N62604.AR.001601
NCBC GULFPORT
5090.3a

OFFSITE DELINEATION WORK PLAN FOR SITE 8 NCBC GULFPORT MS
8/1/1996
ABB ENVIRONMENTAL

OFFSITE DELINEATION WORKPLAN
SITE 8, FORMER HERBICIDE ORANGE STORAGE AREAS

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

Unit Identification No. N62604

Contract No. N62467-89-D-0317/096

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Berkeley Building
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Art Conrad, Code 1865, Remedial Project Manager

August 1996

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act, the Resource Conservation and Recovery Act (RCRA), and the Hazardous and Solid Waste Amendments (HSWA) of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities.

The program that has been adopted to address present hazardous material management is RCRA and the HSWA (RCRA/HSWA) corrective action program. RCRA ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies to facilities generating or handling hazardous waste. The HSWA corrective action program is designed to identify and clean up releases of hazardous substances at RCRA-permitted facilities.

The RCRA/HSWA program is conducted in four stages, as follows:

- RCRA Facility Assessment
- RCRA Facility Investigation
- Corrective Measures Study
- Corrective Measures Implementation

The Southern Division, Naval Facilities Engineering Command manages and the U.S. Environmental Protection Agency and the Mississippi State Department of Environmental Quality oversee the Navy environmental program at Naval Construction Battalion Center (NCBC), Gulfport, Mississippi. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the RCRA program at NCBC Gulfport should be addressed to Mr. Art Conrad, Code 1865, at (803) 820-5520.

TABLE OF CONTENTS

Offsite Delineation Workplan
Site 8, Former Herbicide Orange Storage Areas
Naval Construction Battalion Center
Gulfport, Mississippi

TABLE OF CONTENTS (Continued)

Offsite Delineation Workplan
Site 8, Former Herbicide Orange Storage Areas
Naval Construction Battalion Center
Gulfport, Mississippi

LIST OF FIGURES

Offsite Delineation Workplan
Site 8, Former Herbicide Orange Storage Areas
Naval Construction Battalion Center
Gulfport, Mississippi

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AO	administrative order
ASTM	American Society for Testing and Materials
2,4-D	2,4-dichloro-phenoxyacetic acid
DO	dissolved oxygen
DQO	data quality objective
EG&G	EG&G Idaho, Inc.
FOL	field operations leader
GPS	global positioning satellite
HAZWRAP	Hazardous Waste Remedial Actions Program
HO	herbicide orange
IDW	investigative-derived waste
MS/MSD	matrix spike and matrix spike duplicate
MSDEQ	Mississippi State Department of Environmental Quality
NCBC	Naval Construction Battalion Center
NCF	Naval Construction Force
NEESA	Naval Energy and Environmental Support Activity
ORP	oxidation/reduction potential
PARCC	precision, accuracy, representativeness, completeness, and comparability
2,3,7,8-PeCDD	2,3,7,8-pentachloro-p-dioxin
ppb	part per billion
ppq	parts per quadrillion
ppt	parts per trillion
QA/QC	quality assurance and quality control
QC	quality control
RI/FS	remedial investigation and feasibility study
RPD	relative percent difference
SAP	sampling and analysis plan
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command

GLOSSARY (Continued)

2,4,5-T	2,4,5-trichlorophenoxyacetic acid
TCDD	tetrachlorodibenzo-p-dioxin
TCLP	toxicity characteristics leaching procedure
TDS	total dissolved solids
TEF	toxicity equivalency factor
TEQ	toxicity equivalence quotient
™	trademark
TOC	total organic carbon
TOM	task order manager
TSS	total suspended solids
USEPA	U.S. Environmental Protection Agency
USAF	U.S. Air Force

1.0 INTRODUCTION

Under contract to the U.S. Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), this Offsite Delineation Workplan was prepared for the Naval Construction Battalion Center (NCBC) in Gulfport, Mississippi. This workplan was prepared under the Comprehensive Long-term Environmental Action, Navy Contract No. N62467-89-D-0317, Contract Task Order No. 096.

On February 14, 1996, administrative orders (AO) No. 3193-96 and No. 3194-96 were issued to the U.S. Navy and U.S. Air Force (USAF), respectively, by the Mississippi State Department of Environmental Quality (MSDEQ) as a result of environmental issues at NCBC Gulfport. These orders contained identical requirements of the Navy and USAF. These orders require that an Offsite Delineation Workplan be submitted to MSDEQ by May 1, 1996. This workplan describes the field investigation to be taken offsite (offbase) to identify and delineate dioxin-impacted sediment, surface water, and overflow areas that have impacted surface soil. A meeting to clarify the AO requirements was held between the U.S. Navy and MSDEQ on March 21, 1996. During this meeting, MSDEQ clarified that onsite meant on the base and offsite meant off the base. The chemicals of potential concern were also identified in this meeting as herbicide orange (HO) and its impurity, dioxin.

The purpose of this workplan is to guide the efforts to identify and delineate environmental media containing dioxin, outside the boundaries but related to NCBC Gulfport, that relate to the storage and handling of HO.

The following sections describe the site; provide the objectives, purpose, and scope of the Offsite Delineation Workplan; provide a conceptual model to facilitate an understanding of the existing conditions; and provide an overview of the organization of the workplan.

A note here about how toxicity equivalents are developed for dioxin results. To start with, 2,3,7,8-tetrachlorodibenxo-p-dioxin (2,3,7,8-TCDD) is considered to be the most toxic of the polychlorinated bibenzodioxin and dibenzofuran families. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans (congeners) with chlorine atoms at the 2, 3, 7, and 8 positions (2,3,7,8 substituted compounds) in their molecules can mimic the toxic properties of 2,3,7,8-TCDD. The U.S. Environmental Protection Agency (USEPA) (USEPA, 1989) developed toxicity equivalency factors (TEFs) for each of the congeners with 2,3,7,8-substituted chlorine atoms to quantify the toxicity of these compounds relative to 2,3,7,8-TCDD, which is given a TEF of one. To determine the toxicity equivalence quotient (TEQ) of a particular sample result, the result of each congener is multiplied by the assigned TEF to determine a 2,3,7,8-TCDD equivalent concentration. The equivalent total concentrations are then summed to obtain the toxicity equivalent or TEQ. Those congeners without substitutions at the 2,3,7,8 molecular positions were not considered toxic, at least in terms of carcinogenic potency, and were assigned a TEF of zero.

For example, 2,3,7,8-pentachloro-p-dioxin (2,3,7,8-PeCDD) has a TEF of 0.5. If the sample result reported 100 picograms per liter of 2,3,7,8-PeCDD, the TEQ for this congener would be 50 picograms per liter ($100 \times 0.5 = 50$).

1.1 OBJECTIVES, PURPOSE, AND SCOPE OF THE OFFSITE DELINEATION WORKPLAN. The main objective of this workplan is to identify and delineate dioxin-impacted media outside the boundaries of NCBC Gulfport, but related to the storage and handling of HO at Site 8. The AO identified three media of concern for offbase delineation: sediments, surface water, and soils impacted by ditch overflow.

The field investigation will be performed in two phases. Phase I will identify impacted areas and Phase II will delineate the dioxin-impacted areas that require further investigation. The work will include the following:

- identifying impacted areas in the offbase drainage system and
- delineating dioxin in the surface soil and sediment in the Outfall 3 swamp.

The results of the first phase of the work will be used to update the conceptual models and focus the efforts in the second phase.

1.2 SITE HISTORY. NCBC Gulfport is located in the western part of Gulfport, Mississippi, in Harrison County, in the southeastern corner of the state, approximately 2 miles north of the Gulf of Mexico (Figure 1-1). The base is located on the north side of Gulfport (Figure 1-2) approximately 1 mile from Highway 49.

The primary mission of NCBC Gulfport is the support of four battalions of the Naval Construction Force (NCF) and the storage and maintenance of prepositioned War Reserve Material Stock. The NCF support consists of both homeport services and deployed support. Approximately 4,000 military and 1,600 civilian personnel are assigned to or employed by the base. The base occupies 1,100 acres and has an elevation averaging 30 feet above sea level (Figure 1-3), with the only significant exception being the linear piles of bauxite stored on the surface. These bauxite piles range from 30 to 40 feet above the grade of the base. Surface soils are primarily sand to sandy loam with minor clays (Hazardous Waste Remedial Action Program [HAZWRAP], 1991).

From 1968 through 1977, about 12 acres of the base (Site 8, Area A) were used for storage and handling of approximately 850,000 gallons of HO in 55-gallon drums (Figure 1-4). Spills and leaks of HO occurred during that period in the area later known as Site 8 (Areas A, B, and C, Figure 1-4). The magnitude of the release of HO and dioxin was investigated in 1977 and was known as the Initial HO Monitoring Program (Occupational and Environmental Health Laboratory, 1979). Followup investigations in 1986 and 1987 delineated the horizontal and vertical extent of dioxin in soil to 1 part per billion (ppb). The delineation work was followed by full-scale incineration of Site 8 soil that was contaminated above 1 ppb. The incineration was completed in 1988, and the resulting ash was stored in piles on Area A of Site 8 (HAZWRAP, 1991).

1.3 REGULATORY SETTING. This workplan was initiated following the issuance of the AO by MSDEQ on February 14, 1996. The direction of the AO was clarified by MSDEQ in a meeting on March 21, 1996. In that meeting, the following items were determined.

