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FOLLOWUP GRAY AREA WORK PLAN REVISION 1 MILLINGTON SUPPACT TN
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**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE**

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**FOLLOW UP GRAY AREA
WORK PLAN
REVISION: 01**

CTO-094

Prepared for:

**Department of the Navy
Southern Division
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1.0 INTRODUCTION

NAS Memphis has been scheduled for partial closure and realignment under the Defense Base Closure and Realignment Act of 1990 (BRAC). As part of the BRAC process, an environmental baseline survey was conducted to determine the environmental condition of all buildings, facilities, and parcels of land (hereafter referred to as facilities) at NAS Memphis. During this survey, 20 facilities were identified as needing further assessment, and therefore classified as "7/gray." Of these 20, six are on the closing portion of the base and have been investigated as part of the BRAC process, 11 are on the realigning portion of the base and are scheduled for investigation in the second half of 1995, and three have been determined to require no further action (*Verification Sampling Work Plan for Potential New Sites (Gray Area Work Plan)*, E/A&H, Oct. 1994).

The Gray Area Investigation, conducted in November 1994, addressed the six sites on the north side of NAS Memphis. These sites were given priority over the remaining 11 sites due to base closure schedules. Based on the findings of the investigation, four sites were determined to require further investigation (see Figure 1-1). The current investigation will address three of the four facilities: Facility N-122 (Welding Shop), the Turkey Shoot Area, and Facility N-7 (Hangar). The fourth site, the Gasoline Pits Area, will be addressed under the Navy's Underground Storage Tank (UST) Program. In addition, a recently discovered site, the Riding Trails Disposal Area (see Figure 1-1), will also be addressed at this time.

2.0 SAMPLING PLAN

A sampling approach has been designed for each site to address the primary contaminants of concern and to either delineate the extent of shallow soil contamination (Turkey Shoot Area and Riding Trails Disposal Area) or confirm remediation of the site (Facilities N-7 and N-122). Each facility was previously investigated in November 1994 during the implementation of the *Gray Area Work Plan*. The investigative approach and methodology to be used at each site is described in the following sections.

2.1 Facility N-122 (Welding Shop)

2.1.1 Background and Previous Investigations

Facility N-122 was constructed in 1950 and classified as an "acetylene general building" (NAS Memphis Base Map, 1953) which has been identified through interviews to have also been a welding shop. The most recent use of Facility N-122 was for office space and storage of office supplies and armory equipment by the Naval Air Reserves (NAR).

Facility N-122 was included in the Gray Area Investigation to determine if materials generated during the welding operations had been improperly disposed of in or around the building. Five sample locations were selected at points where waste material (e.g., parts cleaning solvents, etc.) generated during normal daily operations could have been dumped or poured. The areas selected were adjacent to the side door on the east side of the building (Sample I.D. — MEM/122S000301), around the northernmost doorway (MEM/122S000101 and MEM/122S000201), a low-lying area on the south end of the building (MEM/122S000401), and the drainage ditch north of the facility (MEM/122S000501). Samples were collected from the 0-to 12-inch interval using a stainless-steel hand auger and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and total petroleum hydrocarbons (TPH). These parameters were selected to indicate if solvents, paint waste, or welding material (i.e., flux, solder, etc.) had been released in this area. Figure 2-1 shows the site layout and sample locations.



0201
122-000101
12S000301

N-112 N-122

0401

LEGEND



● Sample Point Location

EXCAVATION



0 Feet 50 100



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**FIGURE 2-1
FACILITY N-122
PREVIOUS INVESTIGATION SITE MAP**

The analytical data indicated a release occurred in an isolated area at the south end of Facility N-122. VOCs, SVOCs, metals, and TPH were detected in the surficial soil within a low-lying area (Sample I.D. — MEM/122-S-0004-01). Several polynuclear aromatic hydrocarbons (PAHs), detected by the SVOC analysis, exceeded the residential soil screening levels in the USEPA Region III Risk Based Concentration (RBC) table (Third Quarter, 1994). Total petroleum hydrocarbon (TPH) concentrations detected were below the Tennessee Department of Environment and Conservation's most conservative UST program soil cleanup level of 100 ppm. Concentrations of other constituents were also found in the sediment sample from the ditch, as well as next to the double doors north of Facility N-122, but at considerably lower concentrations (see Tables 2-1 and 2-2). Due to these findings, further investigation was recommended for the low-lying area at the south end of the facility.

