from a secondary dilution was used.

1.2 Inorganic Evaluation Criteria

SW-846 and 40 CFR Part 264 define QC criteria that the laboratory must meet; however, the methods do not address data evaluation from a user's perspective. When the analytical methods did not address data usability, Inorganic Functional Guidelines was used throughout the data evaluation process.

Data evaluation for samples collected at NSA Memphis included the following parameters:

- Holding times
- Instrument calibration
- MS results
- Laboratory duplicates
- Field duplicate precision
- Inductively Coupled Plasma (ICP) interference check samples
- ICP serial dilutions
- LCS results
- Blank analysis
- Atomic Absorption (AA) duplicate injections and postdigestion spike recoveries

According to Inorganic Functional Guidelines, when the QC parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding deficient compounds. The data from SWMU 10 were evaluated using this approach. The following flags were used to annotate data with laboratory and/or field deficiencies or problems:

Validation Qualifiers

- U Undetected** — The analyte was present in a sample, but at a concentration less than five times the blank concentration; the associated value shown is the quantitation limit after evaluation of the blank.
- J Estimated Value** — At least one QC parameter was outside control limits.

UJ Undetected and Estimated — The target analyte was analyzed for, but not detected above the listed estimated quantitation limit; the quantitation limit is estimated because at least one QC parameter was outside control limits.

R/UR Unusable Data — At least one QC parameter grossly exceeded control limits.

These validation flags were applied to data where data deficiencies were noted during validation. The laboratory flags values between the instrument detection limit (IDL) and the PQL with a "B" qualifier to indicate that the analyte was detected below the PQL and is estimated. During validation, all results between the IDL and PQL flagged "B" by the laboratory were changed to "J" during validation for consistency. Because the laboratory uses some of the same qualifiers during analyses, the laboratory "U" qualifier remained on the data unless superseded by a validation qualifier (e.g., "UJ," "UR"). The laboratory "U" qualifier that remained on the data after validation is defined as:

Laboratory Qualifiers

U Undetected — The target analyte was not detected above the PQL.

Appendix E includes tables of all qualified data.

1.2.1 Holding Times

Acceptable technical holding times are specified in the analytical methods. The holding time for metals analysis is six months, except for mercury, which is 28 days from the date of collection. Cyanide analysis has a sample holding time of 14 days from the date of collection.

1.2.2 Instrument Calibration

Initial and continuing calibrations with standard solutions are used to check that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes on the Appendix IX list.

Initial calibration is performed to check the instrument's performance at the beginning of the analytical run and to establish a linear calibration curve. Calibration standard solutions are analyzed periodically to check the instrument's performance and confirm that the initial calibration curve is still valid. Calibrations are verified by calculating the %R and comparing the amount of the analyte recovered by analysis to the known amount of the standard. The %R for metals, except for mercury and cyanide, should fall between 90% and 110%. The %R for mercury and cyanide should fall between 80% and 120%, and 85% and 115%, respectively.

1.2.3 Matrix Spike Analysis

Samples are spiked with known quantities of analytes to evaluate the effect of the sample matrix on digestion and measurement procedures. The %R should be within 75% to 125%. However, when the sample concentration exceeds the spike concentration by a factor of four or more, spike recovery criteria are not applicable. When an element was outside matrix spike QC limits, positive and undetected results for that analyte were qualified for all samples in the SDG as specified in the Inorganic Functional Guidelines.

1.2.4 Laboratory Duplicates

Laboratory duplicate samples are analyzed to evaluate data precision, a measure of the analysis reproducibility. The RPD between the sample and the duplicate sample is calculated. A control limit of 20 RPD for aqueous samples and 35 RPD for soil or sediment samples should not be

exceeded for analyte values greater than the quantitation limit or two times the quantitation limit, respectively.

1.2.5 Blank Analysis

Laboratory method blanks are used to assess the existence and magnitude of potential contamination introduced during analysis. Additionally, *field blanks* may be collected to assess the potential contamination introduced during sample collection as well as ambient field conditions. When chemicals are present in samples and laboratory blanks, the data's usability depends on the reviewer's judgment and the blank's origin. According to Inorganic Functional Guidelines, a sample result should not be considered positive unless the compound's concentration in the sample exceeds five times the amount in **any** blank, referred to as ALs. Weight, dilutions, and sample volumes should be considered when using the blank criteria because blank samples may not be prepared using the same weight, dilution, or volume of sample. The specific actions to be taken are as follows:

- If a chemical is found in the blank but not the sample, no action is taken.
- If the sample concentration is between the IDL, and less than the AL, the concentration is reported as "U."
- If the sample concentration is greater than the AL, the concentration may be used unqualified.

When the blank concentration was less than the IDL (negative value), but had an absolute value greater than the IDL, the AL was 10 times the absolute value of the blank concentration. The specific actions are as follows:

- If the sample concentration is greater than the AL, the concentration may be used unqualified.
- If the concentration of any detected analyte is less than the AL, the concentration is qualified as estimated "J."
- If the result is nondetect, the concentration is qualified as estimated "UJ."

1.2.6 ICP Interference Check Samples

The ICP interference check sample (ICS) is used to confirm the laboratory instrument's inter-element and background correction factors. Interference samples should be run at the beginning and end of each sample analysis or at least twice per eight-hour working shift. The ICS consists of two solutions: A and AB. Solution A contains the interferants (aluminum, calcium, iron, and magnesium); solution AB contains the target analytes mixed with the interferants. An ICS analysis consists of analyzing both solutions consecutively, starting with solution A, for all wavelengths used for each analyte reported by ICP.

No analytes should be detected in the ICS solution A other than aluminum, calcium, iron, and magnesium. The presence of other analytes could lead to the possibility of false positives or false negatives of that analyte in the investigative samples. The %Rs for the ICS solution AB should be between 80% and 120%.

1.2.7 ICP Serial Dilutions

ICP serial dilutions assess the absence or presence of matrix interference. One sample from each set of similar matrix type is chosen for the serial dilution (a five-fold dilution). For an analyte concentration that exceeds the IDL by at least 10 times, the measured concentrations of the

undiluted and diluted samples should agree within 10%. When an element was outside QC criteria, that analyte was flagged as estimated "J" for all positive sample values in the SDG as specified in the Inorganic Functional Guidelines.

1.2.8 Laboratory Control Samples

LCSs are used to monitor the overall performance of analysis steps, including the sample preparation. All aqueous LCS %R results must be within the control limits of 80% to 120%, except for antimony and silver, which have no control limits. Soil LCS standards are generally provided by the USEPA (or state agency or private laboratory). Control limits are established for each soil LCS standard prepared.

1.2.9 AA Duplicate Injections and Postdigestion Spike Recoveries

During AA analysis, duplicate injections and postdigestion spikes are used to assess precision and accuracy of the laboratory analysis. The %RSD of duplicate injections must agree within 20%. The %R of the postdigestion spike sample should fall between 85% and 115%.

1.2.10 Field Duplicate Precision

One field duplicate was collected for each 10 water and/or soil samples collected. Field duplicate samples are analyzed to evaluate overall precision. Field duplicates measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates that measure only laboratory performance.

For the NSA Memphis CSI, RPDs between the samples and duplicates were calculated during the validation processes for sample results exceeding the IDL. If the results for any compounds did not meet RPD criteria of less than 30% for water and less than 50% (Validata used a control limit of 60%) for soil or sediment, the positive results for that compound were flagged as estimated for

the sample and duplicate only. If one value was nondetect and the other value exceeded the PQL, the positive result was flagged as estimated "J," and the nondetect result was flagged as estimated "UJ."

2.0 DATA VALIDATION RESULTS — SWMU 10

All samples were received by the laboratory intact and with the proper documentation. Table 2-1 summarizes the samples that were included in SWMU 10.

Table 2-1
SWMU 10 Sample IDs

Sample ID	SDG	Lab	APX IX Metals	CN	Herb	OP Pest	Pest/ PCB	8270 SVOC	8240 VOCs	8010 VOCs	BTEX	TPH- DRO	TPH- GRO
010S000101	1821	NET	X	X	X	X	X	X	X			X	X
010S000201	1821	NET	X	X	X	X	X	X	X			X	X
010S000301	1821	NET	X	X	X	X	X	X	X			X	X
010S000401	1821	NET	X	X	X	X	X	X	X			X	X
010S000501	1821	NET	X	X	X	X	X	X	X			X	X
010S000601	1821	NET	X	X	X	X	X	X	X			X	X
010M002501	1849	NET	X	X	X	X	X	X	X			X	X
010M002503	1849	NET	X	X	X	X	X	X	X			X	X
010M002601	1849	NET	X	X	X	X	X	X	X			X	X
010M002603	1849	NET	X	X	X	X	X	X	X			X	X
010M002701	1849	NET	X	X	X	X	X	X	X			X	X
010M002703	1849	NET	X	X	X	X	X	X	X			X	X
010M002801	1849	NET	X	X	X	X	X	X	X			X	X
010N002801	1849	NET	X	X	X	X	X	X	X			X	X
010M002803	1849	NET	X	X	X	X	X	X	X			X	X
010M002901	1849	NET	X	X	X	X	X	X	X			X	X
010M002903	1849	NET	X	X	X	X	X	X	X			X	X
010M003001	1849	NET	X	X	X	X	X	X	X			X	X
010M003003	1849	NET	X	X	X	X	X	X	X			X	X
010G000815	96052	TEG								X	X		
010H000815	96052	TEG								X			

Table 2-1
 SWMU 10 Sample IDs

Sample ID	SDG	Lab	APX IX Metals	CN	Herb	OP Pest	Pest/ PCB	8270 SVOC	8240 VOCs	8010 VOCs	BTEX	TPH- DRO	TPH- GRO
010G000848	96052	TEG								X	X		
010H000848	96052	TEG										X	
010G000722	96052	TEG								X	X		
010G000750	96052	TEG								X	X		
010G00924	96052	TEG								X	X		
010G000950	96052	TEG								X	X		
010GG1012	96052	TEG								X	X		
010G001050	96052	TEG								X	X		
010G001116	96052	TEG										X	
010G001150	96052	TEG								X	X		
010G001220	96052	TEG								X	X		
010G001250	96052	TEG								X	X		
010H001250	96052	TEG								X	X		
010G001320	96052	TEG								X	X		
010G001350	96052	TEG								X	X		
010G001420	96052	TEG								X	X		
010G001450	96052	TEG								X	X		
010G001550	96052	TEG								X	X		
010G001620	96052	TEG								X	X		
010S000815	96052	TEG								X	X		
010C000815	96052	TEG								X	X		
010S000915	96052	TEG								X	X		
010S001015	96052	TEG								X	X		
010S001115	96052	TEG								X	X		
010S001215	96052	TEG								X	X		
010S001315	96052	TEG								X	X		

Table 2-1
SWMU 10 Sample IDs

Sample ID	SDG	Lab	APX IX Metals	CN	Herb	OP Pest	Pest/PCB	8270 SVOC	8240 VOCs	8010 VOCs	BTEX	TPH-DRO	TPH-GRO
010S001415	96052	TEG								X	X		
010S001515	96052	TEG								X	X		

Notes:

APX IX Metals = Appendix IX Metals
 CN = Cyanide
 Herb = Herbicides
 OP Pest = OP Pesticides
 Pest/PCB = Pesticides/PCBs
 BTEX = Benzene, Toluene, Ethylbenzene, & Xylene

Forty-nine investigative samples were analyzed in three SDGs for SWMU 10. Full validation reports of this SDG are in Attachment A; data tables are in Appendix E.

2.1 Data Quality

The overall data quality of the analytical work performed for SWMU 10 was considered satisfactory and usable for site remediation and risk assessment. Results outside QA/QC requirements were flagged as estimated "J." This qualification indicates that the data could be biased either high or low. Although the data are qualified as estimated, they remain acceptable for use in risk assessment and site remediation.

2.2 Blanks

The following analytes were detected in several method, trip, and calibration blanks:

Acetone	Chromium	Lead
Antimony	Cobalt	Silver
Arsenic	Copper	Thallium
Barium	Dinoseb	Tin
Beryllium	Methylene Chloride	Vanadium
Cadmium		Zinc

The sample results for these analytes that were attributed to blank contamination were nullified during validation.

2.3 Unusable Data

A few sample results were rendered unusable because the samples grossly exceeded QC parameters. Table 2-2 summarizes the unusable data and explains the qualification.

**Table 2-2
Unusable Data**

Sample ID	Fraction	Analyte(s)	Explanation
010S000101	Herbicides	All	Surrogate %Rs < 10%
	Semivolatiles	All	Surrogate %Rs < 10%
010S000101RE	Herbicides	All 2,4,5-T	Holding time exceeded by 28 days %D between two columns > 300%
010S000201	Herbicides	All	Surrogate %Rs < 10%
	Semivolatiles	All	Surrogate %Rs < 10%
010S000201RE	Herbicides	All 2,4-DB	Holding time exceeded by 28 days %D between two columns > 300%
010S000301	Herbicides	2,4-DB	Surrogate %Rs < 10%
		2,4,5-T	
		2,4,5-TP	
		Dalapon	
		Dicamba	
010S000301RE	Herbicides	Dichloroprop	Holding time exceeded by 28 days
		MCPA	
		MCP	
		All	
010S000401	Herbicides	All	Surrogate %Rs < 10%
010S000401RE	Herbicides	All	Holding time exceeded by 28 days

**Table 2-2
 Unusable Data**

Sample ID	Fraction	Analyte(s)	Explanation
010S000501	Herbicides	2,4-DB Dinoseb 2,4,5-T 2,4,5-TP Dalapon Dicamba Dichloroprop MCPA MCPP	Surrogate %Rs < 10%
010S000501RE	Herbicides	All	Holding time exceeded by 28 days
010S000601	Herbicides	2,4-DB Dinoseb 2,4,5-T 2,4,5-TP Dalapon Dicamba Dichloroprop MCPA MCPP	Surrogate %Rs < 10%
010S000601RE	Herbicides	All	Holding time exceeded by 28 days
010M002503	Herbicides	Dinoseb Dalapon	Surrogate %Rs < 10%

Samples 010S000101, 010S000201, 010S000301, 010S000401, 010S000501, and 010S000601 were qualified as unusable "UR" for nondetect results and estimated "J" for positive results because their surrogates demonstrated %Rs less than 10%. These samples were reanalyzed for herbicides because the reanalysis exceeded the 14-day holding time by more than 28 days, samples were also qualified as unusable "UR" for nondetect results and estimated "J" for positive results. The initial analysis of samples 010S000101, 010S000201, 010S000301, 010S000401, 010S000501, and 010S000601 represents the preferred holding time. Therefore, these samples were used as the investigative samples and appear on the sample data tables.

The following samples were reanalyzed. The laboratory reported two sample results; the preferred analyses were used for interpretation:

SDG	Fraction	Preferred Samples	Reason
1821	SVOC	010S000101RE	Surrogate results improved upon reanalysis
1821	SVOC	010S000201RE	Surrogate results improved upon reanalysis

2.4 Compound Quantitation

Table 2-3 illustrates the results that were reported from a secondary dilution.

Table 2-3
Results Reported From Secondary Dilutions

Sample ID	Compound
010S000101	Dieldrin
010S000201	Dieldrin
010S000401	Heptachlor epoxide, Dieldrin, Phenanthrene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene
010S000501	Heptachlor epoxide, Dieldrin, Endrin ketone, Endrin aldehyde, Phenanthrene, Anthracene Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene
010S000601	Dieldrin, 4,4'-DDT, Aroclor-1260
010M002801	Dieldrin
010N002801	Dieldrin

Attachment A
Data Validation Summary Narratives

SWMU 10

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: NAS Memphis, RFI, Assembly B
PROJECT NUMBER: 8500.14
CONTRACTED LAB: National Environmental Testing, Inc.
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRICES: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Organophosphorus Pesticides, Chlorinated Herbicides, Gasoline Range Organics, Diesel Range Organics, Total Metals/Cyanide,
SDG NUMBERS: 1821 (Level IV)

SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Chlorinated Herbicides	Metals/ Cyanide
010S000101	147752	Soil	X	X	X	X	X
010S000101DL	147752_5DL	Soil			X		
010S000101RE	147752RE	Soil		X		X	
010S000201	147753	Soil	X	X	X	X	X
010S000201DL	147753_2DL	Soil			X		
010S000201RE	147753RE	Soil		X		X	
010S000301	147754	Soil	X	X	X	X	X
010S000301RE	147754RE	Soil				X	
010S000401	147755	Soil	X	X	X	X	X
010S000401DL	147755DL	Soil		X			
010S000401RE	147755RE	Soil				X	
010S000501	147756	Soil	X	X	X	X	X
010S000501DL	147756DL	Soil		X			
010S000501RE	147756RE	Soil				X	
010S000601	147757	Soil	X	X	X	X	X
010S000601RE	147757RE	Soil				X	
000T050796	147758	Water	X				

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Chlorinated Herbicides	Metals Cyanide
010S000301MS	147754MS	Soil			+	+	
010S000301MSD	147754MSD	Soil			+	+	
010S000601S*	147757S*	Soil					+
010S000601D*	147757D*	Soil					+

Client Sample #	Lab Sample #	Matrix	Organophos. Pesticides	Gasoline Range Organics	Diesel Range Organics
010S000101	147752	Soil	X	X	X
010S000201	147753	Soil	X	X	X
010S000301	147754	Soil	X	X	X
010S000401	147755	Soil	X	X	X
010S000501	147756	Soil	X	X	X
010S000601	147757	Soil	X	X	X

+ = Non-billable Quality Control Sample

D* = LAB DUPLICATE, DL = DILUTION, RE = REEXTRACTION / REANALYSIS, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, S* = MATRIX SPIKE, T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

National Environmental Testing, Inc. - 1821 CLP Organics and Inorganics

SAMPLE: 010S000101, 010S000101DL, 010S000101RE, 010S000201, 010S000201DL,
010S000201RE, 010S000301, 010S000301RE, 010S000401, 010S000401DL,
010S000401RE, 010S000501, 010S000501DL, 010S000501RE, 010S000601,
010S000601RE, 000T050796, 010S000301MS, 010S000301MSD, 010S000601S*,
010S000601D*

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the water calibration standard analyzed on 5/17/96 at 09:55 on instrument HP5970L for the following compounds:

1,2-dichloroethane (total)	70.5%
1,1,1-trichloroethane	28.8%

Since only the trip blank was associated with this standard, no action was taken.