- the AO would address dioxin and the constituents of HO;

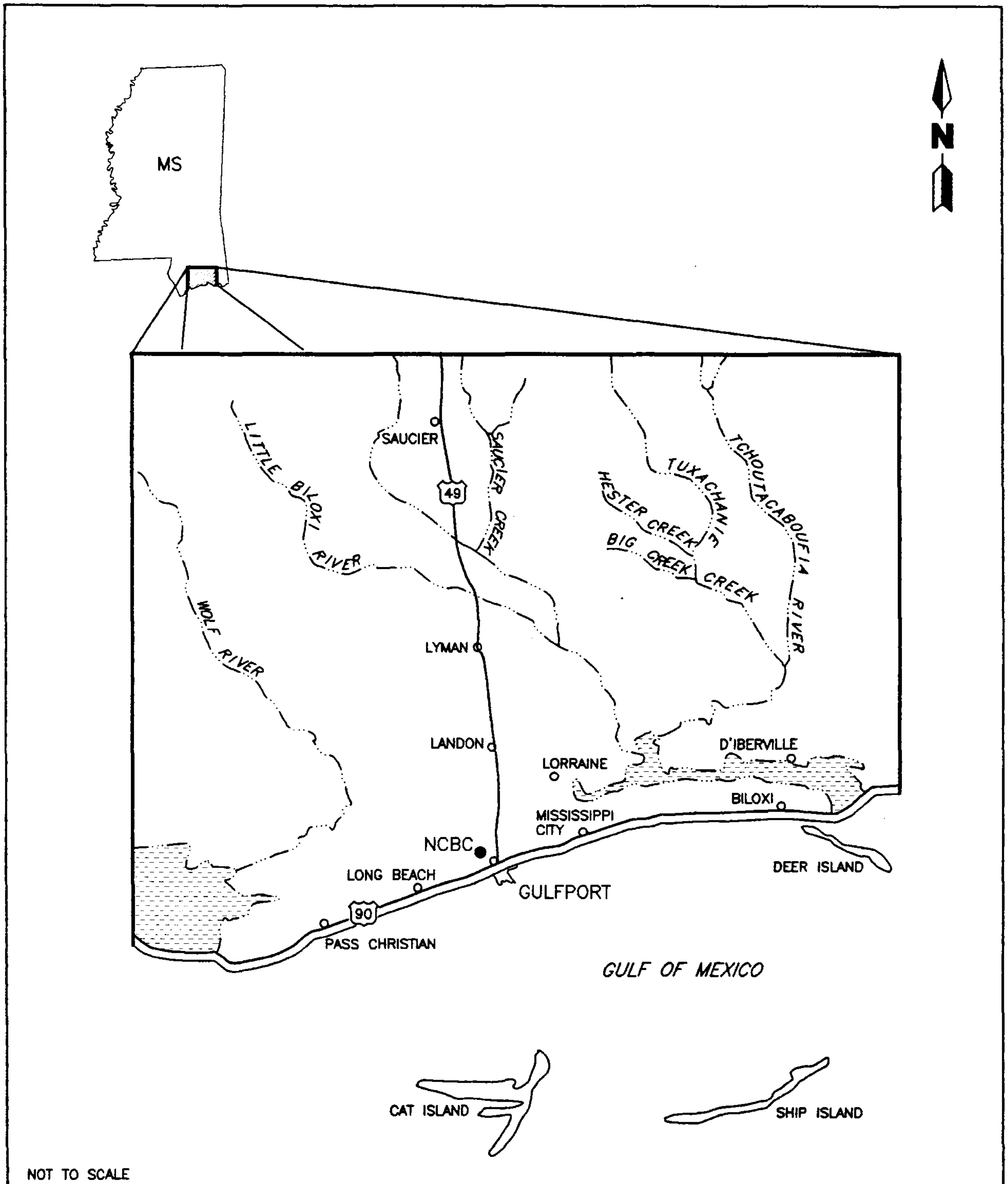


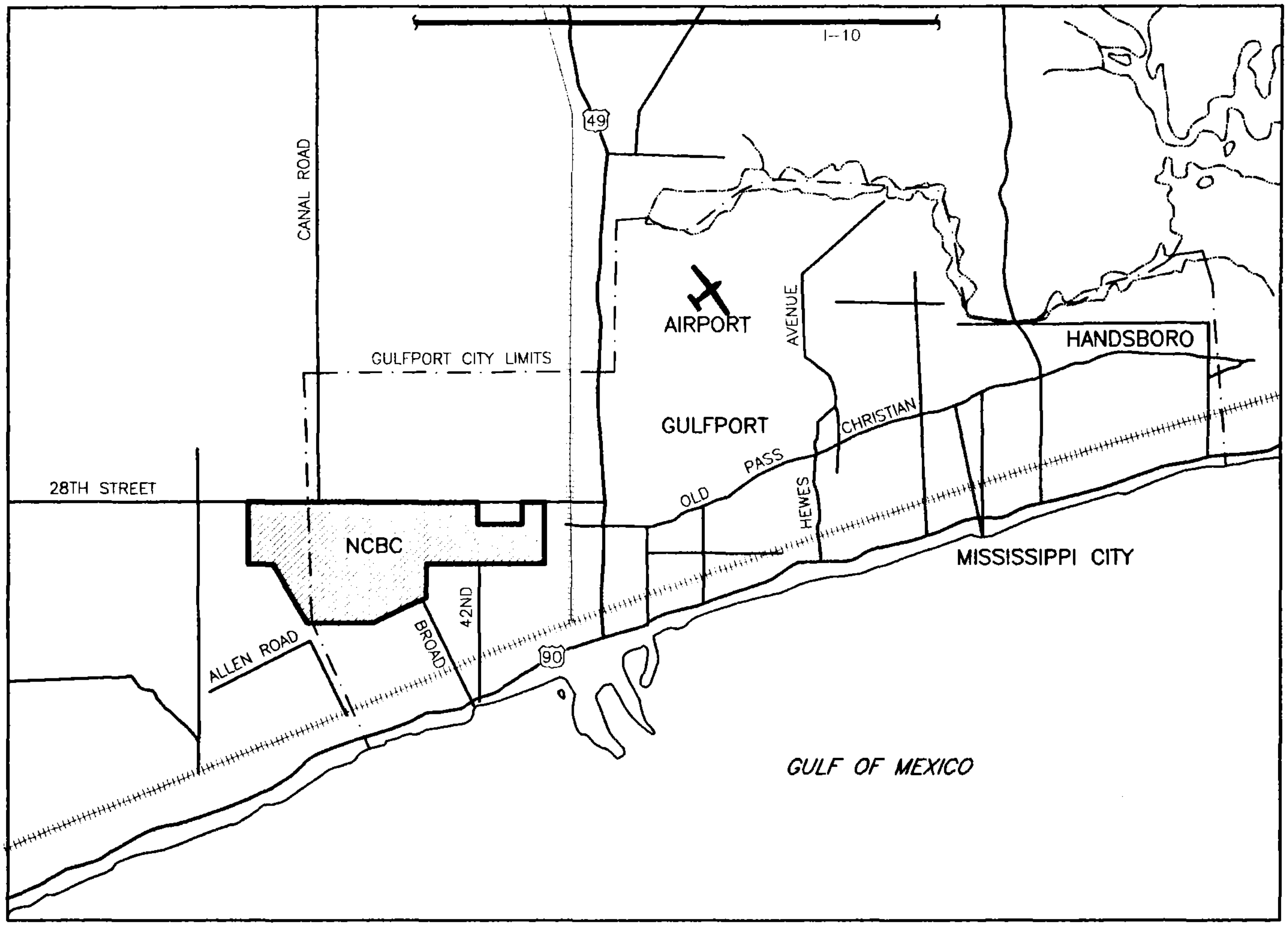
FIGURE 1-1

NCBC LOCATION MAP

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_1-1\DMF\960424



NOT TO SCALE

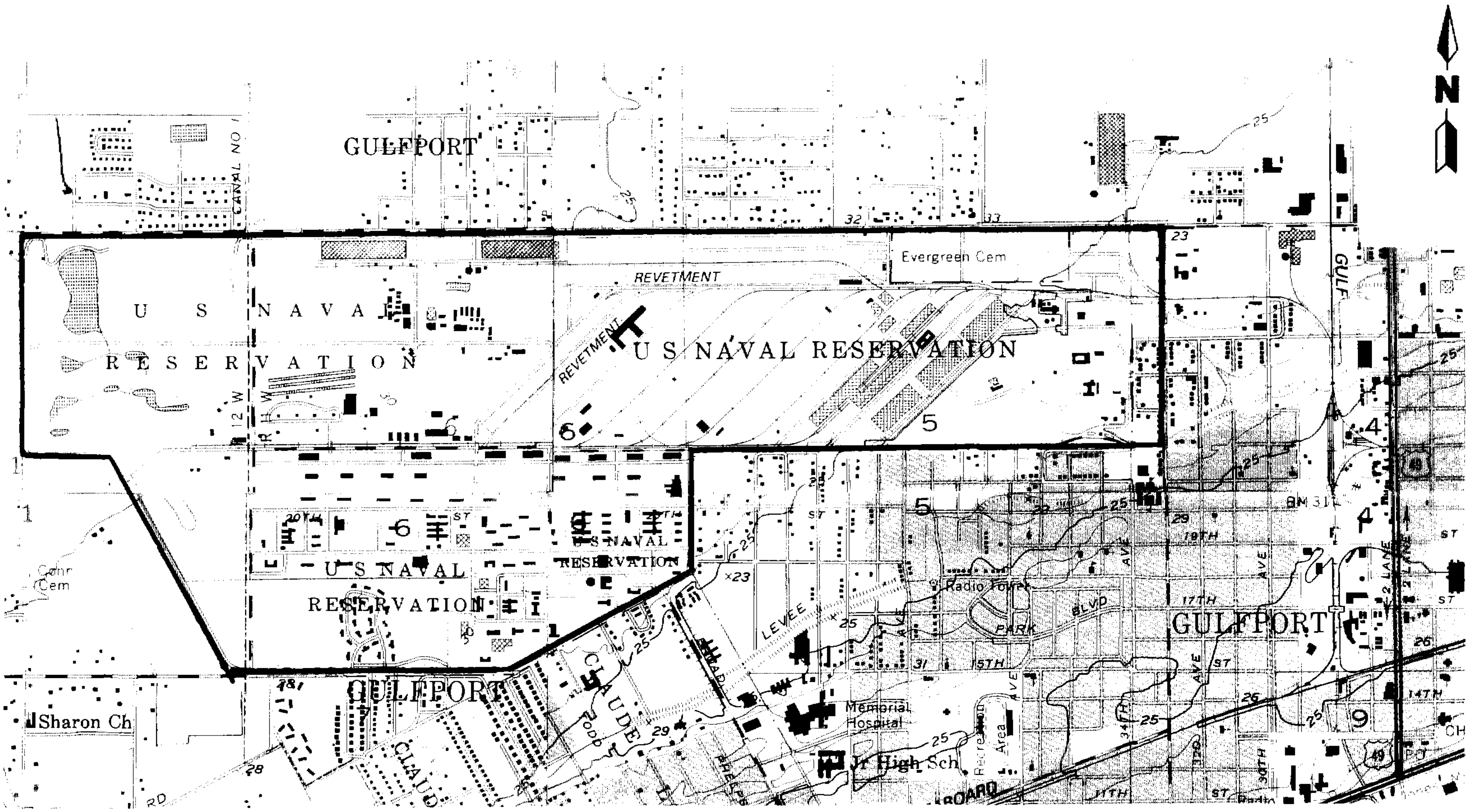
FIGURE 1-2

VICINITY MAP

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_1-2\DMF\960424



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLES GULFPORT NW, GULFPORT NORTH, PASS CHRISTIAN AND GULFPORT SOUTH MISSISSIPPI QUADS.