2.1.2 Site-Specific Sampling Plan

During the Gray Area Investigation, it was determined that an area of soil at the south end of the facility, near sample location MEM/122S000401, had been impacted by petroleum releases in the past. To remedy this situation, soil will be removed, using a backhoe and/or shovel, from this low-lying area (see Figure 2-1), characterized, and disposed of in an approved landfill. Soil will be removed to a depth of 6 inches and placed in 55-gallon drums or a roll-off box for disposal. The areal extent of the excavation will be determined based on the topography of the area and visual observations.

A five-part composite sample will be collected from the excavated material and analyzed for TCLP VOCs, TCLP SVOCs, TCLP TPH, and TCLP metals for disposal characterization. A confirmation sample will be collected from the bottom of the excavated area and analyzed for VOCs (not homogenized), SVOCs, and TPH to ensure that soil exceeding the RBCs and greater than 100 ppm TPH has been removed. The number of confirmation samples may be increased to ensure adequate and representative coverage of the area. The excavated area will be backfilled with clean soil following the collection of the confirmation sample. In the event that the excavation area and depth create a safety hazard, the excavation will be backfilled immediately, otherwise, the area will remain open until receipt of sample data.

Table 2-1
 Building N-122 Soil Samples
 Organic Data Summary

Parameter ($\mu\text{g}/\text{kg}$)	Sample I.D.					RBC Concentrations	
	MEM/122-S-0001-01	MEM/122-S-0002-01	MEM/122-S-0003-01	MEM/122-S-0004-01	MEM/122-S-0005-01	Residential	Industrial
Acenaphthene	BDL	BDL	BDL	120 J	BDL	4,700,000	61,000,000
Dibenzofuran	BDL	BDL	BDL	53 J	BDL	2,300,000	31,000,000
Fluorene	BDL	BDL	BDL	130 J	BDL	3,100,000	41,000,000
Phenanthrene	51 J	BDL	BDL	2400	BDL	2,300,000	31,000,000
Anthracene	BDL	BDL	BDL	660	BDL	23,000,000	310,000,000
Carbazole	BDL	BDL	BDL	470	BDL	32,000	140,000
Di-n-butylphthalate	BDL	BDL	BDL	56 J	40 J	7,800,000	100,000,000
Fluoranthene	170 J	BDL	BDL	4100 J	110 J	3,100,000	41,000,000
Pyrene	150 J	BDL	BDL	3200	91 J	2,300,000	310,000,000
Butylbenzylphthalate	BDL	BDL	BDL	68 J	BDL	16,000,000	200,000,000
Benzo(a)anthracene	82 J	BDL	BDL	1900	47 J	880	3900
Chrysene	97 J	BDL	BDL	2300	59 J	88,000	390,000
bis(2-Ethylhexyl)phthalate (BEHP)	39 J	BDL	BDL	320	BDL	46,000	200,000
Benzo(b)fluoranthene	78 J	BDL	BDL	2100	50 J	880	3,900
Benzo(k)fluoranthene	74 J	BDL	BDL	1600	43 J	8,800	39,000
Benzo(a)pyrene	79 J	BDL	BDL	2000	44 J	88	390
Indeno(1,2,3-cd)pyrene	51 J	BDL	BDL	990	BDL	880	3,900
Dibenzo(a,h)anthracene	BDL	BDL	BDL	350 J	BDL	88	390

**Table 2-1
 Building N-122 Soil Samples
 Organic Data Summary**

Parameter ($\mu\text{g}/\text{kg}$)	Sample I.D.					RBC Concentrations	
	MEM/122-S-0001-01	MEM/122-S-0002-01	MEM/122-S-0003-01	MEM/122-S-0004-01	MEM/122-S-0005-01	Residential	Industrial
Benzo(g,h,i)perylene	55 J	BDL	BDL	960	BDL	2,300,000	31,000,000
Total Petroleum Hydrocarbons (TPH)	BDL	BDL	BDL	140,000	BDL	100000 ¹	—
Methylene Chloride	BDL	BDL	1 J	1 J	BDL	85,000	380,000
1,1,1-Trichloroethane (TCA)	24	5 J	2 J	6 J	BDL	7,000,000	92,000,000
Tetrachloroethene (PCE)	1 J	BDL	BDL	7 J	BDL	12,000	55,000