IV.) Blanks:

Method Blanks:

Methylene chloride (1 ug/L) and acetone (5 ug/L) were detected in method blank VBLK0517L. Since only the trip blank was associated with this blank, no action was taken.

Trip Blank:

Methylene chloride (3 ug/L) and acetone (7 ug/L) were detected in the trip blank. Detections of methylene chloride in the associated samples less than 10X the blank amount were flagged as undetected (U) with the analytical results below the CRQL being replaced with the CRQL. Acetone was not detected in the associated samples. No further action was required.

TIC's:

All TIC criteria were met, so no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

No LCS was analyzed in this SDG. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

The holding times from the sampling date to reextraction were 24 days for samples 010S000101RE and 010S000201RE, which exceeded the 14 day QC limit. All positive and non-detect results for these samples were flagged as estimated (J) and (UJ).

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/24/96 on instrument HP5970F for the following compounds:

hexachlorocyclopentadiene	52.7%
2,4-dinitrophenol	32.4%

Since these compounds were not detected in the associated samples, no action was taken.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/29/96 at 12:10 on instrument HP5970F for the following compounds:

bis(2-chloroethyl)ether	27.9%
acenaphthylene	25.7%
acenaphthene	25.5%
2,4-dinitrophenol	51.5%
4,6-dinitro-2-methylphenol	42.8%
3,3'-dichlorobenzidine	46.6%
benzo(k)fluoranthene	25.5%

All positive and non-detect results for these compounds in associated samples 010S000101, 010S000201, 010S000301, 010S000401, 010S000501 and 010S000601 were flagged as estimated (J) and (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/30/96 at 10:19 on instrument HP5970F for the following compounds:

n-nitroso-di-n-propylamine	30.1%
2-nitroaniline	28.2%
2,4-dinitrophenol	36.0%
4,6-dinitro-2-methylphenol	34.4%

All results for these compounds in associated sample 010S000501DL, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/31/96 at 10:24 on instrument HP5970F for the following compounds:

4,6-dinitro-2-methylphenol	34.4%
benzo(k)fluoranthene	27.2%

The results for these compounds in associated sample 010S000401DL were flagged as estimated (DJ) and (UJ).

The Percent Difference (%D) of 2,4-dinitrophenol was 27.2% which exceeded the 25% for the standards analyzed on 06/05/96 at 09:02 on instrument HP5970F. The results for this compound in associated samples 010S000101RE and 010S000201RE, which were both non-detects, were flagged as estimated (UJ).

IV.) Blank:

Method Blank:

There were no positive results in the method blank. No action was taken.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) were below their respective QC limits for the following samples:

Sample ID	NBZ (23-120%)	FBP (30-115%)	TPH (18-137%)	PHL (24-113%)	2FP (25-121%)	TBP (19-122%)	2CP (20-130%)	DCB (20-130%)
010S000101	5	6	7	7	6	6	6	5
010S000201	6	7	8	7	6	7	7	5

All results for both acid and base/neutral fractions in samples 010S000101 and 010S000201, which consisted entirely of non-detects, were rejected (R) due to surrogate recoveries of less than 10%. The surrogate recoveries were within the QC limits for the reanalyses of these samples.

VI.) Laboratory Control Samples (LCS):

No LCS was analyzed in this SDG. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction, no action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

Phenanthrene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene and benzo(a)pyrene results for sample 010S000401 were above the instrument's linear range. The undiluted values for these compounds were replaced with the diluted values with appropriate flagging.

Phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene and benzo(a)pyrene results for sample 010S000501 were above the instrument's linear range. The undiluted values for these compounds were replaced with the diluted values with appropriate flagging.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All results for both acid and base/neutral fractions of samples 010S000101 and 010S000201, which consisted entirely of non-detects, were rejected (R) due to surrogate recoveries of less than 10%. The reanalyses of these two samples were considered by the validator to be of preferable data quality to the original analyses because of improved surrogate recoveries. All other laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) of delta-BHC on the primary column XTI-5 (57.5%) and secondary column RTX-35 (27.3%) exceeded the 25% QC limit for the standards analyzed on 06/06/96 at 19:18. All results for delta-BHC in associated samples 010S000101DL, 010S000201DL, 010S000301, 010S000401, 010S000501 and 010S000601, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Difference (%D) of delta-BHC was 49.7% for the standard analyzed on 06/07/96 at 21:25 on primary column XTI-5, which exceeded the 25% QC limit. The results for this compound in associated samples 010S000101 and 010S000201, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of decachlorobiphenyl (DCB) were above the 30-150% QC limits for the following samples:

Client Sample #	DCB, %R Column 1	DCB, %R Column 2
010S000401	444	1140
010S000501	467	2800

All positive results for these two samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. Several Percent Recoveries were outside the QC limits. Data validation action based on LCS recoveries was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) were below their respective QC limits in spiked samples 010S000301MS and 010S000301MSD for the following compounds:

<u>Compound</u>	<u>MS. %R</u>	<u>MSD. %R</u>	<u>QC Limits</u>
endosulfan I	-	33	45-153%
dieldrin	-	0	36-146%
endrin aldehyde	45	38	50-150%

The non-detect results for endosulfan I and endrin aldehyde in unspiked sample 010S000301 were flagged as estimated (UJ). The positive result for dieldrin in the unspiked sample was flagged as estimated (J).

The Relative Percent Differences (RPD's) of aldrin (47%) and dieldrin (288%) in spiked samples 010S000301MS and 010S000301MSD exceeded the 40% QC limit. The results for these two compounds in unspiked sample 010S000301 were flagged as estimated (J) and (UJ).

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

The Percent Differences (%D's) between columns 1 and 2 exceeded the 70% QC limit for the following compounds and associated samples:

<u>Sample</u>	<u>Compound</u>	<u>%D</u>
010S000101	4,4'-DDD	245
010S000201	endosulfan II	96
	gamma-chlordane	90
	rochlor-1260	120
010S000201DL	4,4'-DDT	72
010S000401	heptachlor epoxide	135
010S000501	heptachlor epoxide	100
010S000601	4,4'-DDT	82

The associated positive sample results for these compounds were flagged as estimated (J).

IX.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

X.) Pesticide Cleanup Check:

Florisol Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

XI.) Overall Assessment of Data/General:

Results for dieldrin in samples 010S000101 and 010S000201 exceeded the instrument's linear range. The undiluted values were replaced with the diluted values for these compounds in associated samples with appropriate flagging. Samples 010S000401 and 010S000501 were analyzed at 10X dilutions. All laboratory data were acceptable with qualifications.

ORGANOPHOSPHORUS PESTICIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met, so no action was necessary.

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recovery (%R) of naled was 39% in spiked sample 010S000301MS, which was below the 50-150% QC limits. The non-detect result for this compound in unspiked sample 010S000301 was flagged as estimated (UJ).

The Relative Percent Difference (RPD) of merphos was 27% in spiked samples 010S000301MS and 010S000301MSD, which exceeded the 25% QC limit. The non-detect result for this compound in unspiked sample 010S000301 was flagged as estimated (UJ).

VII.) TCL Compound Identification:

Organophosphorus Pesticide Identification Summary (OPIS):

All OPIS Identification criteria were met. No action was required.

VIII.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

CHLORINATED HERBICIDES

I.) Holding Times:

The holding times from the sampling date to reextractions were 31 days for samples 010S000101RE, 010S000201RE, 010S000301RE, 010S000401RE, 010S000501RE and 010S000601RE, which exceeded the 14 day QC limit by more than 2X. All positive results in these samples were flagged as estimated (J) and all non-detects were rejected (R).

II.) Instrument Performance:

All Herbicides Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/01/96 at 08:36 on secondary column RTX-35 for the following compounds:

dinoseb	27.6%
2,4,5-T	26.3%

All positive and non-detect results for these compounds in associated samples 010S000401, 010S000501 and 010S000601 were flagged as estimated (J) and (UJ).

The Percent Difference (%D) of 2,4-DB was 26.3% for the standard analyzed on 6/09/96 at 07:10 on primary column RTX-5, which exceeded the 25% QC limit. All results for this compound in associated samples 010S000301RE, 010S000401RE, 010S000501RE and 010S000601RE were previously rejected due to excessive holding time exceedances. No further action was required.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of the following surrogates were outside the 31-147% QC limits for the samples listed:

<u>Samples</u>	<u>%R (Column 1)</u>	<u>%R (Column 2)</u>
010S000101	0	0
010S000201	18	0
010S000301	10	0
010S000401	11	0
010S000501	17	0
010S000601	14	0

The non-detect results in these samples were rejected (R) due to surrogate recoveries less than 10%. The positive results in these samples were flagged as estimated (J).

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VII.) TCL Compound Identification (HIS):

The Percent Differences (%D's) between columns 1 and 2 exceeded the 70% QC limit for the following compounds and associated samples:

<u>Sample</u>	<u>Compound</u>	<u>%D</u>
010S000101RE	2,4,5-T	400
010S000201RE	2,4-DB	1200
010S000301	2,4-D	114
010S000501	2,4-D	162

The associated positive sample results for compounds with %D's less than 300% were flagged as estimated (J). The positive results for 2,4,5-T in sample 010S000101RE and 2,4-DB in sample 010S000201RE were rejected (R) because the %D's exceeded 300%.

VIII.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

IX.) Overall Assessment of Data/General:

All non-detect results in all SDG samples were rejected because of 0% surrogate recoveries in the original analyses and holding time exceedances (greater than 2X the QC limits) in the reextractions. Positive results for 2,4-D and dinoseb in sample 010S000301 and 2,4-D in sample 010S000601 were the only acceptable results in the herbicide fraction.

GASOLINE RANGE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was necessary.

III.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was required.

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Sample (LCS):

Two LCS's were analyzed for this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VIII.) TCL Compound Identification:

All criteria were met, so no action was required.

IX.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

X.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

DIESEL RANGE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was necessary.

III.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was required.

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was taken.

VI.) Laboratory Control Sample (LCS):

Two LCS's were analyzed for this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VIII.) TCL Compound Identification:

All criteria were met, so no action was required.

IX.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

X.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max Conc.</u>	<u>Action Level</u>
ICB	beryllium	2.80 ug/L	2.80 mg/kg
PBS	copper	0.87 mg/kg	4.33 mg/kg

ICB = Initial Calibration Blank, PBS = Preparation Blank (Soil)

All results greater than the IDL but less than 5X the blank amount (Action Level) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB4	barium	-1.20 ug/L	1.20 mg/kg
CCB1	copper	-4.10 ug/L	4.10 mg/kg
CCB1	lead	-2.20 ug/L	2.20 mg/kg
CCB3	thallium	-2.40 ug/L	2.40 mg/kg

CCB = Continuing Calibration Blank

All associated non-detects for thallium were flagged as estimated (UJ). All associated positive sample results for the other analytes were greater than 5X the absolute value of the negative blank results. No further action was required.

IV.) ICP Interference Check Sample Results:

The Percent Recoveries (%R's) of aluminum, calcium, iron nor magnesium were reported on the Form IV. No action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	17 ug/L
barium	4 ug/L
cadmium	205 ug/L
copper	38 ug/L
silver	7 ug/L
zinc	50 ug/L
tin	1330 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was reported on Form I's for the samples in this SDG, no action was required.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

antimony	-16 ug/L
chromium	-10 ug/L
nickel	-10 ug/L
vanadium	-10 ug/L

Since neither aluminum, calcium, iron nor magnesium was reported on Form I's for the samples in this SDG, no action was required.

V.) ICP Serial Dilution Analysis:

All ICP Serial Dilution criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met, so no action was taken.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of antimony (55%) and selenium (73.5%) in spiked sample 010S000601S* were below the 75-125% QC limits. All results for antimony and selenium in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ).

IX.) Field Duplicates:

Field duplicate samples were not designated in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was necessary.

XI.) Sample Result, Calculation/Transcription Verification:

The correct RPD values, where appropriate, were inserted on the Form VI during validation.

Cadmium was misspelled as "cadium" on all forms in this SDG. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: NAS Memphis, RFI, Assembly B
PROJECT NUMBER: 8500.14
CONTRACTED LAB: National Environmental Testing, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRICES: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Organophosphorus Pesticides, Chlorinated Herbicides, Gasoline Range Organics, Diesel Range Organics, Total Metals and Cyanide

SDG NUMBERS: 1849 (Level III)

SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Chlorinated Herbicides	Total Metals
010M002501	148366	Soil	X	X	X	X	X
010M002501RE	148366RE	Soil	X				
010M002503	148367	Soil	X	X	X	X	X
010M002601	148368	Soil	X	X	X	X	X
010M002603	148369	Soil	X	X	X	X	X
010M002603RE	148369RE	Soil				X	
010M002701	148370	Soil	X	X	X	X	X
010M002703	148371	Soil	X	X	X	X	X
010M002801	148372	Soil	X	X	X	X	X
010M002801DL	148372DL	Soil			X		
010M002803	148373	Soil	X	X	X	X	X
010M002901	148374	Soil	X	X	X	X	X
010M002903	148375	Soil	X	X	X	X	X
010M003001	148376	Soil	X	X	X	X	X
010M003003	148377	Soil	X	X	X	X	X
010N002801	148378	Soil	X	X	X	X	X

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Chlorinated Herbicides	Total Metals
010N002801DL	148378DL	Soil			X		
000T051696	148379	Water	X				
010M002501MS	148366MS	Soil			+		
010M002501MSD	148366MSD	Soil			+		
010M002501S*	148366S*	Soil					+
010M002501D*	148366D*	Soil					+
010M002503MS	148367MS	Soil	+				
010M002503MSD	148367MSD	Soil	+				
010M002601MS	148368MS	Soil		+			
010M002601MSD	148368MSD	Soil		+			

Client Sample #	Lab Sample #	Matrix	Organophos. Pesticides	Gasoline Range Organics	Diesel Range Organics	Cyanide
010M002501	148366	Soil	X	X	X	X
010M002503	148367	Soil	X	X	X	X
010M002601	148368	Soil	X	X	X	X
010M002603	148369	Soil	X	X	X	X
010M002701	148370	Soil	X	X	X	X
010M002703	148371	Soil	X	X	X	X
010M002801	148372	Soil	X	X	X	X
010M002803	148373	Soil	X	X	X	X
010M002901	148374	Soil	X	X	X	X
010M002903	148375	Soil	X	X	X	X
010M003001	148376	Soil	X	X	X	X
010M003003	148377	Soil	X	X	X	X
010N002801	148378	Soil	X	X	X	X
010M003003MS	148377MS	Soil			+	
010M003003MSD	148377MSD	Soil			+	
010M002501MS	148366MS	Soil	+			
010M002501MSD	148366MSD	Soil	+			

+ = Non-billable Quality Control Sample

D* = LAB DUPLICATE, DL = DILUTION, N= FIELD DUPLICATE, RE = REEXTRACTION / REANALYSIS, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, S* = MATRIX SPIKE, T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

Jean M. Delashmit

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

National Environmental Testing, Inc. - 1849 CLP Organics and Inorganics

SAMPLE: 010M002501, 010M002501RE, 010M002503, 010M002601, 010M002603,
010M002603RE, 010M002701, 010M002703, 010M002801, 010M002801DL,
010M002803, 010M002901, 010M002903, 010M003001, 010M003003, 010N002801,
010N002801DL, 000T051696, 010M002501MS, 010M002501MSD, 010M002501S*,
010M002501D*, 010M002503MS, 010M002503MSD, 010M002601MS,
010M002601MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

The Percent Difference (%D) of 4-methyl-2-pentanone was 32.4% for standard analyzed on 5/21/96 at 09:54 on instrument HP5970E, which exceeded the 25% QC limit. All results for this compound in associated samples 010M002501, 010M002503, 010M002601, 010M002603, 010M002701, 010M002803 and 010M002901, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/22/96 at 09:32 on instrument HP5970E for the following compounds:

chloromethane	28.9%
vinyl chloride	29.2%

All results for these compounds in associated samples 010M002501RE, 010M002703, 010M002801, 010M002903, 010M003003 and 010N002801, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks, no action was taken.

Trip Blank:

Methylene chloride was detected at 5 ug/L in trip blank 000T051696. Since methylene chloride was not detected in the associated samples, no action was taken.