0 1000 2000
SCALE: 1" = 2000'

FIGURE 1-3

TOPOGRAPHIC MAP OF SITE VICINITY

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_1-3\DMF\960424

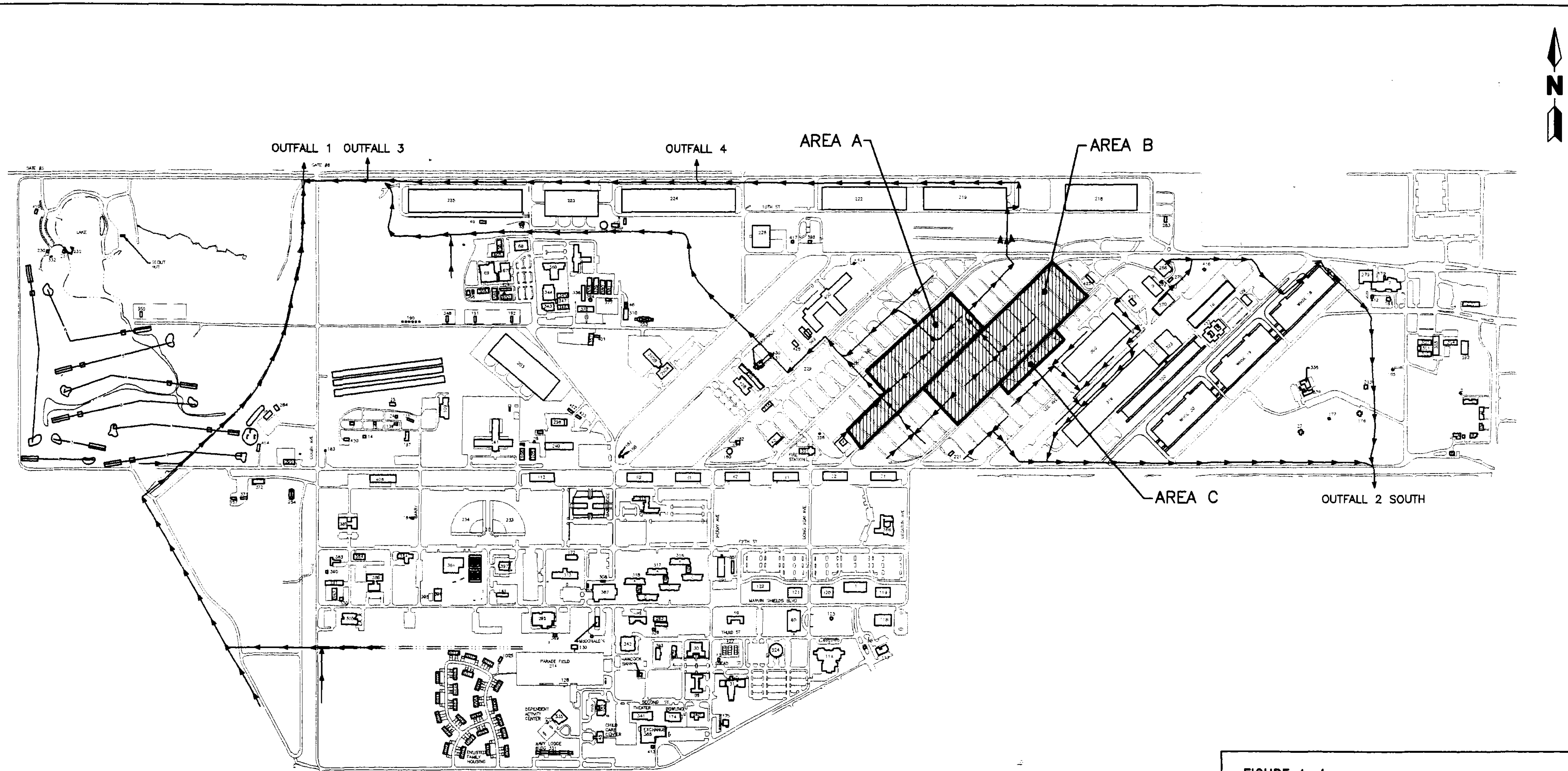


FIGURE 1-4

LOCATION OF FORMER HERBICIDE ORANGE STORAGE AREAS

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-16\ONSITE\FIG_1-4\DMF\960425

- onsite was defined as onbase and offsite was defined as offbase;

- the ash at Site 8 would be handled under the Resource Conservation and Recovery Act, and the remaining impacted media would be handled under the Comprehensive Environmental Response, Compensation, and Liability Act; and

- the method for removing and placing dioxin-impacted sediment and soil at Site 8, employed during the 28th Street Emergency Action, would be used for remediating dioxin-impacted sediment and soil encountered during onbase and offbase delineation activities.

<u>1.4 PREVIOUS INVESTIGATIONS</u>. In 1984, the results of the initial assessment were reported on Site 8A. This study provided the initial definition of HO leakage and spillage through limited sampling and analysis programs. The major findings on the Initial Monitoring Program (HAZWRAP, 1991) were

- soil samples from approximately 2 to 4 acres of the 12-acre former storage area were found to contain HO and associated dioxin;

- TCDD was detected in sediment biological specimen samples collected from the drainage system leading away from Site 8; and

- the movement of dioxin from the storage site seemed to occur primarily through soil erosion, caused by water, wind, or human activity.

The results of this investigation promoted the Comprehensive Soil Characterization Study (EG&G Idaho, Inc. [EG&G], 1987 and 1988). The original sampling and analysis program focused on a portion of the storage site now designated as Area A. This was believed to be the area where HO drums were stored. However, two additional areas designated as Areas B and C, located outside the original HO storage area, were identified and verified as sites of additional drum storage. This prompted a Comprehensive Characterization of Sites 8A, 8B, and 8C. The comprehensive study was performed to delineate the horizontal and vertical extent of HO (2,4-dichloro-phenoxyacetic acid [2,4-D] and 2,4,5-trichlorophenoxyacetic acid [2,4,5-T]) and dioxin in the soil at the former HO storage area. This study proceeded in two parts: (1) Area A and (2) Areas B and C as add-on studies. The results of this study were

- TEQs for dioxin and furan congeners ranged from nondetect to 1,000 ppb;

- TEQs for dioxin and furan congeners above 1 ppb were limited to 2 feet in depth, with a strong trend toward decreasing TEQs with increasing depth; and

- a 95 percent confidence level was estimated for excavating the majority of soil containing TCDD to 1 ppb (26,990 cubic yards) (HAZWRAP, 1991).

Under an USEPA Research Development and Demonstration permit issued in July 1986 (USEPA, 1986a), remediation of Areas A, B, and C was undertaken, with approximately 30,000 cubic yards of impacted soil excavated from the storage areas and incinerated based upon a cleanup criterion for dioxin of 1 ppb (HAZWRAP, 1991). The resulting ash from the incineration was placed back upon approximately one-third of Area A. At that time, no decision had been reached on the petition to delist the ash, characterized as F028 waste, due to discrepancies in the analytical data submitted with the delisting petition.

In November 1987, USEPA Region IV provided final approval to conduct full-scale treatment of the NCBC Site 8 soil. Incineration of the impacted soil containing dioxin above 1 ppb was completed in 1988.

An offsite dioxin contamination survey was performed during the Comprehensive Soil Study (EG&G, 1988) to evaluate potential health impacts from exposure to sediment containing TCDD and to evaluate potential impacts on people who may consume fish and crayfish caught in the drainage system. That study reached the following conclusions:

- no TCDD was detected in potable water supply wells at NCBC;
- concentrations of TCDD in the sediment (less than 270 parts per trillion [ppt]) and biota samples from the NCBC HO storage site drainage system suggest that offsite migration had occurred; and
- at that time, the concentrations of TCDD were below established health risk levels.

On April 10, 1991, SOUTHNAVFACENGCOM authorized sampling of surface soil, surface water, and sediment near the HO site. A characterization of the surface soil was conducted in the area of a construction site known as the Military Construction project P-745, which lies adjacent to the HO site in Area C. Results from these field activities suggest the presence of dioxin at 187 ppt in sediment (ABB Environmental Services, Inc. [ABB-ES], 1993a).

A Sampling and Analysis Plan (SAP), in support of the delisting petition, was prepared in November 1990 (Versar, 1990). The SAP proposed collecting and analyzing additional ash samples. An addendum to the SAP was completed, which focused on the field investigation, analytical methods, and quality assurance and quality control procedures.

A hydrogeologic assessment at Site 8 was performed in 1994 and 1995 (ABB-ES, 1994, 1995a, 1995b, 1995c, 1995d, and 1996a) as an addendum to the Versar (1990) SAP to determine the impact of HO storage on groundwater. Quarterly groundwater samples were collected from 4 monitoring wells along with 10 samples of ash. Below are results from these sampling activities.

- The groundwater flow across Site 8 is generally to the west-northwest.
- Ash sample results for TCDD ranged from nondetect to approximately 70 ppt, although toxicity characteristic leaching procedure (TCLP) results on the samples with highest results were less than 3 ppt.
- TCDD was detected in groundwater samples collected from shallow monitoring wells at concentrations up to 60 parts per quadrillion (ppq), which is above the maximum contaminant level of 30 ppq.

- TCDD concentrations fluctuated with groundwater levels. For example, during periods of higher groundwater elevations at monitoring well GPT-A-2, TCDD TEQs were approximately 60 ppq, and during periods of lower groundwater elevations, TCDD TEQs were 0.15 ppq.

The results from the addendum will be used in the Delisting Petition Addendum (ABB-ES, 1996b, in progress).

In 1995, NCBC contracted ABB-ES to take five soil samples along a fenceline on the south end of Site 8A to assess whether or not detectable concentrations of dioxin were present in the soil. The sampling activity was conducted because the base proposed moving the fence back approximately 20 feet so that a rail line would be located on the outside of the fence rather than inside the fenced area. There was no dioxin detected in the samples, and the fence was relocated (ABB-ES, 1995e).