Notes:

RBC = U.S. Environmental Protection Agency, Region III, Risk-Based Concentration Table, Third Quarter 1994

BDL = Below Detection Limit

— = No Data Available

J = Estimated Value

¹ = TDEC UST Action Level

Table 2-2
 Building N-122 Soil Samples
 Inorganic Data Summary

Parameter (mg/kg)	Sample I.D.					RBC Concentrations	
	MEM/122-S-0001-01	MEM/122-S-0002-01	MEM/122-S-0003-01	MEM/122-S-0004-01	MEM/122-S-0005-01	Residential	Industrial
Antimony	BDL	BDL	BDL	BDL	BDL	31	410
Arsenic	6.7	7.5	6.6	5.2	8.1	23	310
Barium	79.8	88.3	104	115	90.1	5,500	72,000
Beryllium	0.36 J	0.35 J	0.42 J	BDL	0.46 J	0.15	0.67
Cadmium	BDL	BDL	BDL	2.2	1.4	39	510
Chromium	13.2	9.7	14.5	17.6	15.7	—	—
Cobalt	6.6 J	6.9 J	7.6 J	3.9 J	7.4 J	4,700	61,000
Copper	16.4	15.8	16.7	29.6	21.8	2,900	38,000
Lead ¹	71.5	16.2	16.8 S	63.2	22.5 S	400	—
Mercury	BDL	BDL	BDL	0.14	BDL	23	310
Nickel	15.6	14.5	15.7	9.4 J	15.2	—	—
Selenium	0.55 J	BDL	BDL	BDL	BDL	390	5,100
Silver	0.85 J	BDL	BDL	BDL	BDL	390	5,100
Thallium	BDL	BDL	BDL	BDL	BDL	—	—
Vanadium	17.4	17.7	25.4	14.4	27.3	550	7200
Zinc	76.7	63	74.1	244	115	23,000	310,000
Tin	13.5 B	6.5 B	12 B	7.8 B	7.2 B	47,000	610,000

Notes:

- RBC = U.S. Environmental Protection Agency, Region III, Risk-Based Concentration Table, Third Quarter 1994
- BDL = Below Detection Limit
- I = USEPA Guidance (OSWER Directive 9355.4-12)
- = No Data Available
- J = Estimated Value

2.2 Turkey Shoot Area

2.2.1 Background and Previous Investigations

The turkey shoot area is in the extreme southwest corner of the NAS Memphis Northside in an undeveloped area. It was used for 10 years for annual recreational firearm-related activities by the City of Millington. The activities involved shooting at a target from a distance of 25 to 50 yards with a shotgun. The area is presently not in use and is heavily vegetated. This area was investigated due to the potential for lead contamination associated with firearms activities.

Surficial soil samples were collected from the suspected target area (Figure 2-2). This area was identified based on the layout of the area and the shape of the tree line. A soil sample was collected from the 0- to 6-inch interval with a stainless-steel hand auger. No lead-shot pellets were observed in the sample. The sample was split and submitted for two analyses, — total lead (MEM/OTSS000101) and TCLP lead (MEM/OTSS000201). The TCLP method was selected to determine if lead pellets in the soil were of sufficient quantity to cause lead to leach, under "landfill conditions," into the surrounding soil and groundwater. The results presented in Table 2-3 indicate TCLP lead results were below the regulatory limit, but the elevated concentration of total lead found in the other soil sample suggests that further investigation is needed to determine the extent of the contamination.

2.2.2 Site-Specific Sampling Plan

The objective of the follow-up investigation at the turkey shoot area will be to define the areal extent of the lead contamination detected during the Gray Area Investigation. Due to the past uses of the site, it is presumed that lead in the soil may be spread over a large area. To delineate this area effectively, a grid-based sampling approach will be used.



LEGEND



 Sample Point Location



100 ft. x 100 ft. Grid
(cells 10 ft. x 10 ft.)