TIC's:

All TIC criteria were met, so no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

No LCS was analyzed in this SDG. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. There were no calculable Relative Percent Differences (RPD's) for this set of field duplicate samples, so no action was required.

IX.) Internal Standards Performance (ISTD):

The internal standard area counts were below the 50-200% QC limits for the following samples:

<u>Sample</u>	<u>Chlorobenzene-d5</u>
010M002501	44.5%
010M002501RE	49.3%

The results for compounds quantitated on this ISTD, which consisted entirely of non-detects, were flagged as estimated (UJ).

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 010M002501 was considered by the validator to be of preferable data quality to the reanalysis because of fewer data qualifications. The sampling dates were not reported on the spreadsheets. These dates were manually entered during validation. All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/24/96 on instrument HP5970F for the following compounds:

hexachlorocyclopentadiene	52.7%
2,4-dinitrophenol	32.4%

Since these compounds were not detected in the associated samples, no action was taken.

Continuing Calibration:

The Percent Difference (%D) of 4-nitroaniline was 28.0%, which exceeded the 25% QC limit for the standards analyzed on 06/06/96 at 09:05 on instrument HP5970F. All results for this compound in the samples in this SDG, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive results in the method blank. No action was taken.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

No LCS was analyzed in this SDG. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recovery (%R) of pentachlorophenol was 111% in spiked sample 010M002601MSD, which exceeded the 17-109% QC limits. Since this compound was not detected in unspiked sample 010M002601, no action was required.

VIII.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. There were no calculable Relative Percent Differences (RPD's) for this set of field duplicate samples, so no action was required.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

The sampling dates were not reported on the spreadsheets. These dates were manually entered during validation. All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) of the following compounds on the primary and secondary columns exceeded the 25% QC limit for the standards analyzed on 6/07/96 at 08:11:

<u>Compounds</u>	<u>%D</u> <u>(XTI-5)</u>	<u>%D</u> <u>(RTX-35)</u>
beta-BHC	-	36.7
delta-BHC	50.6	-

The results for these two compounds in associated samples 010M002501, 010M002503, 010M002601, 010M002603, 010M002701 and 010M002703, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Difference (%D) of delta-BHC was 49.7% for the standard analyzed on 06/07/96 at 21:25 on primary column XTI-5, which exceeded the 25% QC limit. The results for this compound in associated samples 010M002801, 010M002803, 010M002901, 010M002903, 010M003001, 010M003003 and 010N002801, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) of the following compounds on the primary and secondary columns exceeded the 25% QC limit for the standards analyzed on 6/14/96 at 00:29:

<u>Compounds</u>	<u>%D</u> <u>(XTI-5)</u>	<u>%D</u> <u>(RTX-35)</u>
delta-BHC	30.0	25.0
heptachlor epoxide	40.0	-

The results for these two compounds in associated samples 010M002801DL and 010N002801DL, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. One Percent Recovery was outside the QC limits. Data validation action based on LCS recoveries was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of the following compounds exceeded their respective QC limits in soil spiked samples 010M002501MS and 010M002501MSD:

<u>Compound</u>	<u>MS (%R)</u>	<u>MSD (%R)</u>	<u>QC Limits (%R)</u>
dieldrin	309	177	36-146
4,4'-DDE	155	-	30-145
4,4'-DDD	145	209	31-141
4,4'-DDT	550	187	25-160

Positive results for these compounds in unspiked sample 010M002501 were flagged as estimated (J).

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

The Percent Differences (%D's) between columns 1 and 2 exceeded the 70% QC limit for the following compounds and associated samples:

<u>Sample</u>	<u>Compound</u>	<u>%D</u>
010M002801	heptachlor epoxide	122
	technical chlordane	71
010N002801	heptachlor epoxide	114
010M002903	aroclor-1260	123

The associated positive sample results for these compounds were flagged as estimated (J).

IX.) Field Duplicates:

Field duplicate samples 010M002801 and 010N002801 were analyzed by the laboratory. The calculable Relative Percent Differences (RPD's) were:

<u>Compounds</u>	<u>010M002801</u>	<u>010N002801</u>	<u>RPD</u>
dieldrin	94 ug/kg	95 ug/kg	1
alpha-chlordane	30 ug/kg	17 ug/kg	55
gamma-chlordane	13 ug/kg	6.6 ug/kg	65

The RPD of gamma-chlordane exceeded the 60% QC limit for soil samples. The positive results for gamma-chlordane in the two field duplicate samples were flagged as estimated (J). Since the RPD's for other compounds were within the 60% QC limit, no further action was taken.

X.) Pesticide Cleanup Check:

Florisol Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

XI.) Overall Assessment of Data/General:

The sample collection date was incorrectly reported on the spreadsheets for all samples in this SDG. This error was corrected during validation.

Results for dieldrin in samples 010M002801 and 010N002801 exceeded the instrument's linear range. The original results for dieldrin in these samples were replaced with dilution analysis results with appropriate flagging.

All other laboratory data were acceptable with qualifications.

ORGANOPHOSPHORUS PESTICIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) for the following compounds on the primary and secondary columns exceeded the 25% QC limit for the standard analyzed on 06/14/96 at 06:49:

<u>Compounds</u>	<u>%D</u> <u>Column 1</u>	<u>%D</u> <u>Column 2</u>
dichlorovos	38.0	34.0
mevinphos, alpha	33.0	-
diazinon	26.0	-
methyl parathion	27.0	-
ronnel	26.0	-
chloropyrifos	26.0	-
stirophos	32.0	-

The results for these compounds in associated samples 010M002701, 010M002703, 010M002801, 010M002803, 010M002901, 010M002903, 010M003001, 010M003003 and 010N002801, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of naled were 36% and 15%, respectively, in spiked samples 010M002501MS and 010M002501MSD, which were below the 50-150% QC limits. The Relative Percent Difference (RPD) was 82% for naled in spiked samples 010M002501MS and 010M002501MSD, which exceeded the 25% QC limit. The non-detect result for this compound in unspiked sample 010M002501 was flagged as estimated (UJ).

VII.) TCL Compound Identification:

Organophosphorus Pesticide Identification Summary (OPIS):

All OPIS Identification criteria were met. No action was required.

VIII.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. There were no calculable Relative Percent Differences (RPD's) for this set of field duplicate samples, so no action was required.

IX.) Overall Assessment of Data/General:

Sample collection date was incorrect on the electronic spreadsheet for all samples in this SDG. The date was corrected during validation.

All laboratory data were acceptable with qualifications.

CHLORINATED HERBICIDES

I.) Holding Times:

The holding time from sampling date to reextraction was 22 days for sample 010M002603RE, which exceeded the 14 day QC limit for soil samples. All results for this sample, which consisted entirely of non-detects, were flagged as estimated (UJ).

II.) Instrument Performance:

All Herbicides Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

The Percent Difference (%D) of MCPA was 31.6% for the standard analyzed on 06/14/96 at 04:40 on primary column RTX-5, which exceeded the 25% QC limit. The positive and non-detect results for this compound in associated samples 010M002601, 010M002603, 010M002701, 010M002703 and 010M002801 were flagged as estimated (J) and (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 06/14/96 at 10:47 on primary column for the following compounds:

MCPA	31.6%
MCPP	26.3%
2,4-DB	26.3%

The positive and non-detect results for these compounds in associated samples 010M002803, 010M002901, 010M002903, 010M003001 and 010M003003 were flagged as estimated (J) and (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 06/14/96 at 16:41 on the primary column for the following compounds:

MCPA	31.6%
MCPP	26.3%
2,4-DB	31.6%

The positive and non-detect results for these compounds in associated samples 010N002801 and 010M002603RE were flagged as estimated (J) and (UJ).

IV.) Blanks:

Method Blanks:

Dinoseb was detected at 2.8 ug/kg in the method blank. Detections of dinoseb in the associated samples less than 5X the blank amount were flagged as undetected (U) with the quantitation limit being raised to the level of contamination in each sample.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of surrogate 2,4-dichlorophenylacetic acid were below the 31-147% QC limits for the following samples:

Client Sample	%R Column 1	%R Column 2
010M002701	26	-
010M003001	-	28

All positive and non-detect results in samples 010M002701 and 010M003001 were flagged as estimated (J) and (UJ).

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) were outside the 10-150% QC limits in spiked samples 010M002503MS and 010M002503MSD for the following compounds:

Compound	MS, %R	MSD, %R
silvex	-	224
2,4-DB	-	8
dinoseb	-4	0
2,4,5-T	-64	0
dalapon	0	0

The non-detect results for dinoseb and dalapon in unspiked sample 010M002503 were rejected due to %R's less than 10%. The positive results for silvex, 2,4-DB and 2,4,5-T in unspiked sample 010M002503 were flagged as estimated (J).

The Relative Percent Differences (RPD's) of MCPA (48%), dichloroprop (51%), 2,4-D (56%), silvex

(73%) and 2,4-DB (111%) in spiked samples 010M002503MS and 010M002503MSD exceeded the 20% QC limit. The results for MCPA, dichloroprop and 2,4-D in unspiked sample 010M002503 were flagged as estimated (J) and (UJ). The positive results for silvex and 2,4-DB were previously qualified based on matrix spike recoveries. No further action was taken.

VII.) TCL Compound Identification (HIS):

All HIS Identification criteria were met. No action was required.

VIII.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. The only calculable Relative Percent Difference (RPD) was:

<u>Compound</u>	<u>010M002801</u>	<u>010N002801</u>	<u>RPD</u>
silvex	2.7 ug/kg	3 ug/kg	10.5%

The RPD for silvex was within the 60% QC limit for soil samples. No action was required.

IX.) Overall Assessment of Data/General:

The non-detect results for dalapon and dinoseb in unspiked sample 010M002503 were rejected due to MS/MSD %R's less than 10%. The extraction date for sample 010M002603RE was incorrect on the spreadsheet. The date was corrected during validation. All other laboratory data were acceptable with qualifications.

GASOLINE RANGE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was necessary.

III.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was required.

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Sample (LCS):

Two LCS's were analyzed for this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VIII.) TCL Compound Identification:

All criteria were met, so no action was required.

IX.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. The Relative Percent Difference (RPD) for GRO in this set of field duplicate samples was not calculable. No action was required.

X.) Overall Assessment of Data/General:

Sample collection dates were not reported on the spreadsheets for this fraction. The dates were entered during validation. All other laboratory data were acceptable without qualification.

DIESEL RANGE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Instrument Performance:

All Instrument Performance criteria were met, so no action was necessary.

III.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was required.

IV.) Blank:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Sample (LCS):

Two LCS's were analyzed for this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Recovery criteria were met. No action was taken.

VIII.) TCL Compound Identification:

All criteria were met, so no action was required.

IX.) Field Duplicates:

One set of field duplicate samples, 010M002801 / 010N002801, was analyzed by the laboratory. The Relative Percent Difference (RPD) for DRO in this set of field duplicate samples was not calculable. No action was required.

IX.) Overall Assessment of Data/General:

Sample collection dates were not reported on the spreadsheets for this fraction. The dates were entered during validation. All other laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type/ID#	Analyte	Max. Conc.	Action Level
CCB2	antimony	36.7 ug/L	36.7 mg/kg
ICB1	barium	2.80 ug/L	2.80 mg/kg
ICB1	cadmium	4.20 ug/L	4.20 mg/kg
ICB1	chromium	7.00 ug/L	7.00 mg/kg
ICB1	cobalt	7.80 ug/L	7.80 mg/kg
ICB1	copper	10.6 ug/L	10.6 mg/kg
CCB4	silver	6.70 ug/L	6.70 mg/kg
ICB1	vanadium	7.00 ug/L	7.00 mg/kg
PBS	zinc	1.05 mg/kg	5.25 mg/kg
ICB1	tin	51.9 ug/L	51.9 mg/kg

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank, PBS = Preparation Blank (Soil)

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

Arsenic had a negative result (-3.10 ug/L) with an absolute value greater than the IDL in the third initial calibration blank. All associated sample results were greater than 5X the absolute value of the negative blank result. No action was required.

IV.) ICP Interference Check Sample Results:

The Percent Recoveries (%R's) of aluminum, calcium, iron and magnesium were not reported on the Form IV. No action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

barium	6 ug/L
cadmium	204 ug/L
copper	61 ug/L
silver	5 ug/L
zinc	56 ug/L
tin	1200 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was reported on Form I's for the samples in this SDG, no action was required.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

chromium	-6 ug/L
vanadium	-7 ug/L

Since neither aluminum, calcium, iron nor magnesium was reported on Form I's for the samples in this SDG, no action was required.

V.) ICP Serial Dilution Analysis:

All ICP Serial Dilution criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample criteria were met, so no action was taken.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) of antimony (40.3%), arsenic (34.0%) and selenium (57.3%) in spiked sample 010M002501S* were below the 75-125% QC limits. All positive and non-detect results for these analytes in all associated samples were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

One set of field duplicate samples, 010M002801 and 010N002801, was analyzed by the laboratory. The calculable Relative Percent Differences (RPD's) were:

Analyte	010M002801, mg/kg	010N002801, mg/kg	RPD
arsenic	7.7	10.8	33.5
barium	104	101	2.9
cadmium	14.2	13.3	6.5
chromium	9.7	10.1	7.3
copper	14.5	15.6	18.3
lead	13.9	18.3	27.3
nickel	12.2	13.4	9.4
vanadium	18.7	16.8	5.8
zinc	39.4	42.5	7.6

All Relative Percent Difference's (RPD's) were within the 60% QC limit for soil samples. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was necessary.

XI.) Sample Result, Calculation/Transcription Verification:

Cadmium was misspelled as "cadium" on all forms in this SDG. No action was taken.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

Sample collection dates were not reported on the spreadsheets for this fraction. The dates were entered during validation. All other laboratory data were acceptable without qualification.

ENSAFE VALIDATION SUMMARY REPORT

Site Name: NSA Memphis, Millington, Tennessee
 CTO and Subtask No.: 0094-001-04-730-00
 Laboratory: Transglobal Environmental Geochemistry, Atlanta, Georgia
 Sample Delivery Group: 96052
 Matrix: Water & Soil
 DQO Level: II

Table 1
SDG 96052 Sample IDs

Sample ID	8010 VOCs	BTEX	Sample ID	8010 VOCs	BTEX
010G000815	X	X	010G001320	X	X
010H000815	X		010G001350	X	X
010G000848	X	X	010G001420	X	X
010H000848		X	010G001450	X	X
010G000722	X	X	010G001550	X	X
010G000750	X	X	010G001620	X	X
010G00924	X	X	010S000815	X	X
010G000950	X	X	010C000815	X	X
010GG1012	X	X	010S000915	X	X
010G001050	X	X	010S001015	X	X
010G001116		X	010S001115	X	X
010G001150	X	X	010S001215	X	X
010G001220	X	X	010S001315	X	X
010G001250	X	X	010S001415	X	X
010H001250	X	X	010S001515	X	X

Note: VOC = Volatile Organic Compounds
 BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes

VALIDATION RESULTS

All samples were received by the laboratory intact and with the proper documentation on May 7 - 10, 1996. The following summarizes the data validation results. Tentatively identified compounds (TICs) have not been discussed because most compounds are quantitatively uncertain (many TICs are unidentifiable and are reported as unknowns).

Volatile Organic Compound Fraction

1. All holding times, method blank, and field duplicate results were acceptable. A matrix

spike/matrix spike duplicate was not analyzed with this SDG.

2. The percent recovery of the surrogate 4-bromofluorobenzene exceeded the lower QC requirements of 86% to 115% in samples 010G001012 (82.6%) and 010G001220 (72.9%). All results in these samples were qualified as estimated "J" for positive results and "UJ" for nondetect results.

BTEX Fraction

1. All holding times and method blank results were acceptable. A matrix spike/matrix spike duplicate was not analyzed with this SDG.
2. The percent recovery of the surrogate 4-bromofluorobenzene exceeded the lower QC requirements of 86% to 115% in samples 010G000815 (78.9%), 010G001012 (82.4%), and 010G001220 (83.6%). All results in these samples were qualified as estimated "J" for positive results and "UJ" for nondetect results.
3. The relative percent difference for toluene (82.3%) in field duplicate samples 010G001250 and 010H001250 exceeded the control limit of 30%. Toluene was qualified as estimated "J" for a positive result in sample 010G001250 and "UJ" for a nondetect result in sample 010H001250 due to poor field precision.