Also in 1995, ABB-ES (ABB-ES, 1995f) reported on an investigation of surface water and sediment at major outfalls and onflows around NCBC, and collected groundwater samples from all existing monitoring wells at Installation Restoration sites. The results of this study indicate the following:

- dioxin was detected in the sediment samples collected along Outfalls 1 (0.2 ppt), 3 (150 ppt), and 4 (0.8 ppt) and Onflow 1 (74 ppt);

- dioxin was detected in a groundwater sample from one monitoring well at Site 4 (34.1 ppq);

- dioxin was detected at 1.2 ppq in a surface water sample; and

- sediment containing dioxin is likely migrating offbase through Outfalls 1, 3, and 4.

In mid-1995, a Defense Construction Roadway project along 28th Street coupled with the presence of sediment containing dioxin at the base boundaries prompted additional sediment sampling along the north side of the base. Sediments containing dioxin were found up to 3 feet below grade at Outfalls 1, 3, and 4. This discovery initiated the Interim Removal Action 28th Street (ABB-ES, 1995g). A plan to remove the affected sediments at the identified outfalls and place them on Site 8 was approved by MSDEQ. The excavation was completed in July 1995.

1.5 WORKPLAN ORGANIZATION. This Offsite Delineation Workplan is organized into five chapters, which outline the technical approach for identification and delineation of dioxin in environmental media as outlined in the AO. The contents of each chapter are described below.

Chapter 1.0, Introduction, presents the purpose, scope, regulatory setting, site history, previous investigations, and organization of the corrective measures plan.

Chapter 2.0, Conceptual Models, provides a visualization and description of potential sources of dioxin, media of interest, target analytes, nature of dioxin, transport and deposition of dioxin in environmental media, and the phased approach for sample collection.

Chapter 3.0, Field Investigation, presents the phased approach to identify and delineate dioxin in the environmental media outside the boundaries of the base.

Chapter 4.0, Analytical Program, outlines the guidelines for sample collection, sample analysis, and data validation.

Chapter 5.0, Data Evaluation and Interpretation, provides the general outlines for the summary of Phase I activities. The recommendations of the summary report will be used to guide the Phase II activities.

2.0 CONCEPTUAL MODELS

The conceptual models and logic diagrams developed in this chapter will be used to guide the investigative and remedial processes in the most efficient manner possible. The conceptual model is the current understanding of site conditions and will provide the rationale for sample selection and eventually will help select the most effective remedial options. The models will be updated during the investigative process as new information is assimilated. The logic diagram illustrates the process for evaluating Phase I sample results and provides the decision matrix for Phase II samples.

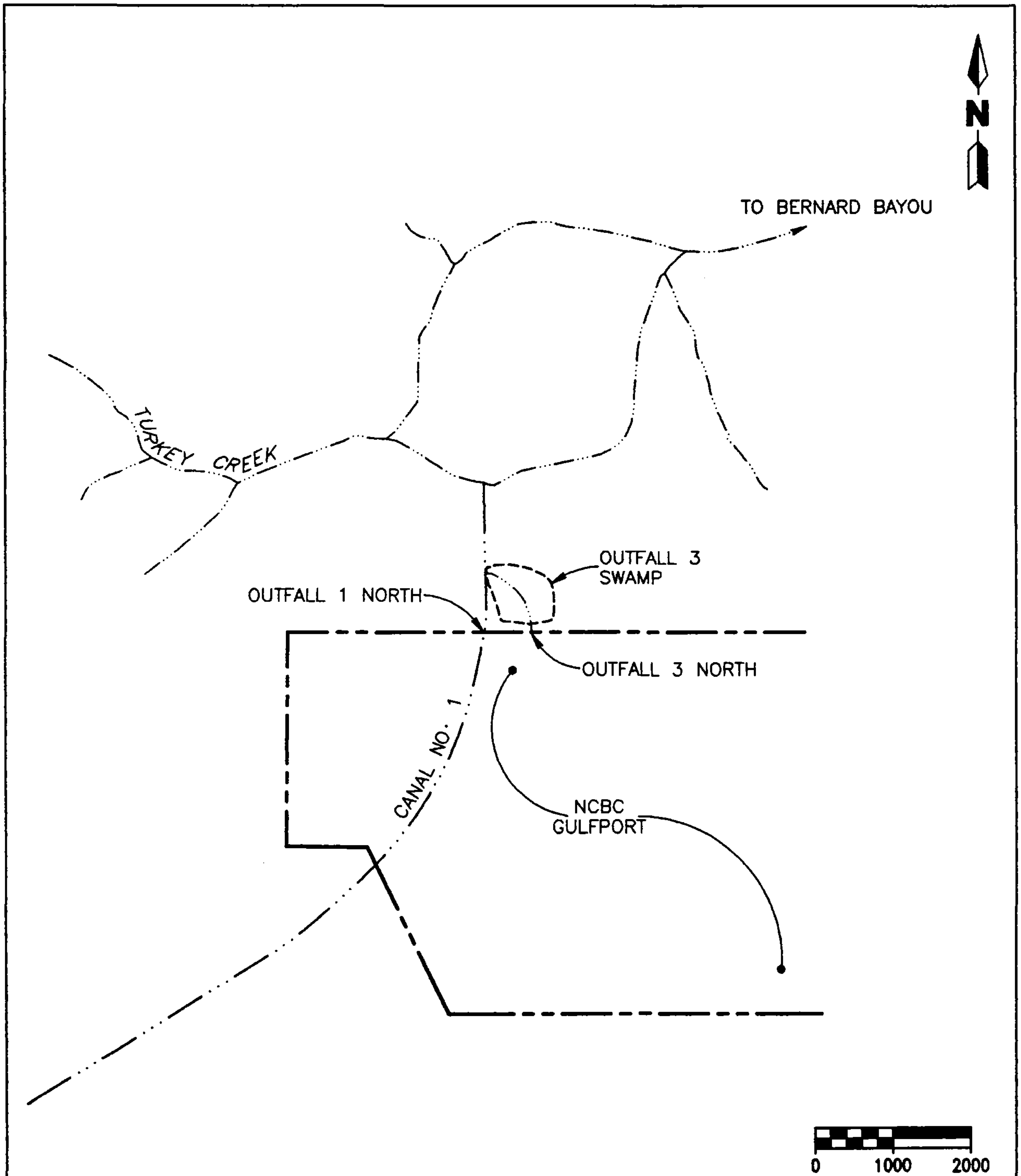
The field investigation will be performed in two phases. Phase I will identify impacted areas and the second phase will delineate the dioxin-impacted areas that require further investigation. Phase I will identify impacted areas in the offbase drainage system. The results of the first phase of the work will be used to update the conceptual models and focus the efforts in Phase II.

2.1 POTENTIAL SOURCES. Currently, the storage and handling of HO is suspected as the source of the dioxin detected in soil, surface water, sediment, and groundwater samples on and off the base. Dioxin is a by-product of the HO manufacturing process. HO is the only suspected source of dioxin because of the unique chemical family members, or congeners, of its constituent dioxins and furans. Of these congeners, TCDD is a good indicator that the source of the dioxin is HO.

From 1965 to 1977, nearly 850,000 gallons of HO were stored at Site 8 in 55-gallon drums. No liners, covers, or protective barriers were placed on or around the drums to mitigate potential spills. In 1984, the former storage areas were initially characterized for the presence of TCDD. A subsequent investigation in 1986 identified an area of approximately 4 acres impacted with dioxin (HAZWRAP, 1991). Nearly all of the samples collected in that area contained TCDD above 1 ppb. This area is believed to be the primary source of dioxin contamination in the ditch systems that drain the Site 8 area. By 1988, incineration of impacted soils at Site 8 had reduced the levels to approximately 1 ppb or less.

2.2 AREAS OF INTEREST. The primary areas of concern for offbase delineation are Canal No. 1, Outfall 3 swamp, and Turkey Creek north of the base (Figure 2-1), as well as Turkey Creek and Bernard Bayou to the northeast of the base (Figure 2-2). The potential sources for these two areas are believed to be the erosion of dioxin-contaminated soils at Site 8 and the transport of that contamination via the bed load of the base ditch system to Canal No. 1 and eventually Turkey Creek.

The conceptual model for Site 8 (Figure 2-3) illustrates the process by which HO containing soil at Site 8 could result in dioxin migrating through the base ditch system. Figure 2-4 depicts the base drainage system from Site 8 to Outfalls 1, 3, and 4 North, which drain directly into Canal No. 1 and eventually into Turkey Creek. Sediments have been confirmed to contain dioxin through sediment sampling and analysis at those outfalls (ABB-ES, 1995f and 1995g). Outfall 2 South will be investigated for the presence of dioxin as well as the other outfalls on the