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**FIGURE 2-2
TURKEY SHOOT AREA (OL-006)
PREVIOUS INVESTIGATION/SITE MAP**

**Table 2-3
 Turkey Shoot Area Data Summary**

Parameter	Sample I.D.		OSWER Directive 9355.4-12 Soil Screening Levels (mg/kg)	TCLP Limit (mg/l)
	MEM/OTS-S-0001-01	MEM/OTS-S-0002-01		
Total Lead (mg/kg)	1260	NA	400	—
TCLP Lead (mg/l)	NA	3.6	—	5

Note:

NA — Not Analyzed

A 100-foot by 100-foot grid, with 10-foot by 10-foot cells, will be established on the site, centered on the previous sample location. This will allow the investigation to start at a known impacted location and expand outward. Twenty, 5-part composite samples will be collected from selected 10-foot by 10-foot grid squares. The twenty samples will be collected from within the grid presented in Figure 2-2. The locations will be randomly generated by assigning each square a unique number, and then selecting the grid squares to be sampled by random number generation.

Composite samples will be collected from the surface interval (0- to 12-inches) using a stainless-steel hand auger. Five points within each selected grid square will be sampled and composited for analysis. The samples will be analyzed for total lead and Synthetic Precipitation Leachate Procedure (SPLP; EPA Method 1312) lead. Unlike TCLP, which mimics landfill conditions, the SPLP analysis is designed to mimic the effects of normal rainfall on the leachability of material in the soil.

A minimum of 20 samples will be collected from the grid area. This will allow the data to undergo a geostatistical analysis (i.e., Geo-EASE) to determine whether the extent of contamination has been sufficiently defined.

2.3 Facility N-7

2.3.1 Background and Previous Investigations

Facility N-7 is a 23,162-square-foot hangar built in 1943 that is currently used to train Navy personnel in catapult and landing gear operations (see Figure 2-3). Past operations included aircraft maintenance; however, no maintenance activities are conducted at this time. An aboveground storage tank (AST), was previously located on the south side of the building. The concrete AST pad is still present within an elevated concrete block containment area surrounded by soil and grass.

Surficial soil samples were collected at this site to determine if a release had occurred in association with the AST or other previous operations. Two soil samples were collected from the 0- to 12-inch interval using a stainless-steel hand auger. One sample (MEM/0N7S000101) was collected from the soil within the AST pad area. The *Gray Area Work Plan* specified that "one sediment sample will be collected from within the storm drain to characterize any material that may have flowed into or been dumped into the storm drain". However, the storm drain grate was not removable. Therefore, a soil sample was collected from an area adjacent to the storm drain (MEM/0N7S000201).

The analytical data generated during the field investigation indicate the presence of PAHs, VOCs and SVOCs in the Facility N-7 area. Table 2-4 lists the compounds detected and their Risk-Based Concentrations (RBCs). The sources of these compounds are suspected to be fuel from the AST and runoff from the street. Because several PAH compounds detected adjacent to the storm sewer inlet exceeded both residential and industrial RBCs, further action was recommended for this site.



**Table 2-4
Facility N-7 Soil Samples
Organic Data Summary**

Parameter ($\mu\text{g}/\text{kg}$)	Sample I.D.		RBC Concentration	
	MEM/ON7-S-0001-01	MEM/ON7-S-0002-01	Residential	Industrial
Naphthalene	BDL	40 J	3,100,000	41,000,000
4-Chloro-3-methylphenol	BDL	41 J	—	—
Acenaphthene	77 J	430	4,700,000	61,000,000
Dibenzofuran	BDL	180 J	2,300,000 ¹	31,000,000 ¹
Fluorene	55 J	420	3,100,000	41,000,000
Phenanthrene	550	3800 J	2,300,000 ¹	31,000,000 ¹
Anthracene	110 J	1000	23,000,000	310,000,000
Carbazole	110 J	BDL	32,000	140,000
Fluoranthene	720	5300 J	3,100,000	41,000,000
Pyrene	630	4500 J	2,300,000	31,000,000
Benzo(a)anthracene	360 J	2700	880	3900
Chrysene	380 J	2900	88,000	390,000
bis-(2-ethylhexyl)phthalate (BEHP)	BDL	96 J	46,000	200,000
Benzo(b)fluoranthene	300 J	2500	880	3,900
Benzo(k)fluoranthene	260 J	1700	8,800	39,000
Benzo(a)pyrene	270 J	2300	88	390
Indeno(1,2,3-cd)pyrene	170 J	1500	880	3,900
Dibenzo(a,h)anthracene	61 J	590	88	390
Benzo(g,h,i)perylene	170 J	1700	2,300,000 ¹	31,000,000 ¹
Acetone	5 J	BDL	78,000,000	100,000,000