Appendix E
Analytical Data Tables

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

8010-V0A		SAMPLE ID ----->	010-S-0008-15	010-C-0008-15	010-S-0009-15	010-S-0010-15	010-S-0011-15	010-S-0012-15			
		ORIGINAL ID ----->	010S000815	010C000815	010S000915	010S001015	010S001115	010S001215			
		LAB SAMPLE ID ---->	010S000815	010C000815	010S000915	010S001015	010S001115	010S001215			
		ID FROM REPORT -->	010S000815	010C000815	010S000915	010S001015	010S001115	010S001215			
		SAMPLE DATE ----->	05/08/96	05/08/96	05/08/96	05/08/96	05/09/96	05/09/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
75-01-4	Vinyl chloride	10.	U	10.	U	10.	U	10.	U	10.	U
75-35-4	1,1-Dichloroethene	10.	U	10.	U	10.	U	10.	U	10.	U
75-09-2	Methylene chloride	10.	U	10.	U	14.6	U	14.5	U	10.6	U
156-60-5	trans-1,2-Dichloroethene	10.	U	10.	U	10.	U	10.	U	10.	U
75-34-3	1,1-Dichloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
156-59-2	cis-1,2-Dichloroethene	10.	U	10.	U	10.	U	10.	U	10.	U
67-66-3	Chloroform	10.	U	10.	U	10.	U	10.	U	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
56-23-5	Carbon tetrachloride	10.	U	10.	U	10.	U	10.	U	10.	U
107-06-2	1,2-Dichloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
79-01-6	Trichloroethene	10.	U	10.	U	10.	U	10.	U	10.	U
78-87-5	1,2-Dichloropropane	10.	U	10.	U	10.	U	10.	U	10.	U
75-27-4	Bromodichloromethane	10.	U	10.	U	10.	U	10.	U	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U	10.	U	10.	U	10.	U	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U	10.	U	10.	U	10.	U	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
127-18-4	Tetrachloroethene	10.	U	10.	U	10.	U	10.	U	10.	U
124-48-1	Dibromochloromethane	10.	U	10.	U	10.	U	10.	U	10.	U
108-90-7	Chlorobenzene	10.	U	10.	U	10.	U	10.	U	10.	U
630-20-6	1,1,1,2-Tetrachloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
75-25-2	Bromoform	10.	U	10.	U	10.	U	10.	U	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U	10.	U	10.	U	10.	U	10.	U
541-73-1	1,3-Dichlorobenzene	10.	U	10.	U	10.	U	10.	U	10.	U
106-46-7	1,4-Dichlorobenzene	10.	U	10.	U	10.	U	10.	U	10.	U
95-50-1	1,2-Dichlorobenzene	10.	U	10.	U	10.	U	10.	U	10.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

8010-VOA	SAMPLE ID ----->	010-S-0013-15	010-S-0014-15	010-S-0015-15			
	ORIGINAL ID ----->	010S001315	010S001415	010S001515			
	LAB SAMPLE ID ---->	010S001315	010S001415	010S001515			
	ID FROM REPORT -->	010S001315	010S001415	010S001515			
	SAMPLE DATE ----->	05/09/96	05/09/96	05/10/96			
	DATE ANALYZED ---->	05/09/96	05/10/96	05/10/96			
	MATRIX ----->	Soil	Soil	Soil			
	UNITS ----->	UG/KG	UG/KG	UG/KG			

CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL
75-01-4	Vinyl chloride	10.	U	10.	U	10.	U
75-35-4	1,1-Dichloroethene	10.	U	10.	U	10.	U
75-09-2	Methylene chloride	12.2		10.	U	10.4	
156-60-5	trans-1,2-Dichloroethene	10.	U	10.	U	10.	U
75-34-3	1,1-Dichloroethane	10.	U	10.	U	10.	U
156-59-2	cis-1,2-Dichloroethene	10.	U	10.	U	10.	U
67-66-3	Chloroform	10.	U	10.	U	10.	U
71-55-6	1,1,1-Trichloroethane	10.	U	10.	U	10.	U
56-23-5	Carbon tetrachloride	10.	U	10.	U	10.	U
107-06-2	1,2-Dichloroethane	10.	U	10.	U	10.	U
79-01-6	Trichloroethene	10.	U	10.	U	10.	U
78-87-5	1,2-Dichloropropane	10.	U	10.	U	10.	U
75-27-4	Bromodichloromethane	10.	U	10.	U	10.	U
10061-01-5	cis-1,3-Dichloropropene	10.	U	10.	U	10.	U
10061-02-6	trans-1,3-Dichloropropene	10.	U	10.	U	10.	U
79-00-5	1,1,2-Trichloroethane	10.	U	10.	U	10.	U
127-18-4	Tetrachloroethene	10.	U	10.	U	10.	U
124-48-1	Dibromochloromethane	10.	U	10.	U	10.	U
108-90-7	Chlorobenzene	10.	U	10.	U	10.	U
630-20-6	1,1,1,2-Tetrachloroethane	10.	U	10.	U	10.	U
75-25-2	Bromoform	10.	U	10.	U	10.	U
79-34-5	1,1,2,2-Tetrachloroethane	10.	U	10.	U	10.	U
541-73-1	1,3-Dichlorobenzene	10.	U	10.	U	10.	U
106-46-7	1,4-Dichlorobenzene	10.	U	10.	U	10.	U
95-50-1	1,2-Dichlorobenzene	10.	U	10.	U	10.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

APX9-METAL		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ----->	147752S	147753S	147754S	147755S	147756S	147757S			
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
7440-36-0	Antimony	8.1	UJ	7.9	UJ	7.8	UJ	7.9	UJ	8.3	UJ
7440-38-2	Arsenic	5.7		7.8		10.1		13.4		6.7	
7440-39-3	Barium	116.		150.		119.		97.3		119.	
7440-41-7	Beryllium	0.38	U	0.58	U	0.38	U	0.37	U	0.39	U
7440-43-9	Cadmium	14.9		20.7		19.3		17.9		15.4	
7440-47-3	Chromium	8.3		12.2		6.8		6.6		8.1	
7440-48-4	Cobalt	6.	J	6.7	J	7.8	J	7.5	J	7.	J
7440-50-8	Copper	14.6		14.4		17.2		15.2		15.1	
7439-92-1	Lead	46.8		37.8		19.3		39.2		34.3	
7439-97-6	Mercury	0.13	U	0.13	U	0.13	U	0.13	U	0.14	U
7440-02-0	Nickel	9.5	J	16.9		15.8		13.2		14.	
7782-49-2	Selenium	0.27	UJ	0.26	UJ	0.26	UJ	0.26	UJ	0.28	UJ
7440-22-4	Silver	0.81	U	0.79	U	0.78	U	0.79	U	0.83	U
7440-28-0	Thallium	0.54	UJ	0.53	UJ	0.52	UJ	0.53	UJ	0.55	UJ
7440-62-2	Vanadium	16.2		21.5		17.6		16.8		17.2	
7440-66-6	Zinc	57.7		51.6		48.2		50.2		54.7	
7440-31-5	Tin	33.4	J	48.8	J	32.9	J	37.8	J	45.3	J

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

BTEX		SAMPLE ID ----->	010-C-0008-15	010-S-0008-15	010-S-0009-15	010-S-0010-15	010-S-0011-15	010-S-0012-15			
		ORIGINAL ID ----->	010C000815	010S000815	010S000915	010S001015	010S001115	010S001215			
		LAB SAMPLE ID ---->	010C000815	010S000815	010S000915	010S001015	010S001115	010S001215			
		ID FROM REPORT -->	010C000815	010S000815	010S000915	010S001015	010S001115	010S001215			
		SAMPLE DATE ----->	05/07/96	05/07/96	05/08/96	05/08/96	05/09/96	05/09/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
71-43-2	Benzene	5.	U	5.	U	5.	U	5.	U	5.	U
108-88-3	Toluene	5.	U	5.	U	5.	U	5.	U	5.	U
100-41-4	Ethylbenzene	5.	U	5.	U	5.	U	5.	U	5.	U
1330-20-7	Xylene (Total)	5.	U	5.	U	5.	U	5.	U	5.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

BTEX		SAMPLE ID ----->	010-S-0013-15	010-S-0014-15	010-S-0015-15			
		ORIGINAL ID ----->	010S001315	010S001415	010S001515			
		LAB SAMPLE ID ---->	010S001315	010S001415	010S001515			
		ID FROM REPORT -->	010S001315	010S001415	010S001515			
		SAMPLE DATE ----->	05/09/96	05/09/96	05/10/96			
		DATE ANALYZED ---->	05/09/96	05/10/96	05/10/96			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	
71-43-2	Benzene	5.	U	5.	U	5.	U	
108-88-3	Toluene	5.	U	5.	U	5.	U	
100-41-4	Ethylbenzene	5.	U	5.	U	5.	U	
1330-20-7	Xylene (Total)	5.	U	5.	U	5.	U	

DATALCP3
09/10/98

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

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Time: 14:58

METAL-CN		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ---->	147752	147753	147754	147755	147756	147757			
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE ANALYZED ---->	05/28/96	05/28/96	05/28/96	05/28/96	05/28/96	05/28/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
57-12-5	Cyanide (CN)	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

*** Validation Complete ***

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

SW846-HERB		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01					
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601					
		LAB SAMPLE ID ---->	147752	147753	147754	147755	147756	147757					
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601					
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96					
		DATE EXTRACTED -->	05/20/96	05/20/96	05/20/96	05/20/96	05/20/96	05/20/96					
		DATE ANALYZED ---->	06/01/96	06/01/96	06/01/96	06/01/96	06/01/96	06/01/96					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL		
94-75-7	2,4-D	9.4	UR	9.4	UR	7.	J	9.4	UR	8.4	J	5.7	J
94-82-6	2,4-DB	9.5	UR	9.5	UR	9.5	UR	9.5	UR	9.5	UR	9.5	UR
88-85-7	Dinoseb	4.7	UR	4.7	UR	3.	J	4.7	UR	4.7	UR	4.7	UR
93-76-5	2,4,5-T	0.95	UR	0.95	UR	0.95	UR	0.95	UR	0.95	UR	0.95	UR
93-72-1	2,4,5-TP (Silvex)	0.95	UR	0.95	UR	0.95	UR	0.95	UR	0.95	UR	0.95	UR
75-99-0	Dalapon	23.	UR	23.	UR	23.	UR	23.	UR	23.	UR	23.	UR
1918-00-9	Dicamba	0.94	UR	0.94	UR	0.94	UR	0.94	UR	0.94	UR	0.94	UR
120-36-5	Dichlorprop	9.4	UR	9.4	UR	9.4	UR	9.4	UR	9.4	UR	9.4	UR
94-74-6	MCPA	930.	UR	940.	UR	930.	UR	930.	UR	930.	UR	940.	UR
93-65-2	MCPP	940.	UR	940.	UR	940.	UR	940.	UR	940.	UR	940.	UR

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Soil Samples

SUB46-OP P		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ---->	147752	147753	147754	147755	147756	147757			
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE EXTRACTED -->	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96			
		DATE ANALYZED ---->	06/03/96	06/04/96	06/04/96	06/04/96	06/04/96	06/04/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
86-50-0	Azinphos methyl	110.	U	100.	U	110.	U	100.	U	100.	U
35400-43-2	Sulprofos (Bolstar)	110.	U	100.	U	110.	U	100.	U	100.	U
2921-88-2	Chloropyrifos	110.	U	100.	U	110.	U	100.	U	100.	U
56-72-4	Coumaphos	110.	U	100.	U	110.	U	100.	U	100.	U
8065-48-3	Demeton,O	110.	U	100.	U	110.	U	100.	U	100.	U
333-41-5	Diazinon	110.	U	100.	U	110.	U	100.	U	100.	U
62-73-7	Dichlorvos	110.	U	100.	U	110.	U	100.	U	100.	U
298-04-4	Disulfoton	110.	U	100.	U	110.	U	100.	U	100.	U
13194-48-4	Ethoprop	110.	U	100.	U	110.	U	100.	U	100.	U
115-90-2	Fensulfothion	110.	U	100.	U	110.	U	100.	U	100.	U
55-38-9	Fenthion	110.	U	100.	U	110.	U	100.	U	100.	U
150-50-5	Merphos	110.	U	100.	U	110.	UJ	100.	U	100.	U
7786-34-7	Mevinphos, Alpha	110.	U	100.	U	110.	U	100.	U	100.	U
300-76-5	Naled	210.	U	200.	U	220.	UJ	210.	U	200.	U
298-00-0	Methyl parathion	110.	U	100.	U	110.	U	100.	U	100.	U
298-02-2	Phorate	110.	U	100.	U	110.	U	100.	U	100.	U
299-84-3	Ronnel	110.	U	100.	U	110.	U	100.	U	100.	U
22248-79-9	Stirophos (Tetrachlorovinphos)	110.	U	100.	U	110.	U	100.	U	100.	U
34643-46-4	Tokuthion	110.	U	100.	U	110.	U	100.	U	100.	U
327-98-0	Trichloronate	110.	U	100.	U	110.	U	100.	U	100.	U
126-75-0	Demeton,S	110.	U	100.	U	110.	U	100.	U	100.	U

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Confirmatory Sampling Investigation
SWMU 10 Soil Samples

SW846-PEST		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ---->	147752	147753	147754	147755_10	147756_10	147757_5			
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE EXTRACTED -->	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96			
		DATE ANALYZED ---->	06/08/96	06/08/96	06/07/96	06/07/96	06/07/96	06/07/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
319-84-6	alpha-BHC	2.1	U	2.	U	2.2	U	21.	U	20.	U
319-85-7	beta-BHC	2.1	U	2.	U	2.2	U	21.	U	20.	U
319-86-8	delta-BHC	2.1	UJ	2.	UJ	2.2	UJ	21.	UJ	20.	UJ
58-89-9	gamma-BHC (Lindane)	2.1	J	2.	U	2.2	U	21.	U	20.	U
76-44-8	Heptachlor	2.1	U	2.	U	2.2	U	21.	U	20.	U
309-00-2	Aldrin	1.1	J	2.	U	2.2	UJ	21.	U	20.	U
1024-57-3	Heptachlor epoxide	2.8		1.5	J	2.2	U	68.	JD	90.	JD
959-98-8	Endosulfan I	2.1	U	2.	U	2.2	UJ	21.	U	20.	U
60-57-1	Dieldrin	130.	D	58.	D	69.	J	29.	JD	230.	JD
72-55-9	4,4'-DDE	28.		8.7		4.4	U	42.	U	41.	U
72-20-8	Endrin	4.3	U	4.1	U	4.4	U	42.	U	41.	U
33213-65-9	Endosulfan II	4.3	U	2.4	J	4.4	U	42.	U	41.	U
72-54-8	4,4'-DDD	5.8	J	4.1	U	4.4	U	42.	U	41.5	U
1031-07-8	Endosulfan sulfate	4.3	U	4.1	U	4.4	U	42.	U	41.	U
50-29-3	4,4'-DDT	27.		21.		3.8	J	42.	U	41.	U
72-43-5	Methoxychlor	21.	U	20.	U	22.	U	210.	U	200.	U
53494-70-5	Endrin ketone	4.3	U	4.1	U	4.4	U	42.	U	57.	JD
7421-93-4	Endrin aldehyde	4.3	U	4.1	U	4.4	UJ	42.	U	30.	JD
5103-71-9	alpha-Chlordane	19.		6.2		2.2	U	21.	U	20.	U
5103-74-2	gamma-Chlordane	18.		5.8	J	2.2	U	21.	U	20.	U
8001-35-2	Toxaphene	43.	U	41.	U	44.	U	420.	U	410.	U
12674-11-2	Aroclor-1016	43.	U	41.	U	44.	U	420.	U	410.	U
11104-28-2	Aroclor-1221	43.	U	41.	U	44.	U	420.	U	410.	U
11141-16-5	Aroclor-1232	43.	U	41.	U	44.	U	420.	U	410.	U
53469-21-9	Aroclor-1242	43.	U	41.	U	44.	U	420.	U	410.	U
12672-29-6	Aroclor-1248	43.	U	41.	U	44.	U	420.	U	410.	U
11097-69-1	Aroclor-1254	43.	U	41.	U	44.	U	420.	U	410.	U
11096-82-5	Aroclor-1260	43.	U	40.	J	44.	U	420.	U	410.	U
12789-03-6	Technical Chlordane	76.		70.		44.	U	420.	U	410.	U

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SWMU 10 Soil Samples

SUB46-SVOA		SAMPLE ID ----->	010-S-0001-01 RE	010-S-0002-01 RE	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101RE	010S000201RE	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ---->	147752RE	147753RE	147754	147755	147756	147757			
		ID FROM REPORT -->	010S000101RE	010S000201RE	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE EXTRACTED -->	05/30/96	05/30/96	05/15/96	05/15/96	05/15/96	05/16/96			
		DATE ANALYZED ---->	06/05/96	06/05/96	05/29/96	05/29/96	05/29/96	05/29/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
108-95-2	Phenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
111-44-4	bis(2-Chloroethyl)ether	430.	UJ	420.	UJ	440.	UJ	440.	UJ	450.	UJ
95-57-8	2-Chlorophenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
541-73-1	1,3-Dichlorobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
106-46-7	1,4-Dichlorobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
95-50-1	1,2-Dichlorobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
95-48-7	2-Methylphenol (o-Cresol)	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
108-60-1	2,2'-oxybis(1-Chloropropane)	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
106-44-5	4-Methylphenol (p-Cresol)	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
621-64-7	N-Nitroso-di-n-propylamine	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
67-72-1	Hexachloroethane	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
98-95-3	Nitrobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
78-59-1	Isophorone	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
88-75-5	2-Nitrophenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
105-67-9	2,4-Dimethylphenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
111-91-1	bis(2-Chloroethoxy)methane	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
120-83-2	2,4-Dichlorophenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
120-82-1	1,2,4-Trichlorobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
91-20-3	Naphthalene	430.	UJ	420.	UJ	86.	J	350.	J	330.	J
106-47-8	4-Chloroaniline	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
87-68-3	Hexachlorobutadiene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
59-50-7	4-Chloro-3-methylphenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
91-57-6	2-Methylnaphthalene	430.	UJ	420.	UJ	440.	U	130.	J	150.	J
77-47-4	Hexachlorocyclopentadiene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
88-06-2	2,4,6-Trichlorophenol	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
95-95-4	2,4,5-Trichlorophenol	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
91-58-7	2-Chloronaphthalene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
88-74-4	2-Nitroaniline	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
131-11-3	Dimethylphthalate	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
208-96-8	Acenaphthylene	430.	UJ	420.	UJ	440.	UJ	46.	J	140.	J
606-20-2	2,6-Dinitrotoluene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
99-09-2	3-Nitroaniline	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
83-32-9	Acenaphthene	430.	UJ	420.	UJ	99.	J	760.	J	1300.	J
51-28-5	2,4-Dinitrophenol	1100.	UJ	1000.	UJ	1100.	UJ	1100.	UJ	1100.	UJ
100-02-7	4-Nitrophenol	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
132-64-9	Dibenzofuran	430.	UJ	420.	UJ	440.	U	510.	U	750.	J