REFERENCE: U.S.G.S 7.5 MIN. QUAD GULFPORT NW, MISS 30089-D2-TF-024

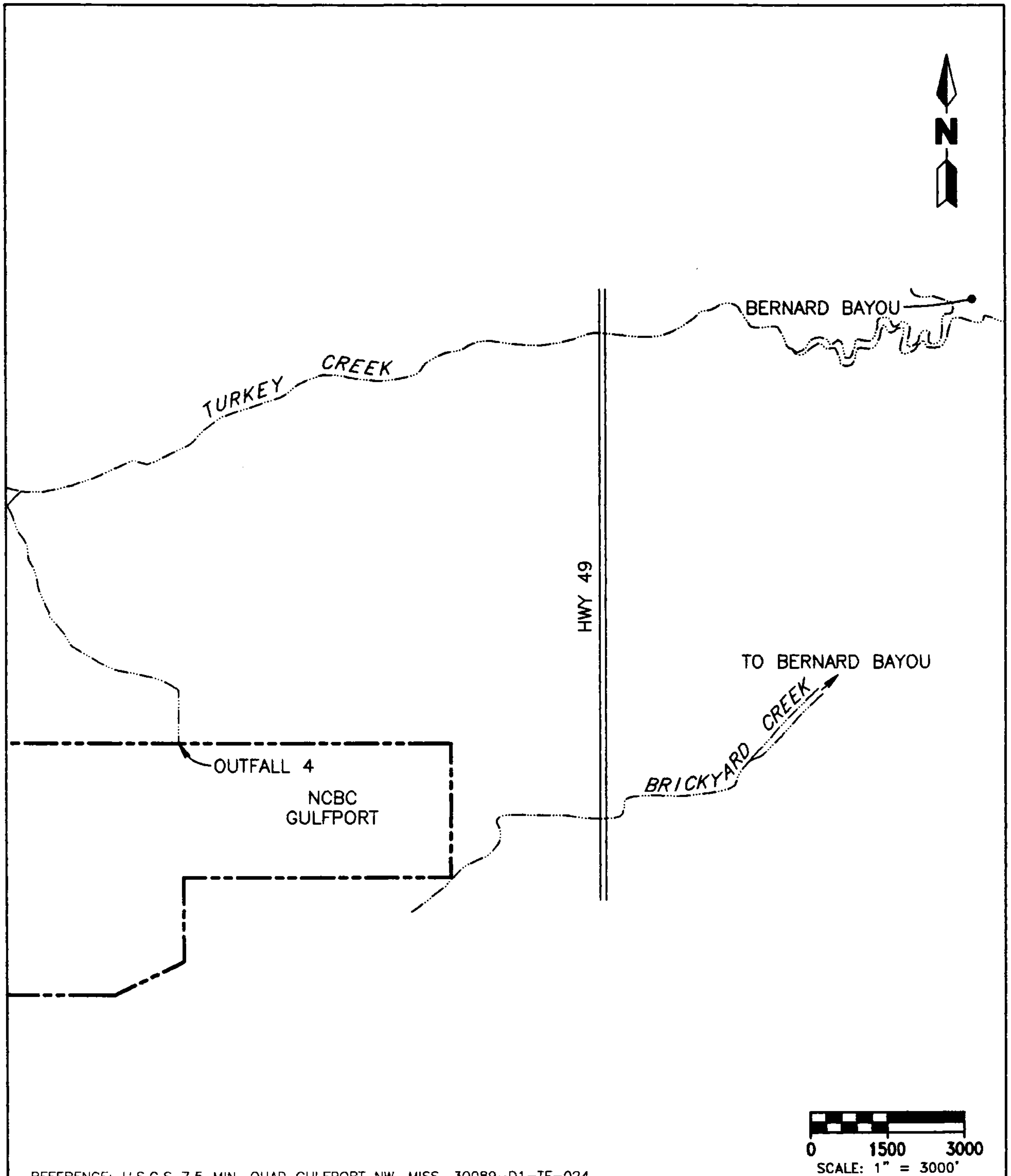
FIGURE 2-1

CANAL NO. 1 AND TURKEY CREEK DRAINAGE

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_2-1\DMF\960424



REFERENCE: U.S.G.S 7.5 MIN. QUAD GULFPORT NW, MISS. 30089-D1-TF-024

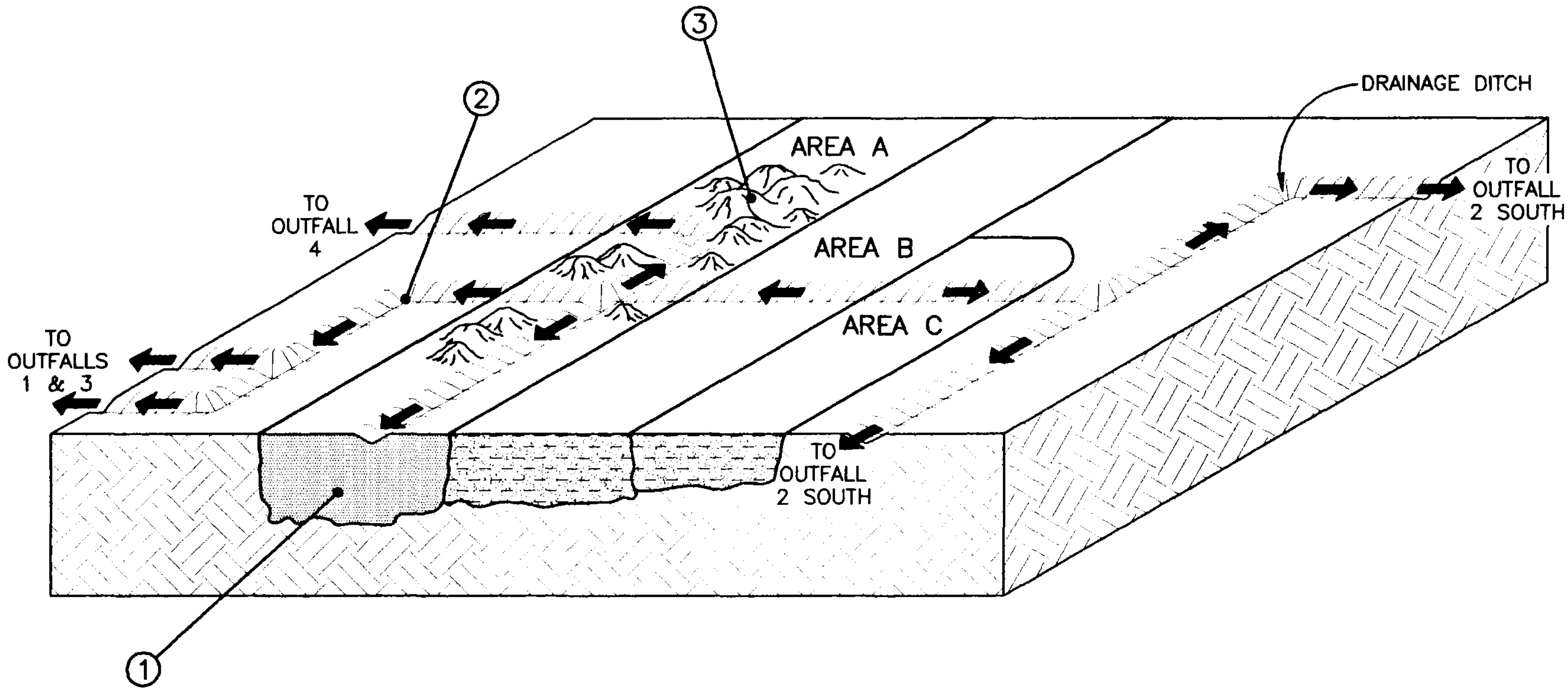
FIGURE 2-2

TURKEY CREEK AND BERNARD BAYOU DRAINAGE

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_2-2\DMF\960424



LEGEND

① SOIL CONTAMINATION DUE TO HERBICIDE ORANGE STORAGE

② SEDIMENT RUNOFF
* SOIL EROSION/RUNOFF

③ ASH EROSION

⬅ FLOW PATH LINES

NOT TO SCALE

FIGURE 2-3

CONCEPTUAL MODEL - SITE 8

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_2-3\DMF\960424

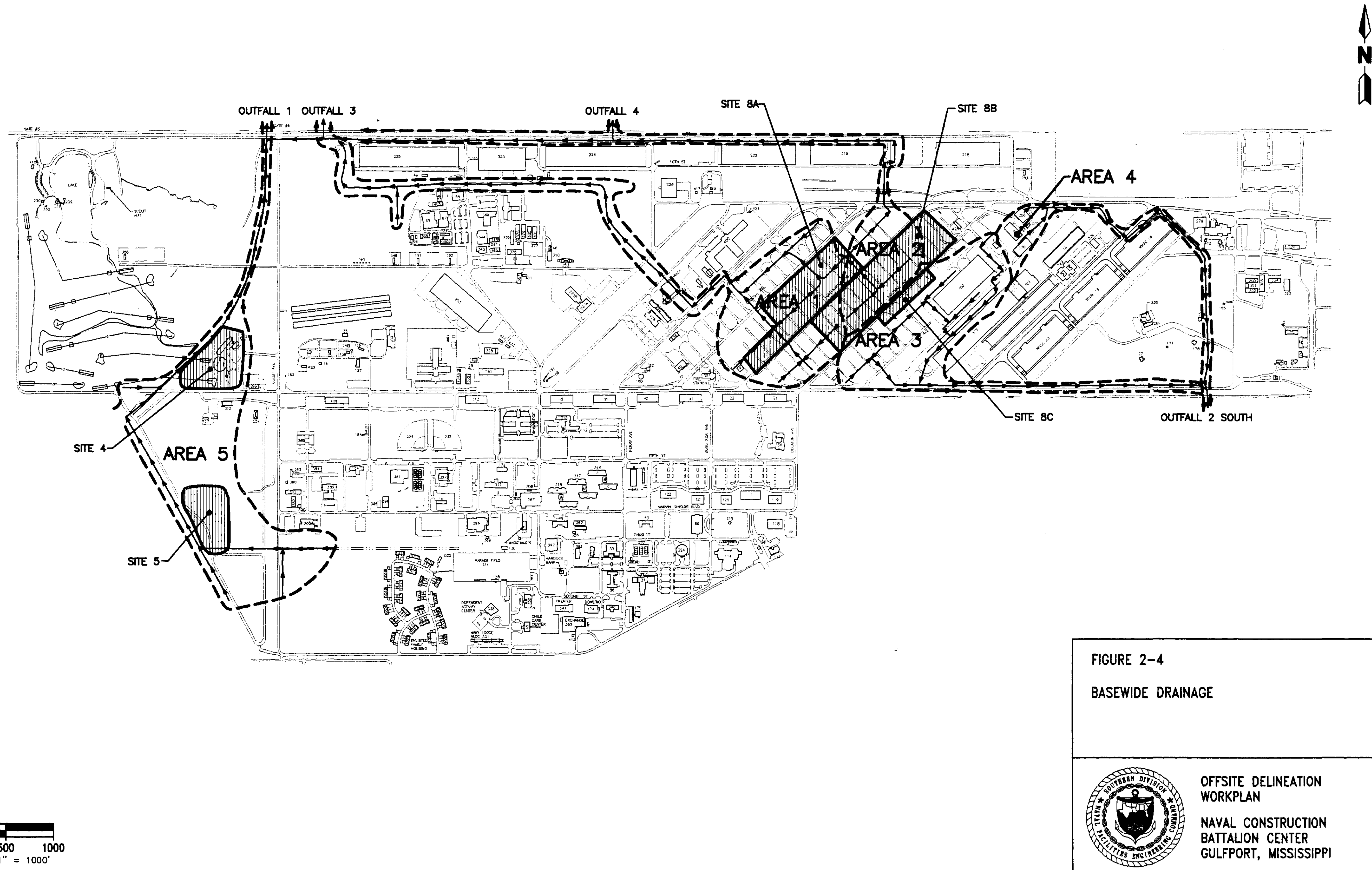


FIGURE 2-4

BASEWIDE DRAINAGE

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-16\ONSITE\FIG_2-4\DMF\960425 north side of the base because part of the drainage area that passes through Outfall 2 South drains the eastern part of Site 8 (Figure 2-4). Figure 2-5 is the offsite conceptual model that identifies the pathways and areas of concern in the potentially impacted drainage ways offbase.