Notes:

- RBC = U.S. Environmental Protection Agency, Region III, Risk-Based Concentration Table, Third Quarter 1994
- = Data not available for these compounds
- 1 = Data presented is the RBC for pyrene as a surrogate
- J = Estimated Value

2.3.2 Site-Specific Sampling Plan

Contaminated soil from the area surrounding the storm sewer inlet will be removed, using a backhoe and/or shovels, to a depth of 6 inches and containerized in 55-gallon drums or roll-off boxes, characterized, and disposed of in an approved landfill. The areal extent of the excavation will be determined based on the topography of the area and visual observation. One five-part composite confirmation sample will be collected from within the excavation area and submitted to an offsite laboratory for full scan analysis as outlined in Section 4.10.2 of the *NAS Memphis Comprehensive RFI Work Plan (E/A&H, 1994)*. The number of confirmation samples may be increased to ensure adequate and representative coverage of the area. Upon completion of the excavation and sampling activities, the excavation area will be backfilled with clean soil. In the event that the excavation area and depth create a safety hazard, the excavation will be backfilled immediately, otherwise, the area will remain open until receipt of sample data.

2.4 Riding Trails Disposal Area

2.4.1 Background and Previous Investigations

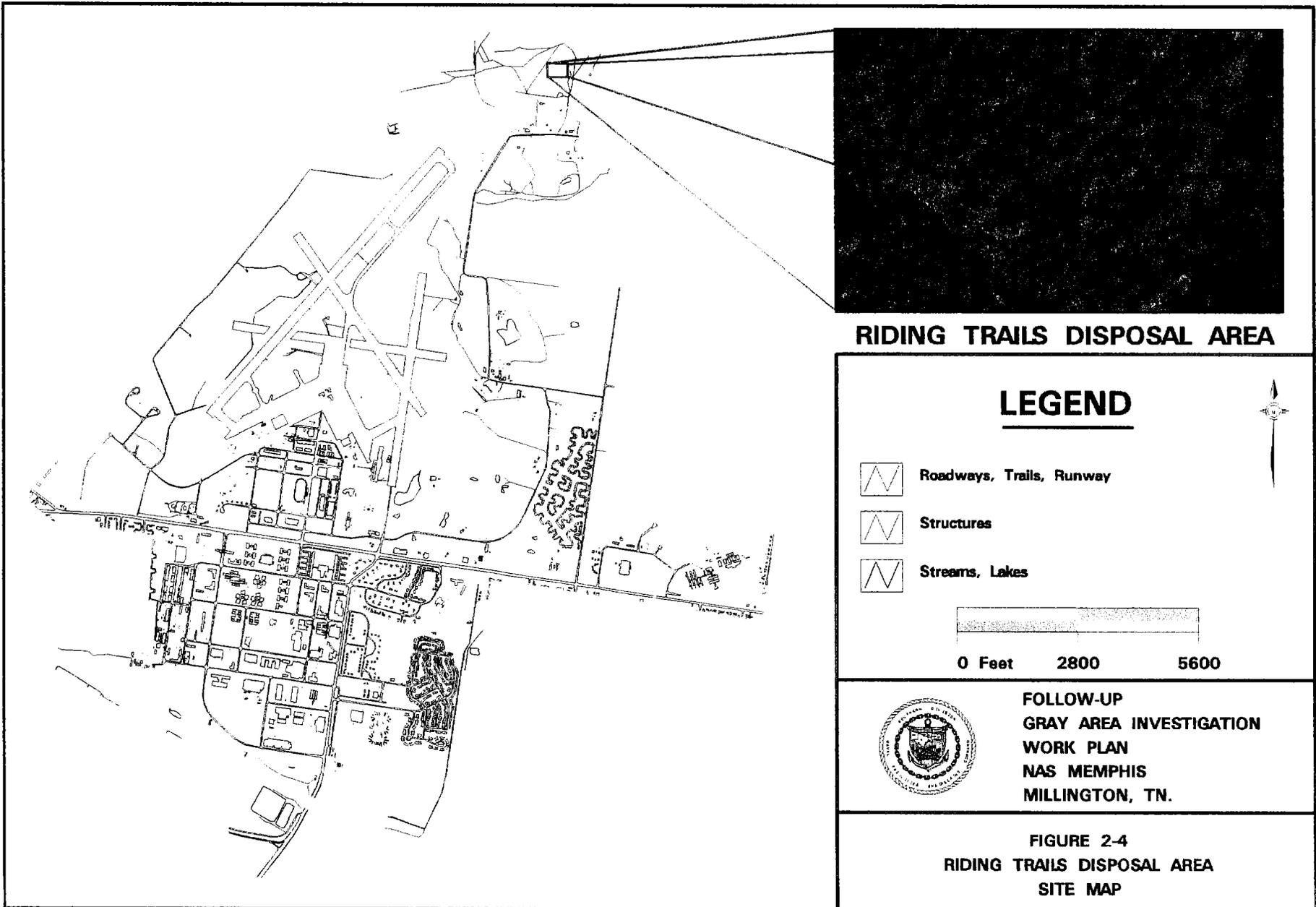
The Riding Trails Disposal Area was discovered during a BRAC Cleanup Team (BCT) walkover of remote areas of the base in February 1995. A survey of the site with a metal detector indicated the presence of buried metallic objects. Some metal debris (e.g., galvanized tubs, barbed wire, etc.) was also visible at the surface. No previous investigations at this site are presently known.