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SUB46-SVOA		SAMPLE ID ----->	010-S-0001-01 RE	010-S-0002-01 RE	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101RE	010S000201RE	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ----->	147752RE	147753RE	147754	147755	147756	147757			
		ID FROM REPORT -->	010S000101RE	010S000201RE	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE EXTRACTED -->	05/30/96	05/30/96	05/15/96	05/15/96	05/15/96	05/16/96			
		DATE ANALYZED -->	06/05/96	06/05/96	05/29/96	05/29/96	05/29/96	05/29/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
121-14-2	2,4-Dinitrotoluene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
84-66-2	Diethylphthalate	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
7005-72-3	4-Chlorophenylphenyl ether	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
86-73-7	Fluorene	430.	UJ	420.	UJ	68.	J	830.	J	1300.	J
100-01-6	4-Nitroaniline	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	UJ	1000.	UJ	1100.	UJ	1100.	UJ	1100.	UJ
86-30-6	N-Nitrosodiphenylamine	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
101-55-3	4-Bromophenyl-phenylether	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
118-74-1	Hexachlorobenzene	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
87-86-5	Pentachlorophenol	1100.	UJ	1000.	UJ	1100.	U	1100.	U	1100.	U
85-01-8	Phenanthrene	59.	J	420.	UJ	600.	D	13000.	D	22000.	D
120-12-7	Anthracene	430.	UJ	420.	UJ	130.	J	2100.	J	4500.	J
86-74-8	Carbazole	430.	UJ	420.	UJ	120.	J	1900.	J	3500.	J
84-74-2	Di-n-butylphthalate	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
206-44-0	Fluoranthene	130.	J	75.	J	750.	D	16000.	D	32000.	D
129-00-0	Pyrene	110.	J	58.	J	640.	D	13000.	D	28000.	D
85-68-7	Butylbenzylphthalate	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
91-94-1	3,3'-Dichlorobenzidine	430.	UJ	420.	UJ	440.	UJ	440.	UJ	450.	UJ
56-55-3	Benzo(a)anthracene	73.	J	50.	J	350.	D	6400.	D	14000.	D
218-01-9	Chrysene	78.	J	49.	J	350.	D	7400.	D	15000.	D
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	430.	UJ	420.	UJ	440.	U	440.	U	71.	J
117-84-0	Di-n-octylphthalate	430.	UJ	420.	UJ	440.	U	440.	U	450.	U
205-99-2	Benzo(b)fluoranthene	58.	J	44.	J	360.	J	6800.	D	16000.	D
207-08-9	Benzo(k)fluoranthene	78.	J	59.	J	260.	J	4900.	DJ	9800.	D
50-32-8	Benzo(a)pyrene	75.	J	58.	J	340.	J	6000.	D	14000.	D
193-39-5	Indeno(1,2,3-cd)pyrene	55.	J	420.	UJ	200.	J	2300.	J	3300.	J
53-70-3	Dibenz(a,h)anthracene	430.	UJ	420.	UJ	87.	J	1200.	J	710.	J
191-24-2	Benzo(g,h,i)perylene	70.	J	44.	J	250.	J	2400.	J	3100.	J

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SUB46-VOA		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01			
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		LAB SAMPLE ID ---->	147752	147753	147754	147755	147756	147757			
		ID FROM REPORT ---->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601			
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96			
		DATE ANALYZED ---->	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96	05/13/96			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL
74-87-3	Chloromethane	13.	U	12.	U	13.	U	12.	U	12.	U
74-83-9	Bromomethane	13.	U	12.	U	13.	U	12.	U	12.	U
75-01-4	Vinyl chloride	13.	U	12.	U	13.	U	12.	U	12.	U
75-00-3	Chloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
75-09-2	Methylene chloride	13.	U	12.	U	13.	U	12.	U	12.	U
67-64-1	Acetone	13.	U	12.	U	13.	U	12.	U	12.	U
75-15-0	Carbon disulfide	13.	U	12.	U	13.	U	12.	U	12.	U
75-35-4	1,1-Dichloroethene	13.	U	12.	U	13.	U	12.	U	12.	U
75-34-3	1,1-Dichloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
540-59-0	1,2-Dichloroethene (total)	13.	U	12.	U	13.	U	12.	U	12.	U
67-66-3	Chloroform	13.	U	12.	U	13.	U	12.	U	12.	U
107-06-2	1,2-Dichloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
78-93-3	2-Butanone (MEK)	13.	U	12.	U	13.	U	12.	U	12.	U
71-55-6	1,1,1-Trichloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
56-23-5	Carbon tetrachloride	13.	U	12.	U	13.	U	12.	U	12.	U
75-27-4	Bromodichloromethane	13.	U	12.	U	13.	U	12.	U	12.	U
78-87-5	1,2-Dichloropropane	13.	U	12.	U	13.	U	12.	U	12.	U
10061-01-5	cis-1,3-Dichloropropene	13.	U	12.	U	13.	U	12.	U	12.	U
79-01-6	Trichloroethene	13.	U	12.	U	13.	U	12.	U	12.	U
124-48-1	Dibromochloromethane	13.	U	12.	U	13.	U	12.	U	12.	U
79-00-5	1,1,2-Trichloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
71-43-2	Benzene	13.	U	12.	U	13.	U	12.	U	12.	U
10061-02-6	trans-1,3-Dichloropropene	13.	U	12.	U	13.	U	12.	U	12.	U
75-25-2	Bromoform	13.	U	12.	U	13.	U	12.	U	12.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	13.	U	12.	U	13.	U	12.	U	12.	U
591-78-6	2-Hexanone	13.	U	12.	U	13.	U	12.	U	12.	U
127-18-4	Tetrachloroethene	13.	U	12.	U	13.	U	12.	U	12.	U
79-34-5	1,1,2,2-Tetrachloroethane	13.	U	12.	U	13.	U	12.	U	12.	U
108-88-3	Toluene	13.	U	12.	U	13.	U	3.	J	6.	J
108-90-7	Chlorobenzene	13.	U	12.	U	13.	U	12.	U	12.	U
100-41-4	Ethylbenzene	13.	U	12.	U	13.	U	12.	U	12.	U
100-42-5	Styrene	13.	U	12.	U	13.	U	12.	U	2.	J
1330-20-7	Xylene (Total)	13.	U	12.	U	13.	U	12.	U	12.	U

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SWMU 10 Soil Samples

TPH-DRO		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01				
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601				
		LAB SAMPLE ID ---->	147752	147753	147754	147755	147756	147757				
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601				
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96				
		DATE EXTRACTED -->	05/16/96	05/16/96	05/16/96	05/16/96	05/16/96	05/16/96				
		DATE ANALYZED -->	05/28/96	05/28/96	05/28/96	05/28/96	05/29/96	05/29/96				
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil				
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG				
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL	
9999900-02-6	TPH - Diesel Range Organics	33000.		17000.		15000.		120000.		160000.		63000.

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TPH-GRO		SAMPLE ID ----->	010-S-0001-01	010-S-0002-01	010-S-0003-01	010-S-0004-01	010-S-0005-01	010-S-0006-01					
		ORIGINAL ID ----->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601					
		LAB SAMPLE ID -->	147752	147753	147754	147755	147756	147757					
		ID FROM REPORT -->	010S000101	010S000201	010S000301	010S000401	010S000501	010S000601					
		SAMPLE DATE ----->	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96	05/06/96					
		DATE ANALYZED ---->	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1821	VAL	1821	VAL	1821	VAL	1821	VAL	1821	VAL		
9999900-02-5	TPH - Gasoline Range Organics	64.	U	62.	U	67.	U	63.	U	61.	U	59.	U

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SWMU 10 Sediment Samples

APX9-METAL		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03					
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		LAB SAMPLE ID ---->	148366S	148367S	148368S	148369S	148370S	148371S					
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
7440-36-0	Antimony	8.5	UJ	8.4	UJ	10.3	UJ	8.1	UJ	8.2	UJ	7.5	UJ
7440-38-2	Arsenic	9.	J	6.5	J	6.1	J	10.1	J	5.3	J	4.1	J
7440-39-3	Barium	128.		261.		181.		71.2		88.4		96.4	
7440-41-7	Beryllium	0.49	J	0.67	J	0.57	J	0.45	J	0.32	J	0.35	J
7440-43-9	Cadmium	16.9		22.4		19.7		19.6		14.3		14.	
7440-47-3	Chromium	12.		14.1		14.8		11.9		10.2		8.3	
7440-48-4	Cobalt	6.4	U	14.2		9.7	J	7.2	U	6.5	U	6.6	U
7440-50-8	Copper	19.8		21.2		22.5		18.3		16.3		13.5	
7439-92-1	Lead	22.7		9.		11.1		11.7		15.6		11.8	
7439-97-6	Mercury	0.14	U	0.14	U	0.14	U	0.13	U	0.14	U	0.13	U
7440-02-0	Nickel	16.		24.6		28.4		12.2		16.		13.3	
7782-49-2	Selenium	0.81	J	0.28	UJ	0.27	UJ	0.27	UJ	0.27	UJ	0.25	UJ
7440-22-4	Silver	0.85	U	0.84	U	1.3	U	0.81	U	0.82	U	0.75	U
7440-28-0	Thallium	0.57	U	0.56	U	0.54	U	0.54	U	0.55	U	0.5	U
7440-62-2	Vanadium	19.6		29.9		22.6		25.8		16.6		15.8	
7440-66-6	Zinc	58.8		62.5		47.3		41.3		44.1		37.9	
7440-31-5	Tin	44.6	U	47.6	U	29.	U	33.1	U	16.5	U	31.5	U

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SWMU 10 Sediment Samples

APX9-METAL		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01			
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		LAB SAMPLE ID ---->	148372S	148378S	148373S	148374S	148375S	148376S			
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
7440-36-0	Antimony	7.9	UJ	8.3	UJ	8.6	UJ	7.9	UJ	8.6	UJ
7440-38-2	Arsenic	7.7	J	10.8	J	8.8	J	8.2	J	10.1	J
7440-39-3	Barium	104.		101.		242.		89.7		166.	
7440-41-7	Beryllium	0.4	J	0.36	J	0.47	J	0.39	J	0.44	J
7440-43-9	Cadmium	14.2		13.3		20.8		18.4		21.	
7440-47-3	Chromium	9.7		10.1		10.9		11.6		12.9	
7440-48-4	Cobalt	6.7	U	6.5	U	8.6	J	9.2	J	10.3	J
7440-50-8	Copper	14.5		15.6		22.2		16.2		24.5	
7439-92-1	Lead	13.9		18.3		13.8		14.3		12.3	
7439-97-6	Mercury	0.13	U	0.14	U	0.13	U	0.13	U	0.13	U
7440-02-0	Nickel	12.2		13.4		26.9		10.2	J	24.5	
7782-49-2	Selenium	0.26	UJ	0.28	UJ	0.26	UJ	0.26	UJ	0.25	UJ
7440-22-4	Silver	1.2	U	1.6	U	4.2	U	1.	U	0.76	U
7440-28-0	Thallium	0.53	U	0.55	U	0.53	U	0.53	U	0.51	U
7440-62-2	Vanadium	18.7		16.8		21.5		24.2		22.	
7440-66-6	Zinc	39.4		42.5		57.5		39.3		54.3	
7440-31-5	Tin	21.4	U	39.9	U	33.6	U	39.1	U	34.4	U

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SWMU 10 Sediment Samples

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APX9-METAL		SAMPLE ID -----> 010-M-0030-03					
		ORIGINAL ID -----> 010M003003					
		LAB SAMPLE ID ----> 148377S					
		ID FROM REPORT --> 010M003003					
		SAMPLE DATE -----> 05/15/96					
		MATRIX -----> Sediment					
		UNITS -----> MG/KG					
CAS #	Parameter	1849	VAL				
7440-36-0	Antimony	7.9	UJ				
7440-38-2	Arsenic	5.8	J				
7440-39-3	Barium	124.					
7440-41-7	Beryllium	0.49	J				
7440-43-9	Cadmium	19.8					
7440-47-3	Chromium	12.					
7440-48-4	Cobalt	7.7	U				
7440-50-8	Copper	20.2					
7439-92-1	Lead	13.4					
7439-97-6	Mercury	0.13	U				
7440-02-0	Nickel	20.2					
7782-49-2	Selenium	0.26	UJ				
7440-22-4	Silver	1.2	U				
7440-28-0	Thallium	0.53	U				
7440-62-2	Vanadium	21.8					
7440-66-6	Zinc	47.5					
7440-31-5	Tin	44.	U				

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METAL-CN		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03					
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371					
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE EXTRACTED -->	05/29/96	05/29/96	05/29/96	05/29/96	05/29/96	05/29/96					
		DATE ANALYZED ---->	06/05/96	06/05/96	06/05/96	06/05/96	06/05/96	06/05/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
57-12-5	Cyanide (CN)	0.5	U	0.5	U	1.22		0.5	U	0.5	U	0.5	U

*** Validation Complete ***

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SWMU 10 Sediment Samples

METAL-CN		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01			
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376			
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/29/96	05/29/96	05/29/96	05/29/96	05/29/96	05/29/96			
		DATE ANALYZED ---->	06/05/96	06/05/96	06/05/96	06/05/96	06/05/96	06/05/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
57-12-5	Cyanide (CN)	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

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METAL-CN		SAMPLE ID -----> 010-M-0030-03 ORIGINAL ID -----> 010M003003 LAB SAMPLE ID ----> 148377 ID FROM REPORT --> 010M003003 SAMPLE DATE -----> 05/15/96 DATE EXTRACTED --> 05/29/96 DATE ANALYZED ----> 06/05/96 MATRIX -----> Sediment UNITS -----> MG/KG					
CAS #	Parameter	1849	VAL				
57-12-5	Cyanide (CN)	0.5	U				

*** Validation Complete ***

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SWMU 10 Sediment Samples

SW846-HERB		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/27/96	05/27/96	05/27/96	05/27/96	05/27/96	05/27/96			
		DATE ANALYZED ---->	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
94-75-7	2,4-D	9.4	U	9.4	UJ	9.4	U	9.4	UJ	9.4	U
94-82-6	2,4-DB	9.5	U	9.	J	10.		9.5	U	16.	
88-85-7	Dinoseb	4.7	U	6.6	UR	12.	U	4.7	U	4.7	U
93-76-5	2,4,5-T	0.95	U	12.	J	0.95	U	6.5	UJ	0.95	U
93-72-1	2,4,5-TP (Silvex)	4.		4.8	J	6.1		0.95	U	3.5	J
75-99-0	Dalapon	23.	U	23.	UR	23.	U	23.	U	23.	UJ
1918-00-9	Dicamba	0.94	U	0.94	U	0.94	U	0.94	U	0.94	UJ
120-36-5	Dichlorprop	9.4	U	9.4	UJ	9.4	U	9.4	U	9.4	UJ
94-74-6	MCPA	930.	U	720.	J	1200.	J	930.	UJ	950.	J
93-65-2	MCPP	940.	U	940.	U	940.	U	940.	U	940.	UJ

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SWMU 10 Sediment Samples

SW846-HERB		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01			
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376			
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/27/96	05/27/96	05/27/96	05/27/96	05/27/96	05/27/96			
		DATE ANALYZED ---->	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
94-75-7	2,4-D	9.4	U	9.4	U	9.4	U	9.4	U	9.4	UJ
94-82-6	2,4-DB	4.9	J	13.	J	27.	J	17.	J	9.5	UJ
88-85-7	Dinoseb	4.7	UJ	16.	J	19.	U	4.3	U	22.	UJ
93-76-5	2,4,5-T	0.95	U	0.95	U	10.	U	0.95	U	9.	UJ
93-72-1	2,4,5-TP (Silvex)	2.7		3.		7.4		5.2		6.7	UJ
75-99-0	Dalapon	23.	U	23.	U	23.	U	23.	U	23.	UJ
1918-00-9	Dicamba	0.94	U	0.94	U	0.94	U	0.94	U	0.94	UJ
120-36-5	Dichlorprop	9.4	U	9.4	U	9.4	U	9.4	U	9.4	UJ
94-74-6	MCPA	930.	UJ	930.	UJ	1400.	J	940.	UJ	930.	UJ
93-65-2	MCPA	940.	U	940.	UJ	940.	UJ	940.	UJ	940.	UJ