2.3 TARGET ANALYTES. The target analytes during this investigation, as outlined in the AO, are the dioxin and furan congeners and the constituents that make up HO (2,4-D and 2,4,5-T). The phenoxy-herbicides 2,4-D and 2,4,5-T are known to be in HO, which the dioxin congeners form as a trace impurity. Total organic carbon (TOC) amounts will be determined in the sediment and soil samples. TOC has proven to be an indicator for likely areas of dioxin deposition. The effectiveness of TOC as a dioxin indicator will be used to guide sampling efforts and could prove especially useful during any remedial activities that require removal of impacted sediments or surface soils.

2.4 MEDIA OF INTEREST. The media of concern for the Offsite Delineation Workplan, as outlined in the AO, are offbase surface water, sediment, and surface soil in areas where overflow from ditches could potentially deposit impacted sediment outside the ditch.

2.5 NATURE OF HO AND DIOXIN. Dioxin is a colorless and odorless solid at room temperature, has a very low aqueous solubility (octanol-water partition coefficient equals 1.93×10^{-5}), and is not likely to be dissolved in water at concentrations above 20 ppt (Arienti and others, 1988). However, dioxin is soluble in oils, fats, and organic solvents. Dioxin has a specific gravity greater than water and a strong affinity for organic carbon. Dioxin is known to have a long half life in nature before breaking down. HO was mixed with diesel fuel prior to application as a herbicide and was stored at Site 8 already mixed with diesel fuel.

Considering the nature of dioxin, it is likely that dioxin has adhered to soil or organic particles and is mobile primarily in the sediment bed load in ditches or through erosion of surface soil. This trend has been verified through a comparison of sediment, surface water, and surface soil samples (ABB-ES, 1995f and 1995g).

2.6 TRANSPORTATION AND DEPOSITION OF DIOXIN. The main mechanism for dioxin transportation is the erosion and mobilization of dioxin-contaminated soil from Site 8 (see Figure 2-3, Conceptual Model for Site 8). In this figure, soil at the former storage area are shown as the source for dioxin-containing sediment in the ditches that drain Site 8. The relationship between the onbase ditches and the offbase ditches is shown on Figure 2-5. As shown on Figure 2-5, the dioxin potentially migrates to Outfalls 1 and 3 North through drainage Area 1. The highest sediment sample results have been obtained in this drainage area. Transport of dioxin to Outfall 4 North could potentially occur through the sediment bed load transfer from drainage area 2 (Figure 2-4). The drainage ditch leading away from Outfall 4 has not been field-confirmed.

THIS PAGE INTENTIONALLY LEFT BLANK.

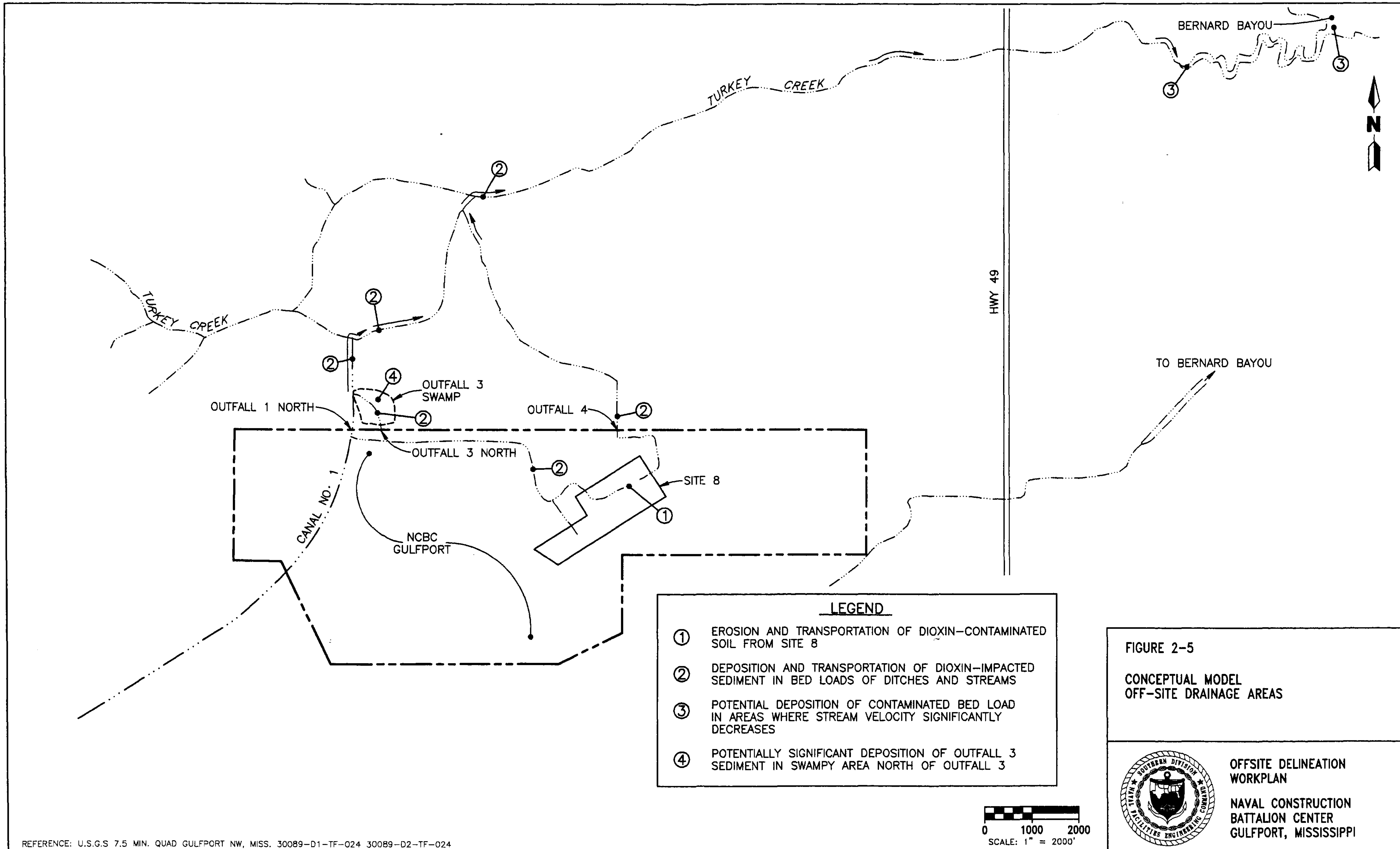


FIGURE 2-5

CONCEPTUAL MODEL
OFF-SITE DRAINAGE AREAS

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_2-5\DMF\960424

Deposition of dioxin occurs through four mechanisms: (1) sediment settles out in the bed load in low-energy environments in the ditches; (2) the dioxin becomes adhered to the organic-rich "muck" commonly found in the ditches; (3) sediment is deposited outside the banks of the ditches during high-flow periods; and (4) wind-blown deposits are blown off Site 8 and deposited downwind. The first three mechanisms have all been substantiated through sampling, while the wind-blown deposits have been observed but not quantified. The offsite conceptual model (Figure 2-5) shows the conceptual scenario for suspected dioxin deposition.

The relationship between organic carbon and dioxin TEQs in the sediment sample results has been observed and reported in the Removal Action Technical Support (ABB-ES, 1995h) and Soil and Sediment Triplicate Study (ABB-ES, 1996d). Both studies determined that as dioxin levels increased a corresponding increase in organic carbon was observed.

This relationship will be used in the field to attempt to locate the potential area of highest dioxin deposition in the ditch systems by locating the areas of greatest organic carbon deposition. In this manner, a biased sample would be collected that can be reasonably assumed to contain the highest levels of dioxin in that particular ditch segment. This method of biased "maximum" samples will be verified by including organic carbon analysis on all sediment samples, even areas where little organic carbon appears to exist.

2.7 POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS. An exposure assessment that will start in May 1996 and be completed in August 1996 will identify exposure pathways and potential receptors of the contaminants identified in the AO. The results of that study will be incorporated into the site conceptual models generated for Site 8 and off site ditches. The information from the exposure assessment may provide additional guidance for the need to collect additional samples in Phase II, as well as determine the need for, and to some extent, the scope of, future remedial actions.

2.8 SAMPLE LOGIC DIAGRAM. The sample logic diagram included in this section (Figure 2-6) illustrates the process for evaluating Phase I sample results and provides the decision matrix for Phase II actions. The sampling logic diagram has been developed for sediment and surface water collection in potentially impacted ditch systems off the base and for surface soil areas potentially impacted by overflow and deposition of dioxin-containing sediment.

2.8.1 Sediment and Surface Water Offbase Sediment and surface water samples at the base boundary confirm that these media have been impacted and could act as a secondary source of contamination. Phase I sample locations have been selected through the conceptual model process that have the following objectives: identify which ditches and streams offbase have been affected by the HO stored at Site 8, collect samples in Phase I to subdivide these ditches and streams into manageable segments of contamination, and utilize risk data and engineering requirements to guide Phase II sampling.