2.4.2 Site-Specific Sampling Plan

Due to the presence of metal debris and the potential for buried waste in the disposal area, shallow soil samples will be collected from this area to determine if there are any impacts associated with the disposal activities. A grid will be established to aid in documenting the sampling activities and to assist in any further investigations, if necessary. A metal detector will be used to determine and document the location of any detectable metal debris. At least three biased soil sample locations will be selected based on metal detector readings and any field

observations made at the time of the investigation. The soil samples will be collected from the 0- to 12-inch interval using a stainless-steel hand auger and submitted to an offsite laboratory for full scan analysis as outlined in Section 4.10.2 of the *NAS Memphis Comprehensive RFI Work Plan (E/A&H, 1994)*. In the event that buried wastes are discovered, additional deeper samples will be collected. The number and depth of additional samples will be determined in the field.

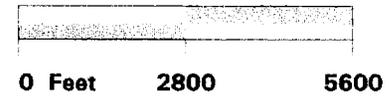
Figure 2-4 presents the location of the site within the Riding Trails area. The sampling grid and sample locations will be determined during the field investigation.



RIDING TRAILS DISPOSAL AREA

LEGEND

-  Roadways, Trails, Runway
-  Structures
-  Streams, Lakes



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**FIGURE 2-4
RIDING TRAILS DISPOSAL AREA
SITE MAP**

3.0 SAMPLING INVESTIGATION

3.1 Sampling Objectives

The objective of the original Gray Area Investigation was to determine if releases have occurred at the various sites. The intent of this follow up investigation is to remove small areas of contaminated soils at Facilities N-7 and N-122, define the extent of shallow soil contamination at the Turkey Shoot Area, and to determine if a release has occurred at the Riding Trails Disposal Area. Sampling at Facilities N-7 and N-122 will be to confirm removal of contaminated soil and to facilitate disposal of the excavated soil. The approach for the Turkey Shoot Area and the Riding Trails Disposal Area will be to define the areal extent of the impacted area. Analytical parameters will be based on contaminants identified during previous investigations and/or acquired knowledge of the site and its operations. Samples collected at the Riding Trails Disposal Area will require FSA due to the lack of information about the site.

3.2 Sampling Procedures

All sampling procedures to be employed during this investigation will be in accordance with the procedures outlined in the USEPA Region IV Environmental Services Division *Standard Operating Procedures and Quality Assurance Manual (February, 1991)* and the *Comprehensive RCRA Facility Investigation (RFI) Work Plan (E/A&H, October 1994)*.

3.3 Analytical Methods

All laboratory analytical methods to be used during this investigation will be in accordance with the methods outlined in Section 4.10 of the *Comprehensive RFI Work Plan*.

4.0 REFERENCES

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