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SW846-HERB

SAMPLE ID -----> 010-M-0030-03
ORIGINAL ID -----> 010M003003
LAB SAMPLE ID ----> 148377
ID FROM REPORT --> 010M003003
SAMPLE DATE -----> 05/15/96
DATE EXTRACTED --> 05/27/96
DATE ANALYZED ----> 06/14/96
MATRIX -----> Sediment
UNITS -----> ug/Kg

CAS #	Parameter	1849	VAL				
94-75-7	2,4-D	9.4	U				
94-82-6	2,4-DB	29.	J				
88-85-7	Dinoseb	30.					
93-76-5	2,4,5-T	0.95	U				
93-72-1	2,4,5-TP (Silvex)	3.8					
75-99-0	Dalapon	23.	U				
1918-00-9	Dicamba	0.94	U				
120-36-5	Dichlorprop	9.4	U				
94-74-6	MCPA	930.	UJ				
93-65-2	MCPP	940.	UJ				

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SM846-OP P		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96			
		DATE ANALYZED ---->	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
86-50-0	Azinphos methyl	110.	U	110.	U	110.	U	110.	U	110.	U
35400-43-2	Sulprofos (Bolstar)	110.	U	110.	U	110.	U	110.	U	110.	U
2921-88-2	Chloropyrifos	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
56-72-4	Coumaphos	110.	U	110.	U	110.	U	110.	U	110.	U
8065-48-3	Demeton, O	110.	U	110.	U	110.	U	110.	U	110.	U
333-41-5	Diazinon	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
62-73-7	Dichlorvos	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
298-04-4	Disulfoton	110.	U	110.	U	110.	U	110.	U	110.	U
13194-48-4	Ethoprop	110.	U	110.	U	110.	U	110.	U	110.	U
115-90-2	Fensulfothion	110.	U	110.	U	110.	U	110.	U	110.	U
55-38-9	Fenthion	110.	U	110.	U	110.	U	110.	U	110.	U
150-50-5	Merphos	110.	U	110.	U	110.	U	110.	U	110.	U
7786-34-7	Mevinphos, Alpha	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
300-76-5	Naled	220.	UJ	220.	U	220.	U	220.	U	220.	U
298-00-0	Methyl parathion	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
298-02-2	Phorate	110.	U	110.	U	110.	U	110.	U	110.	U
299-84-3	Ronnel	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
22248-79-9	Stirophos (Tetrachlorovinphos)	110.	U	110.	U	110.	U	110.	UJ	110.	UJ
34643-46-4	Tokuthion	110.	U	110.	U	110.	U	110.	U	110.	U
327-98-0	Trichloronate	110.	U	110.	U	110.	U	110.	U	110.	U
126-75-0	Demeton, S	110.	U	110.	U	110.	U	110.	U	110.	U

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SWMU 10 Sediment Samples

SW846-OP P	SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01
	ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001
	LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376
	ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001
	SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96
	DATE EXTRACTED -->	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96
	DATE ANALYZED ---->	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96	06/14/96
	MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	

CAS #	Parameter	1849	VAL								
86-50-0	Azinphos methyl	110.	U	110.	U	110.	U	120.	U	110.	U
35400-43-2	Sulprofos (Bolstar)	110.	U	110.	U	110.	U	120.	U	110.	U
2921-88-2	Chloropyrifos	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
56-72-4	Coumaphos	110.	U	110.	U	110.	U	120.	U	110.	U
8065-48-3	Demeton,O	110.	U	110.	U	110.	U	120.	U	110.	U
333-41-5	Diazinon	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
62-73-7	Dichlorvos	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
298-04-4	Disulfoton	110.	U	110.	U	110.	U	120.	U	110.	U
13194-48-4	Ethoprop	110.	U	110.	U	110.	U	120.	U	110.	U
115-90-2	Fensulfothion	110.	U	110.	U	110.	U	120.	U	110.	U
55-38-9	Fenthion	110.	U	110.	U	110.	U	120.	U	110.	U
150-50-5	Merphos	110.	U	110.	U	110.	U	120.	U	110.	U
7786-34-7	Mevinphos, Alpha	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
300-76-5	Waled	220.	U	220.	U	220.	U	230.	U	230.	U
298-00-0	Methyl parathion	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
298-02-2	Phorate	110.	U	110.	U	110.	U	120.	U	110.	U
299-84-3	Ronnel	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
22248-79-9	Stiropfos (Tetrachlorovinphos)	110.	UJ	110.	UJ	110.	UJ	120.	UJ	110.	UJ
34643-46-4	Tokuthion	110.	U	110.	U	110.	U	120.	U	110.	U
327-98-0	Trichloronate	110.	U	110.	U	110.	U	120.	U	110.	U
126-75-0	Demeton,S	110.	U	110.	U	110.	U	120.	U	110.	U

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

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Time: 14:58

SM846-OP P

SAMPLE ID -----> 010-M-0030-03
ORIGINAL ID -----> 010M003003
LAB SAMPLE ID ----> 148377
ID FROM REPORT --> 010M003003
SAMPLE DATE -----> 05/15/96
DATE EXTRACTED --> 05/23/96
DATE ANALYZED ----> 06/14/96
MATRIX -----> Sediment
UNITS -----> ug/Kg

CAS #	Parameter	1849	VAL				
86-50-0	Azinphos methyl	110.	U				
35400-43-2	Sulprofos (Bolstar)	110.	U				
2921-88-2	Chloropyrifos	110.	UJ				
56-72-4	Coumaphos	110.	U				
8065-48-3	Demeton, O	110.	U				
333-41-5	Diazinon	110.	UJ				
62-73-7	Dichlorvos	110.	UJ				
298-04-4	Disulfoton	110.	U				
13194-48-4	Ethoprop	110.	U				
115-90-2	Fensulfothion	110.	U				
55-38-9	Fenthion	110.	U				
150-50-5	Merphos	110.	U				
7786-34-7	Mevinphos, Alpha	110.	UJ				
300-76-5	Naled	220.	U				
298-00-0	Methyl parathion	110.	UJ				
298-02-2	Phorate	110.	U				
299-84-3	Ronnel	110.	UJ				
22248-79-9	Stirophos (Tetrachlorovinphos)	110.	UJ				
34643-46-4	Tokuthion	110.	U				
327-98-0	Trichloronate	110.	U				
126-75-0	Demeton, S	110.	U				

*** Validation Complete ***

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SUB46-PEST		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96			
		DATE ANALYZED ---->	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
319-84-6	alpha-BHC	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
319-85-7	beta-BHC	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ
319-86-8	delta-BHC	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ	2.2	UJ
58-89-9	gamma-BHC (Lindane)	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
76-44-8	Heptachlor	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
309-00-2	Aldrin	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
1024-57-3	Heptachlor epoxide	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
959-98-8	Endosulfan I	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
60-57-1	Dieldrin	25.	J	4.3	U	4.4	U	4.4	U	4.4	U
72-55-9	4,4'-DDE	5.9	J	4.3	U	4.4	U	4.4	U	4.4	U
72-20-8	Endrin	4.4	U	4.3	U	4.4	U	4.4	U	4.4	U
33213-65-9	Endosulfan II	4.4	U	4.3	U	4.4	U	4.4	U	4.4	U
72-54-8	4,4'-DDD	3.1	J	4.3	U	4.4	U	4.4	U	4.4	U
1031-07-8	Endosulfan sulfate	4.4	U	4.3	U	4.4	U	4.4	U	4.4	U
50-29-3	4,4'-DDT	8.9	J	4.3	U	4.4	U	4.4	U	4.4	U
72-43-5	Methoxychlor	22.	U	22.	U	22.	U	22.	U	22.	U
53494-70-5	Endrin ketone	4.4	U	4.3	U	4.4	U	4.4	U	4.4	U
7421-93-4	Endrin aldehyde	4.4	U	4.3	U	4.4	U	4.4	U	4.4	U
5103-71-9	alpha-Chlordane	2.2	U	2.2	U	2.2	U	2.2	U	3.8	U
5103-74-2	gamma-Chlordane	2.2	U	2.2	U	2.2	U	2.2	U	2.7	U
8001-35-2	Toxaphene	44.	U	43.	U	44.	U	44.	U	44.	U
12674-11-2	Aroclor-1016	44.	U	43.	U	44.	U	44.	U	44.	U
11104-28-2	Aroclor-1221	44.	U	43.	U	44.	U	44.	U	44.	U
11141-16-5	Aroclor-1232	44.	U	43.	U	44.	U	44.	U	44.	U
53469-21-9	Aroclor-1242	44.	U	43.	U	44.	U	44.	U	44.	U
12672-29-6	Aroclor-1248	44.	U	43.	U	44.	U	44.	U	44.	U
11097-69-1	Aroclor-1254	44.	U	43.	U	44.	U	44.	U	44.	U
11096-82-5	Aroclor-1260	44.	U	43.	U	44.	U	44.	U	44.	U
12789-03-6	Technical Chlordane	44.	U	43.	U	44.	U	44.	U	44.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SMB46-PEST		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01	
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001	
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376	
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001	
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	
		DATE EXTRACTED -->	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	
		DATE ANALYZED ---->	06/08/96	06/08/96	06/08/96	06/08/96	06/08/96	06/08/96	
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	
		UNITS ----->	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL
319-84-6	alpha-BHC	2.2	U	2.2	U	2.2	U	2.3	U
319-85-7	beta-BHC	2.2	U	2.2	U	2.2	U	2.3	U
319-86-8	delta-BHC	2.2	UJ	2.2	UJ	2.2	UJ	2.3	UJ
58-89-9	gamma-BHC (Lindane)	2.2	U	2.2	U	2.2	U	2.3	U
76-44-8	Heptachlor	2.2	U	2.2	U	2.2	U	2.3	U
309-00-2	Aldrin	2.2	U	2.2	U	2.2	U	2.3	U
1024-57-3	Heptachlor epoxide	2.7	J	2.2	J	2.2	U	2.3	U
959-98-8	Endosulfan I	2.2	U	2.2	U	2.2	U	2.3	U
60-57-1	Dieldrin	94.	D	95.	D	2.5	J	2.4	J
72-55-9	4,4'-DDE	3.	J	4.5	U	4.4	U	4.6	U
72-20-8	Endrin	4.4	U	4.5	U	4.4	U	4.6	U
33213-65-9	Endosulfan II	4.4	U	4.5	U	4.4	U	4.6	U
72-54-8	4,4'-DDD	4.4	U	4.5	U	4.4	U	4.6	U
1031-07-8	Endosulfan sulfate	4.4	U	4.5	U	4.4	U	4.6	U
50-29-3	4,4'-DDT	4.4	U	4.5	U	4.4	U	4.6	U
72-43-5	Methoxychlor	22.	U	22.	U	22.	U	23.	U
53494-70-5	Endrin ketone	4.4	U	4.5	U	4.4	U	4.6	U
7421-93-4	Endrin aldehyde	4.4	U	4.5	U	4.4	U	4.6	U
5103-71-9	alpha-Chlordane	30.		17.		2.2	U	2.3	U
5103-74-2	gamma-Chlordane	13.	J	6.6	J	2.2	U	2.3	U
8001-35-2	Toxaphene	44.	U	45.	U	44.	U	46.	U
12674-11-2	Aroclor-1016	44.	U	45.	U	44.	U	46.	U
11104-28-2	Aroclor-1221	44.	U	45.	U	44.	U	46.	U
11141-16-5	Aroclor-1232	44.	U	45.	U	44.	U	46.	U
53469-21-9	Aroclor-1242	44.	U	45.	U	44.	U	46.	U
12672-29-6	Aroclor-1248	44.	U	45.	U	44.	U	46.	U
11097-69-1	Aroclor-1254	44.	U	45.	U	44.	U	46.	U
11096-82-5	Aroclor-1260	44.	U	45.	U	44.	U	39.	J
12789-03-6	Technical Chlordane	82.	J	45.	U	44.	U	46.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SW846-PEST		SAMPLE ID -----> 010-M-0030-03						
		ORIGINAL ID -----> 010M003003						
		LAB SAMPLE ID ----> 148377						
		ID FROM REPORT --> 010M003003						
		SAMPLE DATE -----> 05/15/96						
		DATE EXTRACTED --> 05/23/96						
		DATE ANALYZED ----> 06/08/96						
		MATRIX -----> Sediment						
		UNITS -----> ug/Kg						
CAS #	Parameter	1849	VAL					
319-84-6	alpha-BHC	2.2	U					
319-85-7	beta-BHC	2.2	U					
319-86-8	delta-BHC	2.2	UJ					
58-89-9	gamma-BHC (Lindane)	2.2	U					
76-44-8	Heptachlor	2.2	U					
309-00-2	Aldrin	2.2	U					
1024-57-3	Heptachlor epoxide	2.2	U					
959-98-8	Endosulfan I	2.2	U					
60-57-1	Dieldrin	4.4	U					
72-55-9	4,4'-DDE	4.4	U					
72-20-8	Endrin	4.4	U					
33213-65-9	Endosulfan II	4.4	U					
72-54-8	4,4'-DDD	4.4	U					
1031-07-8	Endosulfan sulfate	4.4	U					
50-29-3	4,4'-DDT	4.4	U					
72-43-5	Methoxychlor	22.	U					
53494-70-5	Endrin ketone	4.4	U					
7421-93-4	Endrin aldehyde	4.4	U					
5103-71-9	alpha-Chlordane	2.2	U					
5103-74-2	gamma-Chlordane	2.2	U					
8001-35-2	Toxaphene	44.	U					
12674-11-2	Aroclor-1016	44.	U					
11104-28-2	Aroclor-1221	44.	U					
11141-16-5	Aroclor-1232	44.	U					
53469-21-9	Aroclor-1242	44.	U					
12672-29-6	Aroclor-1248	44.	U					
11097-69-1	Aroclor-1254	44.	U					
11096-82-5	Aroclor-1260	44.	U					
12789-03-6	Technical Chlordane	44.	U					

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SWB46-SVOA		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96			
		DATE ANALYZED ---->	06/06/96	06/06/96	06/06/96	06/06/96	06/09/96	06/06/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
108-95-2	Phenol	440.	U	430.	U	440.	U	440.	U	440.	U
111-44-4	bis(2-Chloroethyl)ether	440.	U	430.	U	440.	U	440.	U	440.	U
95-57-8	2-Chlorophenol	440.	U	430.	U	440.	U	440.	U	440.	U
541-73-1	1,3-Dichlorobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
106-46-7	1,4-Dichlorobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
95-50-1	1,2-Dichlorobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
95-48-7	2-Methylphenol (o-Cresol)	440.	U	430.	U	440.	U	440.	U	440.	U
108-60-1	2,2'-oxybis(1-Chloropropane)	440.	U	430.	U	440.	U	440.	U	440.	U
106-44-5	4-Methylphenol (p-Cresol)	440.	U	430.	U	440.	U	440.	U	440.	U
621-64-7	N-Nitroso-di-n-propylamine	440.	U	430.	U	440.	U	440.	U	440.	U
67-72-1	Hexachloroethane	440.	U	430.	U	440.	U	440.	U	440.	U
98-95-3	Nitrobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
78-59-1	Isophorone	440.	U	430.	U	440.	U	440.	U	440.	U
88-75-5	2-Nitrophenol	440.	U	430.	U	440.	U	440.	U	440.	U
105-67-9	2,4-Dimethylphenol	440.	U	430.	U	440.	U	440.	U	440.	U
111-91-1	bis(2-Chloroethoxy)methane	440.	U	430.	U	440.	U	440.	U	440.	U
120-83-2	2,4-Dichlorophenol	440.	U	430.	U	440.	U	440.	U	440.	U
120-82-1	1,2,4-Trichlorobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
91-20-3	Naphthalene	440.	U	430.	U	440.	U	440.	U	440.	U
106-47-8	4-Chloroaniline	440.	U	430.	U	440.	U	440.	U	440.	U
87-68-3	Hexachlorobutadiene	440.	U	430.	U	440.	U	440.	U	440.	U
59-50-7	4-Chloro-3-methylphenol	440.	U	430.	U	440.	U	440.	U	440.	U
91-57-6	2-Methylnaphthalene	440.	U	430.	U	440.	U	440.	U	440.	U
77-47-4	Hexachlorocyclopentadiene	440.	U	430.	U	440.	U	440.	U	440.	U
88-06-2	2,4,6-Trichlorophenol	440.	U	430.	U	440.	U	440.	U	440.	U
95-95-4	2,4,5-Trichlorophenol	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
91-58-7	2-Chloronaphthalene	440.	U	430.	U	440.	U	440.	U	440.	U
88-74-4	2-Nitroaniline	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
131-11-3	Dimethylphthalate	440.	U	430.	U	440.	U	440.	U	440.	U
208-96-8	Acenaphthylene	440.	U	430.	U	440.	U	440.	U	440.	U
606-20-2	2,6-Dinitrotoluene	440.	U	430.	U	440.	U	440.	U	440.	U
99-09-2	3-Nitroaniline	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
83-32-9	Acenaphthene	440.	U	430.	U	440.	U	440.	U	440.	U
51-28-5	2,4-Dinitrophenol	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
100-02-7	4-Nitrophenol	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
132-64-9	Dibenzofuran	440.	U	430.	U	440.	U	440.	U	440.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SUB46-SVOA		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96			
		DATE ANALYZED ---->	06/06/96	06/06/96	06/06/96	06/06/96	06/09/96	06/06/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
121-14-2	2,4-Dinitrotoluene	440.	U	430.	U	440.	U	440.	U	440.	U
84-66-2	Diethylphthalate	440.	U	430.	U	440.	U	440.	U	440.	U
7005-72-3	4-Chlorophenylphenyl ether	440.	U	430.	U	440.	U	440.	U	440.	U
86-73-7	Fluorene	440.	U	430.	U	440.	U	440.	U	440.	U
100-01-6	4-Nitroaniline	1100.	UJ	1100.	UJ	1100.	UJ	1100.	UJ	1100.	UJ
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
86-30-6	N-Nitrosodiphenylamine	440.	U	430.	U	440.	U	440.	U	440.	U
101-55-3	4-Bromophenyl-phenylether	440.	U	430.	U	440.	U	440.	U	440.	U
118-74-1	Hexachlorobenzene	440.	U	430.	U	440.	U	440.	U	440.	U
87-86-5	Pentachlorophenol	1100.	U	1100.	U	1100.	U	1100.	U	1100.	U
85-01-8	Phenanthrene	110.	J	430.	U	53.	J	440.	U	93.	J
120-12-7	Anthracene	440.	U	430.	U	440.	U	440.	U	440.	U
86-74-8	Carbazole	440.	U	430.	U	440.	U	440.	U	440.	U
84-74-2	Di-n-butylphthalate	110.	U	430.	U	150.	J	68.	J	190.	J
206-44-0	Fluoranthene	220.	J	430.	U	440.	U	440.	U	160.	J
129-00-0	Pyrene	140.	J	430.	U	440.	U	440.	U	120.	J
85-68-7	Butylbenzylphthalate	440.	U	430.	U	440.	U	440.	U	440.	U
91-94-1	3,3'-Dichlorobenzidine	440.	U	430.	U	440.	U	440.	U	440.	U
56-55-3	Benzo(a)anthracene	90.	J	430.	U	440.	U	440.	U	71.	J
218-01-9	Chrysene	140.	J	430.	U	440.	U	440.	U	83.	J
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	440.	U	430.	U	440.	U	440.	U	65.	J
117-84-0	Di-n-octylphthalate	440.	U	430.	U	440.	U	440.	U	440.	U
205-99-2	Benzo(b)fluoranthene	100.	J	430.	U	440.	U	440.	U	60.	J
207-08-9	Benzo(k)fluoranthene	99.	J	430.	U	440.	U	440.	U	77.	J
50-32-8	Benzo(a)pyrene	98.	J	430.	U	440.	U	440.	U	74.	J
193-39-5	Indeno(1,2,3-cd)pyrene	89.	J	430.	U	440.	U	440.	U	47.	J
53-70-3	Dibenz(a,h)anthracene	440.	U	430.	U	440.	U	440.	U	440.	U
191-24-2	Benzo(g,h,i)perylene	97.	J	430.	U	440.	U	440.	U	48.	J