The decision points for Phase II actions, illustrated on Figure 2-6, are first to identify contaminated segments and then to determine what the Phase II action will be. Prior to Phase II sampling, data needs for delineation will be weighed

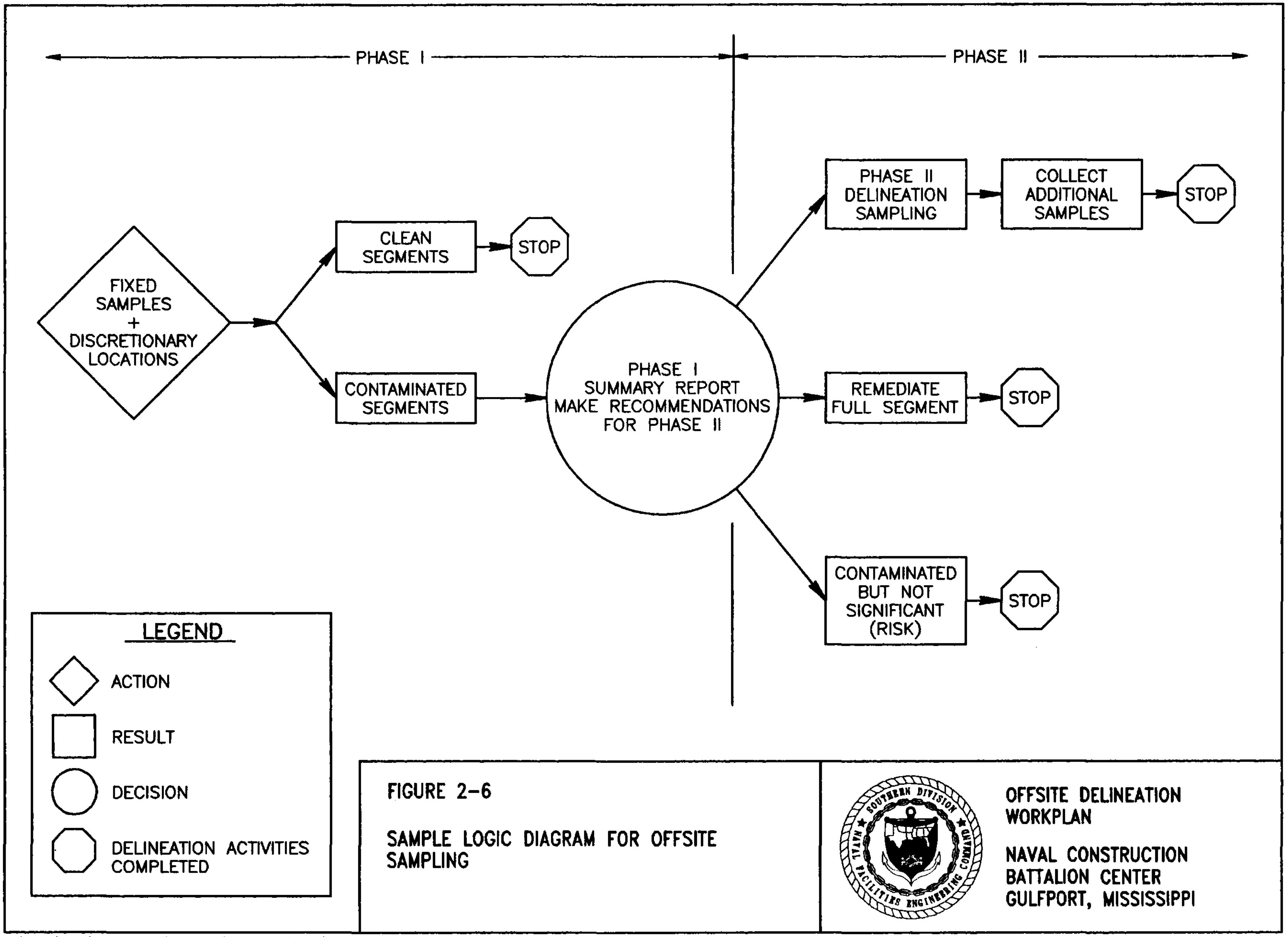


FIGURE 2-6

SAMPLE LOGIC DIAGRAM FOR OFFSITE SAMPLING

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_2-6\DMF\960424

against risk considerations and engineering requirements. For example, if the hypothetical impacted segment identified in Phase I was remediated through excavation, then no further Phase II delineation sampling of that segment would be required.

<u>**2.8.2 Surface Soil Offbase**</u> Surface soil samples will be collected in areas where surface water and sediment overflow the ditch and stream banks and are deposited on surface soils. The locations for surface soil sampling offbase will be identified in the field.

3.0 FIELD INVESTIGATION

The objectives of the offsite field investigation are identification and delineation of the presence of dioxin related to the storage and handling of HO at Site 8. The field investigation will be focused on the offbase media potentially impacted by the storage and handling of HO at Site 8. The areas covered in this workplan are the surface water and sediments in Canal No. 1, the swamp north of Outfall 3 (Outfall 3 swamp), Turkey Creek, and Bernard Bayou. Also considered in this field investigation are soils in and near the identified ditches and streams that have received impacted sediment.

The Phase I sample selection process outlined in this Chapter is based on the conceptual models developed and presented in Chapter 2.0. The logic diagrams illustrate the two-phased sample collection process. By focusing the sample collection in a phased approach, fewer samples will be required to confidently identify and delineate impacted areas and meet the needs of the AO. The traditional approach of collecting samples on a grid or on a fixed spacing in a single phase would result in an inordinate number of samples. By phasing in the delineation, segments of ditches and streams that do not contain dioxin can be eliminated from the areas of concern without additional sampling. The work will include sediment and surface water sampling in the identified streams and ditches, as well as surface soil sampling in overflow depositional areas. The results of the first phase of the work will be used to update the conceptual models and focus the efforts in the second phase.

Currently, only surface water and sediment samples near the base drainage system and in the swamp north of Outfall 3 North should require further delineation sampling in Phase II. This assumption is based on results of sediment samples collected from Canal No. 1 and Turkey Creek (ABB-ES, 1995g).

3.1 PRELIMINARY ACTIVITIES. Prior to initiation of field activities, various mobilization tasks must be completed to ensure efficient field sampling events. The project team will develop specifications to initiate procurement of subcontractors and vendors for specialized services and equipment. Standard items for mobilization will be handled in accordance with Federal Acquisitions Regulations with individual items being coordinated through the field operations leader (FOL) and the task order manager (TOM).

Additional efforts will be expended to ensure that coordination exists among the contractor, the base environmental coordinator, and a representative from Public Works while activities are occurring on the base. The contractor will keep the environmental coordinator informed of the scheduled field activities to prevent interference with base activities.

Obtaining permission for sampling on private property will require formal notification of the owners of all properties where proposed sampling activities are planned. The effort to notify owners and obtain permission should begin as early as possible to prevent serious delays in the field program.

3.2 FIELD INVESTIGATION. Phase I of the investigation will focus on identifying dioxin-impacted segments of the identified streams, ditches, and the swamp north of Outfall 3. The work will include sediment, surface water, and surface soil collection from Canal No. 1, Outfall 3 swamp, Turkey Creek, and Bernard Bayou.

Phase II of the investigation will refine the delineation of the segments containing dioxin. The Phase II sampling will be conducted to provide data to adequately design remedial measures and conduct risk assessments specifically for HO and the dioxin congeners. Technical justification for Phase II actions will be included in the Phase I Summary Report outlined in Chapter 5.0 of this workplan.

3.2.1 **Sediment and Surface Water** The Phase I sampling locations for Canal No.1, Turkey Creek, and the Outfall 4 Swamp are shown on Figure 3-1. These locations were selected based on known contamination and the conceptual transportation and depositional pathways of potentially impacted surface water and sediment that migrates off the base.

Phase I sediment and surface water sample locations downstream in Turkey Creek and into Bernard Bayou are shown on Figure 3-2. The objectives of these samples are to identify dioxin in surface water and sediment in Turkey Creek and Bernard Bayou and to quantify the downstream limits of the dioxin.

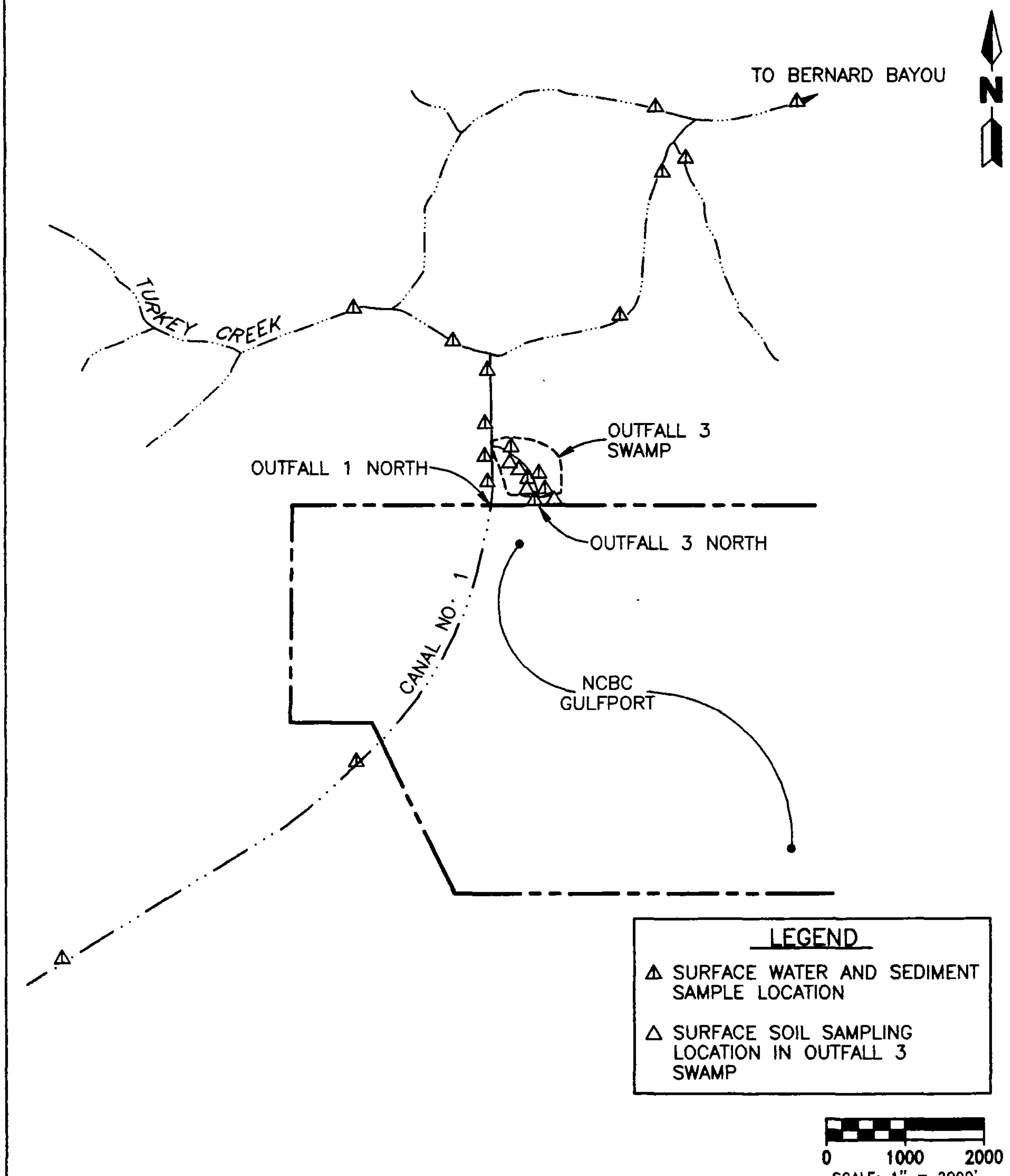
The sampling locations shown on Figures 3-1 and 3-2 are only approximate, because exact sediment sample locations will be biased towards collecting the most dioxin-impacted sample in the identified area. The biased sample approach is important because sample results will be a maximum for that segment of the drainage way, which will reduce the total number of samples required to achieve a confident delineation.