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SUB46-SV0A		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01					
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376					
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE EXTRACTED -->	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96					
		DATE ANALYZED ---->	06/06/96	06/06/96	06/06/96	06/06/96	06/06/96	06/06/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
108-95-2	Phenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
111-44-4	bis(2-Chloroethyl)ether	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
95-57-8	2-Chlorophenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
541-73-1	1,3-Dichlorobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
106-46-7	1,4-Dichlorobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
95-50-1	1,2-Dichlorobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
95-48-7	2-Methylphenol (o-Cresol)	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
108-60-1	2,2'-oxybis(1-Chloropropane)	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
106-44-5	4-Methylphenol (p-Cresol)	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
621-64-7	N-Nitroso-di-n-propylamine	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
67-72-1	Hexachloroethane	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
98-95-3	Nitrobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
78-59-1	Isophorone	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
88-75-5	2-Nitrophenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
105-67-9	2,4-Dimethylphenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
111-91-1	bis(2-Chloroethoxy)methane	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
120-83-2	2,4-Dichlorophenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
120-82-1	1,2,4-Trichlorobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
91-20-3	Naphthalene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
106-47-8	4-Chloroaniline	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
87-68-3	Hexachlorobutadiene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
59-50-7	4-Chloro-3-methylphenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
91-57-6	2-Methylnaphthalene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
77-47-4	Hexachlorocyclopentadiene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
88-06-2	2,4,6-Trichlorophenol	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
95-95-4	2,4,5-Trichlorophenol	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
91-58-7	2-Chloronaphthalene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
88-74-4	2-Nitroaniline	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
131-11-3	Dimethylphthalate	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
208-96-8	Acenaphthylene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
606-20-2	2,6-Dinitrotoluene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
99-09-2	3-Nitroaniline	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
83-32-9	Acenaphthene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
51-28-5	2,4-Dinitrophenol	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
100-02-7	4-Nitrophenol	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
132-64-9	Dibenzofuran	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SW846-SVOA		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01					
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376					
		ID FROM REPORT --->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE EXTRACTED -->	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96	05/24/96					
		DATE ANALYZED ---->	06/06/96	06/06/96	06/06/96	06/06/96	06/06/96	06/06/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
121-14-2	2,4-Dinitrotoluene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
84-66-2	Diethylphthalate	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
7005-72-3	4-Chlorophenylphenyl ether	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
86-73-7	Fluorene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
100-01-6	4-Nitroaniline	1100.	UJ	1100.	UJ	1100.	UJ	1200.	UJ	1100.	UJ	1300.	UJ
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
86-30-6	N-Nitrosodiphenylamine	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
101-55-3	4-Bromophenyl-phenylether	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
118-74-1	Hexachlorobenzene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
87-86-5	Pentachlorophenol	1100.	U	1100.	U	1100.	U	1200.	U	1100.	U	1300.	U
85-01-8	Phenanthrene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
120-12-7	Anthracene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
86-74-8	Carbazole	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
84-74-2	Di-n-butylphthalate	390.	J	210.	J	440.	U	460.	U	460.	U	510.	U
206-44-0	Fluoranthene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
129-00-0	Pyrene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
85-68-7	Butylbenzylphthalate	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
91-94-1	3,3'-Dichlorobenzidine	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
56-55-3	Benzo(a)anthracene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
218-01-9	Chrysene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	440.	U	110.	J	440.	U	460.	U	460.	U	510.	U
117-84-0	Di-n-octylphthalate	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
205-99-2	Benzo(b)fluoranthene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
207-08-9	Benzo(k)fluoranthene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
50-32-8	Benzo(a)pyrene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
193-39-5	Indeno(1,2,3-cd)pyrene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
53-70-3	Dibenz(a,h)anthracene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U
191-24-2	Benzo(g,h,i)perylene	440.	U	450.	U	440.	U	460.	U	460.	U	510.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SW846-SV0A		SAMPLE ID ----->	010-M-0030-03				
		ORIGINAL ID ----->	010M003003				
		LAB SAMPLE ID ---->	148377				
		ID FROM REPORT -->	010M003003				
		SAMPLE DATE ----->	05/15/96				
		DATE EXTRACTED -->	05/24/96				
		DATE ANALYZED ---->	06/06/96				
		MATRIX ----->	Sediment				
		UNITS ----->	UG/KG				
CAS #	Parameter	1849	VAL				
108-95-2	Phenol	440.	U				
111-44-4	bis(2-Chloroethyl)ether	440.	U				
95-57-8	2-Chlorophenol	440.	U				
541-73-1	1,3-Dichlorobenzene	440.	U				
106-46-7	1,4-Dichlorobenzene	440.	U				
95-50-1	1,2-Dichlorobenzene	440.	U				
95-48-7	2-Methylphenol (o-Cresol)	440.	U				
108-60-1	2,2'-oxybis(1-Chloropropane)	440.	U				
106-44-5	4-Methylphenol (p-Cresol)	440.	U				
621-64-7	N-Nitroso-di-n-propylamine	440.	U				
67-72-1	Hexachloroethane	440.	U				
98-95-3	Nitrobenzene	440.	U				
78-59-1	Isophorone	440.	U				
88-75-5	2-Nitrophenol	440.	U				
105-67-9	2,4-Dimethylphenol	440.	U				
111-91-1	bis(2-Chloroethoxy)methane	440.	U				
120-83-2	2,4-Dichlorophenol	440.	U				
120-82-1	1,2,4-Trichlorobenzene	440.	U				
91-20-3	Naphthalene	440.	U				
106-47-8	4-Chloroaniline	440.	U				
87-68-3	Hexachlorobutadiene	440.	U				
59-50-7	4-Chloro-3-methylphenol	440.	U				
91-57-6	2-Methylnaphthalene	440.	U				
77-47-4	Hexachlorocyclopentadiene	440.	U				
88-06-2	2,4,6-Trichlorophenol	440.	U				
95-95-4	2,4,5-Trichlorophenol	1100.	U				
91-58-7	2-Chloronaphthalene	440.	U				
88-74-4	2-Nitroaniline	1100.	U				
131-11-3	Dimethylphthalate	440.	U				
208-96-8	Acenaphthylene	440.	U				
606-20-2	2,6-Dinitrotoluene	440.	U				
99-09-2	3-Nitroaniline	1100.	U				
83-32-9	Acenaphthene	440.	U				
51-28-5	2,4-Dinitrophenol	1100.	U				
100-02-7	4-Nitrophenol	1100.	U				
132-64-9	Dibenzofuran	440.	U				

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SUB46-SVOA

SAMPLE ID -----> 010-M-0030-03
ORIGINAL ID -----> 010M003003
LAB SAMPLE ID ----> 148377
ID FROM REPORT --> 010M003003
SAMPLE DATE -----> 05/15/96
DATE EXTRACTED --> 05/24/96
DATE ANALYZED ----> 06/06/96
MATRIX -----> Sediment
UNITS -----> UG/KG

CAS #	Parameter	1849	VAL				
121-14-2	2,4-Dinitrotoluene	440.	U				
84-66-2	Diethylphthalate	440.	U				
7005-72-3	4-Chlorophenylphenyl ether	440.	U				
86-73-7	Fluorene	440.	U				
100-01-6	4-Nitroaniline	1100.	UJ				
534-52-1	2-Methyl-4,6-Dinitrophenol	1100.	U				
86-30-6	N-Nitrosodiphenylamine	440.	U				
101-55-3	4-Bromophenyl-phenylether	440.	U				
118-74-1	Hexachlorobenzene	440.	U				
87-86-5	Pentachlorophenol	1100.	U				
85-01-8	Phenanthrene	440.	U				
120-12-7	Anthracene	440.	U				
86-74-8	Carbazole	440.	U				
84-74-2	Di-n-butylphthalate	440.	U				
206-44-0	Fluoranthene	440.	U				
129-00-0	Pyrene	440.	U				
85-68-7	Butylbenzylphthalate	440.	U				
91-94-1	3,3'-Dichlorobenzidine	440.	U				
56-55-3	Benzo(a)anthracene	440.	U				
218-01-9	Chrysene	440.	U				
117-81-7	bis(2-Ethylhexyl)phthalate (BEHP)	440.	U				
117-84-0	Di-n-octylphthalate	440.	U				
205-99-2	Benzo(b)fluoranthene	440.	U				
207-08-9	Benzo(k)fluoranthene	440.	U				
50-32-8	Benzo(a)pyrene	440.	U				
193-39-5	Indeno(1,2,3-cd)pyrene	440.	U				
53-70-3	Dibenz(a,h)anthracene	440.	U				
191-24-2	Benzo(g,h,i)perylene	440.	U				

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SW846-VOA		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		LAB SAMPLE ID --->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE ANALYZED --->	05/21/96	05/21/96	05/21/96	05/21/96	05/21/96	05/22/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
74-87-3	Chloromethane	13.	U	13.	U	13.	U	13.	U	13.	UJ
74-83-9	Bromomethane	13.	U	13.	U	13.	U	13.	U	13.	U
75-01-4	Vinyl chloride	13.	U	13.	U	13.	U	13.	U	13.	UJ
75-00-3	Chloroethane	13.	U	13.	U	13.	U	13.	U	13.	U
75-09-2	Methylene chloride	13.	U	13.	U	13.	U	13.	U	13.	U
67-64-1	Acetone	13.	U	13.	U	13.	U	13.	U	13.	U
75-15-0	Carbon disulfide	13.	U	13.	U	13.	U	13.	U	13.	U
75-35-4	1,1-Dichloroethene	13.	U	13.	U	13.	U	13.	U	13.	U
75-34-3	1,1-Dichloroethane	13.	U	13.	U	13.	U	13.	U	13.	U
540-59-0	1,2-Dichloroethene (total)	13.	U	13.	U	13.	U	13.	U	13.	U
67-66-3	Chloroform	13.	U	13.	U	13.	U	13.	U	13.	U
107-06-2	1,2-Dichloroethane	13.	U	13.	U	13.	U	13.	U	13.	U
78-93-3	2-Butanone (MEK)	13.	U	13.	U	13.	U	13.	U	13.	U
71-55-6	1,1,1-Trichloroethane	13.	U	13.	U	13.	U	13.	U	13.	U
56-23-5	Carbon tetrachloride	13.	U	13.	U	13.	U	13.	U	13.	U
75-27-4	Bromodichloromethane	13.	U	13.	U	13.	U	13.	U	13.	U
78-87-5	1,2-Dichloropropane	13.	U	13.	U	13.	U	13.	U	13.	U
10061-01-5	cis-1,3-Dichloropropene	13.	U	13.	U	13.	U	13.	U	13.	U
79-01-6	Trichloroethene	13.	U	13.	U	13.	U	13.	U	13.	U
124-48-1	Dibromochloromethane	13.	U	13.	U	13.	U	13.	U	13.	U
79-00-5	1,1,2-Trichloroethane	13.	U	13.	U	13.	U	13.	U	13.	U
71-43-2	Benzene	13.	U	13.	U	13.	U	13.	U	13.	U
10061-02-6	trans-1,3-Dichloropropene	13.	U	13.	U	13.	U	13.	U	13.	U
75-25-2	Bromoform	13.	U	13.	U	13.	U	13.	U	13.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	13.	UJ	13.	UJ	13.	UJ	13.	UJ	13.	UJ
591-78-6	2-Hexanone	13.	UJ	13.	U	13.	U	13.	U	13.	U
127-18-4	Tetrachloroethene	13.	UJ	13.	U	13.	U	13.	U	13.	U
79-34-5	1,1,2,2-Tetrachloroethane	13.	UJ	13.	U	13.	U	13.	U	13.	U
108-88-3	Toluene	13.	UJ	3.	J	13.	U	13.	U	13.	U
108-90-7	Chlorobenzene	13.	UJ	13.	U	13.	U	13.	U	13.	U
100-41-4	Ethylbenzene	13.	UJ	13.	U	13.	U	13.	U	13.	U
100-42-5	Styrene	13.	UJ	13.	U	13.	U	13.	U	13.	U
1330-20-7	Xylene (Total)	13.	UJ	13.	U	13.	U	13.	U	13.	U

NSA MEMPHIS
Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

SUB46-VDA		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01					
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376					
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE ANALYZED ---->	05/22/96	05/22/96	05/21/96	05/21/96	05/22/96	05/23/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
74-87-3	Chloromethane	13.	UJ	14.	UJ	13.	U	14.	U	14.	UJ	15.	U
74-83-9	Bromomethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-01-4	Vinyl chloride	13.	UJ	14.	UJ	13.	U	14.	U	14.	UJ	15.	U
75-00-3	Chloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-09-2	Methylene chloride	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
67-64-1	Acetone	13.	UJ	43.	J	13.	U	14.	U	14.	U	15.	U
75-15-0	Carbon disulfide	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-35-4	1,1-Dichloroethene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-34-3	1,1-Dichloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
540-59-0	1,2-Dichloroethene (total)	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
67-66-3	Chloroform	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
107-06-2	1,2-Dichloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
78-93-3	2-Butanone (MEK)	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
71-55-6	1,1,1-Trichloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
56-23-5	Carbon tetrachloride	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-27-4	Bromodichloromethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
78-87-5	1,2-Dichloropropane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
10061-01-5	cis-1,3-Dichloropropene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
79-01-6	Trichloroethene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
124-48-1	Dibromochloromethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
79-00-5	1,1,2-Trichloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
71-43-2	Benzene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
10061-02-6	trans-1,3-Dichloropropene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
75-25-2	Bromoform	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	13.	U	14.	U	13.	UJ	14.	UJ	14.	U	15.	U
591-78-6	2-Hexanone	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
127-18-4	Tetrachloroethene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
79-34-5	1,1,2,2-Tetrachloroethane	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
108-88-3	Toluene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
108-90-7	Chlorobenzene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
100-41-4	Ethylbenzene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
100-42-5	Styrene	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U
1330-20-7	Xylene (Total)	13.	U	14.	U	13.	U	14.	U	14.	U	15.	U

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SUB846-VDA		SAMPLE ID ----->	010-M-0030-03					
		ORIGINAL ID ----->	010M003003					
		LAB SAMPLE ID ---->	148377					
		ID FROM REPORT --->	010M003003					
		SAMPLE DATE ----->	05/15/96					
		DATE ANALYZED --->	05/22/96					
		MATRIX ----->	Sediment					
		UNITS ----->	UG/KG					
CAS #	Parameter	1849	VAL					
74-87-3	Chloromethane	13.	U					
74-83-9	Bromomethane	13.	UJ					
75-01-4	Vinyl chloride	13.	U					
75-00-3	Chloroethane	13.	UJ					
75-09-2	Methylene chloride	13.	U					
67-64-1	Acetone	13.	U					
75-15-0	Carbon disulfide	13.	U					
75-35-4	1,1-Dichloroethene	13.	U					
75-34-3	1,1-Dichloroethane	13.	U					
540-59-0	1,2-Dichloroethene (total)	13.	U					
67-66-3	Chloroform	13.	U					
107-06-2	1,2-Dichloroethane	13.	U					
78-93-3	2-Butanone (MEK)	13.	U					
71-55-6	1,1,1-Trichloroethane	13.	U					
56-23-5	Carbon tetrachloride	13.	U					
75-27-4	Bromodichloromethane	13.	U					
78-87-5	1,2-Dichloropropane	13.	U					
10061-01-5	cis-1,3-Dichloropropene	13.	U					
79-01-6	Trichloroethene	13.	U					
124-48-1	Dibromochloromethane	13.	U					
79-00-5	1,1,2-Trichloroethane	13.	U					
71-43-2	Benzene	13.	U					
10061-02-6	trans-1,3-Dichloropropene	13.	U					
75-25-2	Bromoform	13.	U					
108-10-1	4-Methyl-2-Pentanone (MIBK)	13.	U					
591-78-6	2-Hexanone	13.	U					
127-18-4	Tetrachloroethene	13.	U					
79-34-5	1,1,2,2-Tetrachloroethane	13.	U					
108-88-3	Toluene	13.	U					
108-90-7	Chlorobenzene	13.	U					
100-41-4	Ethylbenzene	13.	U					
100-42-5	Styrene	13.	U					
1330-20-7	Xylene (Total)	13.	U					

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

TPH-DRO		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03			
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M0002603	010M002701	010M002703			
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371			
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703			
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96			
		DATE EXTRACTED -->	05/22/96	05/22/96	05/22/96	05/22/96	05/22/96	05/22/96			
		DATE ANALYZED -->	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96			
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL
9999900-02-6	TPH - Diesel Range Organics	5300.	U	5200.	U	5300.	U	5300.	U	6400.	U

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

TPH-DRO		SAMPLE ID ----->	010-N-0028-01	010-N-0028-01	010-N-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01				
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001				
		LAB SAMPLE ID ---->	148372	148378	148373	148374	148375	148376				
		ID FROM REPORT -->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001				
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96				
		DATE EXTRACTED -->	05/22/96	05/22/96	05/22/96	05/22/96	05/22/96	05/22/96				
		DATE ANALYZED ---->	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96	06/07/96				
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment				
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG				
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL	
9999900-02-6	TPH - Diesel Range Organics	5300.	U	6900.		5300.	U	12000.		5500.	U	21000.

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

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TPH-DRO		SAMPLE ID -----> 010-M-0030-03 ORIGINAL ID -----> 010M003003 LAB SAMPLE ID ----> 148377 ID FROM REPORT --> 010M003003 SAMPLE DATE -----> 05/15/96 DATE EXTRACTED --> 05/22/96 DATE ANALYZED ----> 06/07/96 MATRIX -----> Sediment UNITS -----> UG/KG					
CAS #	Parameter	1849	VAL				
9999900-02-6	TPH - Diesel Range Organics	5300.	U				

*** Validation Complete ***

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

TPH-GRO		SAMPLE ID ----->	010-M-0025-01	010-M-0025-03	010-M-0026-01	010-M-0026-03	010-M-0027-01	010-M-0027-03					
		ORIGINAL ID ----->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		LAB SAMPLE ID ---->	148366	148367	148368	148369	148370	148371					
		ID FROM REPORT -->	010M002501	010M002503	010M002601	010M002603	010M002701	010M002703					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE EXTRACTED -->	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96	05/23/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
9999900-02-5	TPH - Gasoline Range Organics	66.	U	65.	U	68.	U	67.	U	67.	U	66.	U

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SWMU 10 Sediment Samples

TPH-GRO		SAMPLE ID ----->	010-M-0028-01	010-N-0028-01	010-M-0028-03	010-M-0029-01	010-M-0029-03	010-M-0030-01					
		ORIGINAL ID ----->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		LAB SAMPLE ID --->	148372	148378	148373	148374	148375	148376					
		ID FROM REPORT --->	010M002801	010N002801	010M002803	010M002901	010M002903	010M003001					
		SAMPLE DATE ----->	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96	05/15/96					
		DATE EXTRACTED -->	05/23/96	05/24/96	05/23/96	05/23/96	05/23/96	05/24/96					
		MATRIX ----->	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	1849	VAL	1849	VAL	1849	VAL	1849	VAL	1849	VAL		
9999900-02-5	TPH - Gasoline Range Organics	66.	U	71.		67.	U	69.	U	68.	U	77.	U

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Confirmatory Sampling Investigation
SWMU 10 Sediment Samples

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TPH-GRO		SAMPLE ID -----> ORIGINAL ID -----> LAB SAMPLE ID ----> ID FROM REPORT --> SAMPLE DATE -----> DATE EXTRACTED --> MATRIX -----> UNITS ----->	010-N-0030-03 010M003003 148377 010M003003 05/15/96 05/24/96 Sediment UG/KG					
CAS #	Parameter	1849	VAL					
9999900-02-5	TPH - Gasoline Range Organics	67.	U					

*** Validation Complete ***

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Confirmatory Sampling Investigation
SWMU 10 Groundwater Samples

8010-V0A		SAMPLE ID ----->	010-G-0007-22	010-G-0007-50	010-G-0008-15	010-H-0008-15	010-G-0008-48	010-G-0009-24			
		ORIGINAL ID ----->	010G000722	010G000750	010G000815	010H000815	010G000848	010G000924			
		LAB SAMPLE ID ---->	010G000722	010G000750	010G000815	010H000815	010G000848	010G000924			
		ID FROM REPORT -->	010G000722	010G000750	010G000815	010H000815	010G000848	010G000924			
		SAMPLE DATE ----->	05/07/96	05/07/96	05/07/96	05/07/96	05/07/96	05/08/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
75-01-4	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U
75-35-4	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	4.4	
75-09-2	Methylene chloride	1.	U	1.	U	1.	U	1.	U	7.3	
156-60-5	trans-1,2-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
75-34-3	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
156-59-2	cis-1,2-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
67-66-3	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U
71-55-6	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
56-23-5	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U
107-06-2	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
79-01-6	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
78-87-5	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U
75-27-4	Bromodichloromethane	1.	U	1.	U	1.	U	1.	U	1.	U
10061-01-5	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U
10061-02-6	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U
79-00-5	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
127-18-4	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
124-48-1	Dibromochloromethane	1.	U	1.	U	1.	U	1.	U	1.	U
108-90-7	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
630-20-6	1,1,1,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
75-25-2	Bromoform	1.	U	1.	U	1.	U	1.	U	1.	U
79-34-5	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
541-73-1	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
106-46-7	1,4-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
95-50-1	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U

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Confirmatory Sampling Investigation
SWMU 10 Groundwater Samples

8010-VOA		SAMPLE ID ----->	010-G-0009-50	010-G-0010-12	010-G-0010-50	010-G-0011-50	010-G-0012-20	010-G-0012-50			
		ORIGINAL ID ----->	010G000950	010G001012	010G001050	010G001150	010G001220	010G001250			
		LAB SAMPLE ID ---->	010G000950	010G001012	010G001050	010G001150	010G001220	010G001250			
		ID FROM REPORT -->	010G000950	010G001012	010G001050	010G001150	010G001220	010G001250			
		SAMPLE DATE ----->	05/08/96	05/08/96	05/08/96	05/09/96	05/09/96	05/09/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/10/96	05/10/96	05/10/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
75-01-4	Vinyl chloride	1.	U	1.	UJ	1.	U	1.	U	1.	U
75-35-4	1,1-Dichloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U
75-09-2	Methylene chloride	6.1		6.2	J	1.	U	1.	U	1.	U
156-60-5	trans-1,2-Dichloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U
75-34-3	1,1-Dichloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
156-59-2	cis-1,2-Dichloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U
67-66-3	Chloroform	1.	U	1.	UJ	1.	U	1.	U	1.	U
71-55-6	1,1,1-Trichloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
56-23-5	Carbon tetrachloride	1.	U	1.	UJ	1.	U	1.	U	1.	U
107-06-2	1,2-Dichloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
79-01-6	Trichloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U
78-87-5	1,2-Dichloropropane	1.	U	1.	UJ	1.	U	1.	U	1.	U
75-27-4	Bromodichloromethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
10061-01-5	cis-1,3-Dichloropropene	1.	U	1.	UJ	1.	U	1.	U	1.	U
10061-02-6	trans-1,3-Dichloropropene	1.	U	1.	UJ	1.	U	1.	U	1.	U
79-00-5	1,1,2-Trichloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
127-18-4	Tetrachloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U
124-48-1	Dibromochloromethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
108-90-7	Chlorobenzene	1.	U	1.	UJ	1.	U	1.	U	1.	U
630-20-6	1,1,1,2-Tetrachloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
75-25-2	Bromoform	1.	U	1.	UJ	1.	U	1.	U	1.	U
79-34-5	1,1,2,2-Tetrachloroethane	1.	U	1.	UJ	1.	U	1.	U	1.	U
541-73-1	1,3-Dichlorobenzene	1.	U	1.	UJ	1.	U	1.	U	1.	U
106-46-7	1,4-Dichlorobenzene	1.	U	1.	UJ	1.	U	1.	U	1.	U
95-50-1	1,2-Dichlorobenzene	1.	U	1.	UJ	1.	U	1.	U	1.	U

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SWMU 10 Groundwater Samples

8010-VOA		SAMPLE ID ----->	010-H-0012-50	010-G-0013-20	010-G-0013-50	010-G-0014-20	010-G-0014-50	010-G-0015-50			
		ORIGINAL ID ----->	010H001250	010G001320	010G001350	010G001420	010G001450	010G001550			
		LAB SAMPLE ID ---->	010H001250	010G001320	010G001350	010G001420	010G001450	010G001550			
		ID FROM REPORT -->	010H001250	010G001320	010G001350	010G001420	010G001450	010G001550			
		SAMPLE DATE ----->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/10/96			
		DATE ANALYZED ---->	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
75-01-4	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U
75-35-4	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
75-09-2	Methylene chloride	1.	U	1.	U	1.	U	1.	U	1.	U
156-60-5	trans-1,2-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
75-34-3	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
156-59-2	cis-1,2-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
67-66-3	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U
71-55-6	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
56-23-5	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U
107-06-2	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
79-01-6	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
78-87-5	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U
75-27-4	Bromodichloromethane	1.	U	1.	U	1.	U	1.	U	1.	U
10061-01-5	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U
10061-02-6	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U
79-00-5	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
127-18-4	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U
124-48-1	Dibromochloromethane	1.	U	1.	U	1.	U	1.	U	1.	U
108-90-7	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
630-20-6	1,1,1,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
75-25-2	Bromoform	1.	U	1.	U	1.	U	1.	U	1.	U
79-34-5	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U
541-73-1	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
106-46-7	1,4-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U
95-50-1	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U

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8010-V0A		SAMPLE ID -----> 010-G-0016-20					
		ORIGINAL ID -----> 010G001620					
		LAB SAMPLE ID ----> 010G001620					
		ID FROM REPORT --> 010G001620					
		SAMPLE DATE -----> 05/10/96					
		DATE ANALYZED ----> 05/10/96					
		MATRIX -----> Water					
		UNITS -----> UG/L					
CAS #	Parameter	96052	VAL				
75-01-4	Vinyl chloride	1.	U				
75-35-4	1,1-Dichloroethene	4.2					
75-09-2	Methylene chloride	5.4					
156-60-5	trans-1,2-Dichloroethene	1.	U				
75-34-3	1,1-Dichloroethane	1.	U				
156-59-2	cis-1,2-Dichloroethene	1.	U				
67-66-3	Chloroform	1.	U				
71-55-6	1,1,1-Trichloroethane	1.	U				
56-23-5	Carbon tetrachloride	1.	U				
107-06-2	1,2-Dichloroethane	1.	U				
79-01-6	Trichloroethene	1.	U				
78-87-5	1,2-Dichloropropane	1.	U				
75-27-4	Bromodichloromethane	1.	U				
10061-01-5	cis-1,3-Dichloropropene	1.	U				
10061-02-6	trans-1,3-Dichloropropene	1.	U				
79-00-5	1,1,2-Trichloroethane	1.	U				
127-18-4	Tetrachloroethene	1.	U				
124-48-1	Dibromochloromethane	1.	U				
108-90-7	Chlorobenzene	1.	U				
630-20-6	1,1,1,2-Tetrachloroethane	1.	U				
75-25-2	Bromoform	1.	U				
79-34-5	1,1,2,2-Tetrachloroethane	1.	U				
541-73-1	1,3-Dichlorobenzene	1.	U				
106-46-7	1,4-Dichlorobenzene	1.	U				
95-50-1	1,2-Dichlorobenzene	1.	U				

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BTEX		SAMPLE ID ----->	010-G-0007-22	010-G-0007-50	010-G-0008-15	010-G-0008-48	010-H-0008-48	010-G-0009-24			
		ORIGINAL ID ----->	010G000722	010G000750	010G000815	010G000848	010H000848	010G000924			
		LAB SAMPLE ID ---->	010G000722	010G000750	010G000815	010G000848	010H000848	010G000924			
		ID FROM REPORT -->	010G000722	010G000750	010G000815	010G000848	010H000848	010G000924			
		SAMPLE DATE ----->	05/07/96	05/07/96	05/07/96	05/07/96	05/07/96	05/08/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
71-43-2	Benzene	2.	U	2.	U	2.	UJ	2.	U	2.	U
108-88-3	Toluene	2.	U	2.	U	2.	UJ	2.	U	2.	U
100-41-4	Ethylbenzene	2.	U	2.	U	2.	UJ	2.	U	2.	U
1330-20-7	Xylene (Total)	2.	U	2.	U	2.	UJ	2.	U	2.	U

*** Validation Complete ***

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BTEX		SAMPLE ID ----->	010-G-0009-50	010-G-0010-12	010-G-0010-50	010-G-0011-16	010-G-0011-50	010-G-0012-20			
		ORIGINAL ID ----->	010G000950	010G001012	010G001050	010G001116	010G001150	010G001220			
		LAB SAMPLE ID ---->	010G000950	010G001012	010G001050	010G001116	010G001150	010G001220			
		ID FROM REPORT -->	010G000950	010G001012	010G001050	010G001116	010G001150	010G001220			
		SAMPLE DATE ----->	05/08/96	05/08/96	05/08/96	05/09/96	05/09/96	05/09/96			
		DATE ANALYZED ---->	05/09/96	05/09/96	05/09/96	05/10/96	05/10/96	05/10/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
71-43-2	Benzene	2.	U	2.	UJ	2.	U	2.	U	2.	UJ
108-88-3	Toluene	2.	U	2.	UJ	2.	U	3.5	U	2.1	J
100-41-4	Ethylbenzene	2.	U	2.	UJ	2.	U	2.	U	2.	UJ
1330-20-7	Xylene (Total)	2.	U	2.	UJ	2.	U	2.	U	2.	UJ

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BTEX		SAMPLE ID ----->	010-G-0012-50	010-H-0012-50	010-G-0013-20	010-G-0013-50	010-G-0014-20	010-G-0014-50			
		ORIGINAL ID ----->	010G001250	010H001250	010G001320	010G001350	010G001420	010G001450			
		LAB SAMPLE ID ---->	010G001250	010H001250	010G001320	010G001350	010G001420	010G001450			
		ID FROM REPORT -->	010G001250	010H001250	010G001320	010G001350	010G001420	010G001450			
		SAMPLE DATE ----->	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96	05/09/96			
		DATE ANALYZED ---->	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96	05/10/96			
		MATRIX ----->	Water	Water	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	96052	VAL	96052	VAL	96052	VAL	96052	VAL	96052	VAL
71-43-2	Benzene	2.	U	2.	U	2.	U	2.	U	2.	U
108-88-3	Toluene	4.8	J	2.	UJ	4.3	U	2.	U	4.6	U
100-41-4	Ethylbenzene	2.	U	2.	U	2.	U	2.	U	2.	U
1330-20-7	Xylene (Total)	2.	U	2.	U	2.	U	2.	U	2.	U

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BTEX		SAMPLE ID ----->	010-G-0015-50	010-G-0016-20				
		ORIGINAL ID ----->	010G001550	010G001620				
		LAB SAMPLE ID ---->	010G001550	010G001620				
		ID FROM REPORT -->	010G001550	010G001620				
		SAMPLE DATE ----->	05/10/96	05/10/96				
		DATE ANALYZED ---->	05/10/96	05/10/96				
		MATRIX ----->	Water	Water				
		UNITS ----->	UG/L	UG/L				
CAS #	Parameter	96052	VAL	96052	VAL			
71-43-2	Benzene	2.	U	2.	U			
108-88-3	Toluene	4.7		2.	U			
100-41-4	Ethylbenzene	2.	U	2.	U			
1330-20-7	Xylene (Total)	2.	U	2.	U			

*** Validation Complete ***