Note that sample density is greatest in the immediate vicinity of the base and decreases with distance from the base. This sample strategy has been selected based on dioxin sample results from Canal No. 1 and Turkey Creek (ABB-ES, 1995g) and conceptually, the concentration of dioxin contamination should decrease due to volume dilution from larger bed loads in larger bodies of water (i.e, Canal No. 1 to Turkey Creek to Bernard Bayou).

Thirty-three fixed sediment locations along with six discretionary sediment samples have been identified for Phase I. Of the 37 identified locations, 12 will have an additional sample collected in the sidewall in areas where obvious or suspected deposition has occurred. The discretionary samples are included for use if the FOL identifies a pertinent location not identified in this workplan. Twenty percent of the sediment locations will have an associated surface water sample collected. Twenty percent surface water collection is proposed based on consistent data (ABB-ES, 1995f and 1995g) showing that dioxin is typically not present or mobile in surface water.

Ten surface soil samples will be collected from areas where drainage overflow and deposition of sediment are identified in drainage systems offbase. Five fixed surface soil locations have been identified in the Outfall 3 swamp, with an additional five discretionary samples potentially collected by the FOL.

3.2.2 **Geotechnical Sample Collection** Geotechnical parameters outlined in the Interim Corrective Measures Workplan (ABB-ES, 1996c) will be collected during Phase I of the field investigation. Samples are collected during this investigation to facilitate an engineering evaluation and to support the generation of the



REFERENCE: U.S.G.S 7.5 MIN. QUAD GULFPORT NW, MISS 30089-D2-TF-024

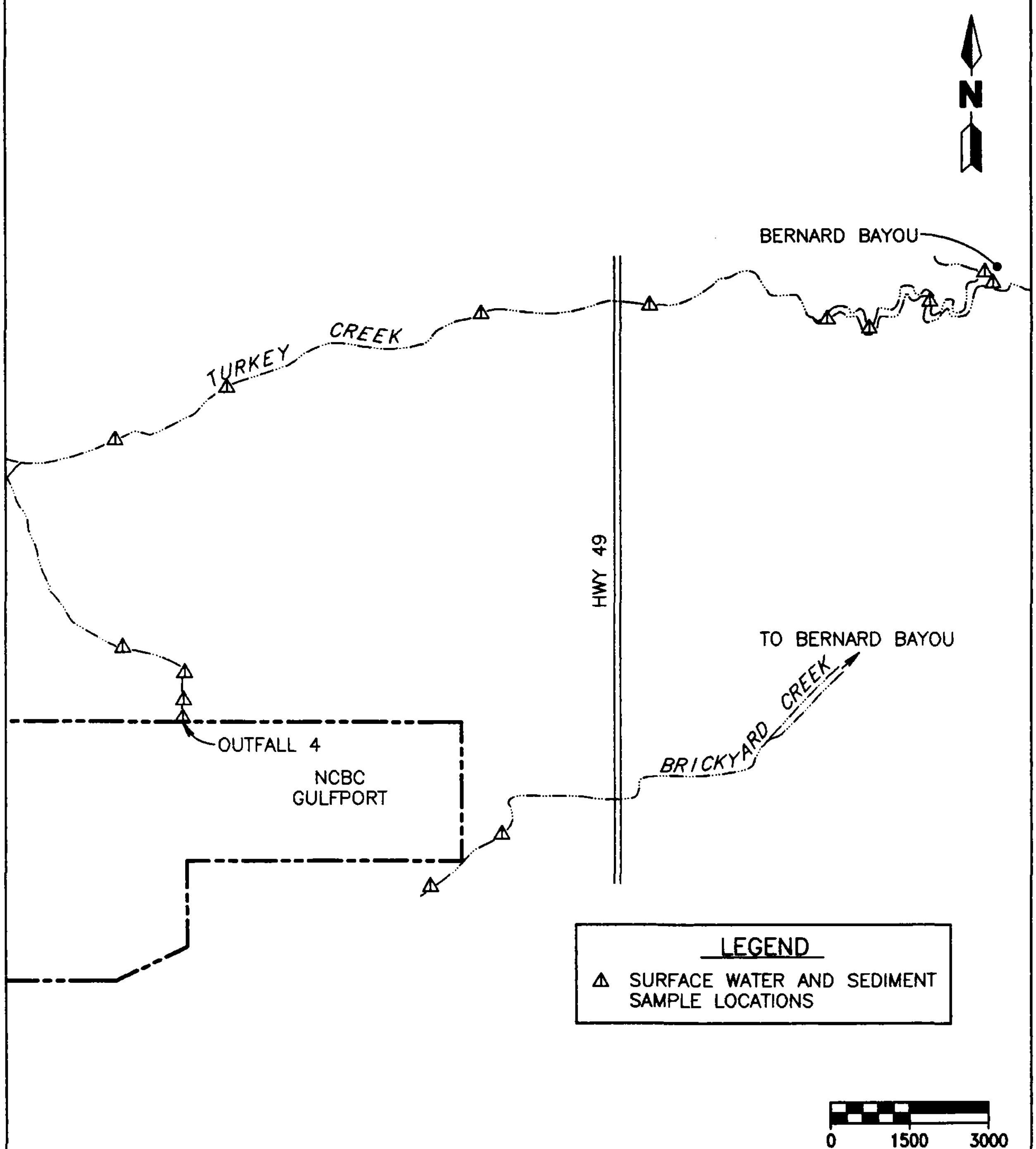
FIGURE 3-1

SURFACE WATER, SEDIMENT, AND SURFACE SOIL SAMPLING LOCATIONS FOR TURKEY CREEK AND BERNARD BAYOU

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_3-1\DMF\960424



REFERENCE: U.S.G.S 7.5 MIN. QUAD GULFPORT NW, MISS. 30089-D1-TF-024

FIGURE 3-2

SAMPLING LOCATIONS FOR TURKEY CREEK AND BERNARD BAYOU

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

D:\DWG\ABB\08505-14\OFFSITE\FIG_3-2\DMF\960424

Remedial Action Workplan requested by MSDEQ in the AO. Chapter 4.0 summarizes the parameters and media that will be collected. Geotechnical samples will be collected along with the Phase I fixed locations.

3.3 TECHNICAL BASIS FOR SAMPLE COLLECTION. This section outlines the sampling method for each of the media identified in this workplan.

3.3.1 Surface Soil Sample Collection Surface soil sample collection will be performed using a stainless-steel hand auger. The samples will be a composite from the surface to 1.0 foot in depth. Mixing of the composite will be performed in a decontaminated glass bowl using a stainless-steel trowel or long-handled spoon. The sample locations will be identified in the field in areas where bed load sediment has been deposited outside the banks of the ditches and streams.

3.3.2 Surface Water and Sediment Sample Collection A biased sampling method will be used when collecting sediment samples. This method is proposed because of the variable nature of dioxin transportation and deposition. According to the conceptual model developed for this base, dioxin is transported through the bed load of ditches and streams and is deposited in low-energy environments, or where organic-rich deposits have accumulated. This mechanism for deposition has been observed through field sampling and analysis (ABB-ES, 1995f and 1995g) and results in heterogeneous deposition of dioxin-containing sediment. Therefore, samples will be collected from low-energy, organically rich areas. The Phase I-identified locations are a guide to the sample location, within 20 to 50 feet. The final location will be determined and documented in the field as the location with the highest likelihood of containing dioxin.

The sample collection will be a composite of the 0 to 1.0 foot interval. The samples will be collected using decontaminated stainless-steel augers. The samples will be a composite from the surface of the bed load to 1.0 foot in depth. Mixing of the composite will be performed in a decontaminated glass bowl using a stainless-steel trowel or long-handled spoon.

The surface water samples will be collected at 20 percent of the sediment locations. The surface water samples will be collected at the same location, but prior to collection of the sediment sample to minimize the amount of sediment in the water sample.

A global positioning satellite (GPS) receiver will be used to determine the exact locations of samples collected offbase. GPS will be used because of the large distances between samples and the relative lack of cultural features that could serve as location references.

3.4 FIELD DECONTAMINATION PROCEDURES. Where possible, the field crew will transport sufficient equipment so that the entire study can be conducted without the need for field decontamination. However, when this is not possible, the following field decontamination procedures will be followed (ABB-ES, 1993b).

Teflon™, stainless-steel, or glass sampling equipment will be used to collect the samples and will be decontaminated between sample locations as listed below.

1. Wash and scrub equipment with laboratory detergent and tap or deionized water.

2. Rinse thoroughly with organic-free deionized water.

3. Rinse twice with nonpolar solvent (pesticide-grade isopropanol). This is especially important when sampling for dioxin because dioxin is not soluble in water.

4. Rinse with organic-free deionized water and allow to air-dry for as long as possible.

3.5 CONTROL AND DISPOSAL OF INVESTIGATIVE-DERIVED WASTE. The investigative-derived waste (IDW) will be segregated by medium and stored in 55-gallon drums. Labels will be attached to the drums that describe the content of the specific container (soil or water) and the date of generation. The drums will then be placed on pallets.

Personal protective equipment and other disposable items (Visqueen™, disposable equipment, etc.) will be washed and scrubbed to remove debris, double bagged, and disposed in NCBC waste containers.

At the end of the field investigation, the IDW will be characterized by sampling the waste for TCLP dioxin. The storage containers will then be labeled as non-hazardous, solid waste, or hazardous waste based on these results.

The laboratory results will be used to determine the final disposition of the containerized IDW. A copy of the laboratory analytical report will be stored onbase so that comparisons of the results and IDW classification and disposition can be made.

3.6 HEALTH AND SAFETY PLAN. This field investigation will utilize the Health and Safety Plan developed for the Remedial Investigation and Feasibility Study (RI/FS) (ABB-ES, 1993) for NCBC Gulfport.

4.0 ANALYTICAL PROGRAM

This chapter outlines the analytical program for chemical and geotechnical data to be collected during offsite delineation activities at the NCBC. The analytical program includes the development of data quality objectives (DQOs) for the program; identification of laboratory methodology for sample analyses; procedures for data assessment, including data validation procedures; and procedures for data management. All procedures and methodology included in this analytical program are consistent with those outlined in the RI/FS SAP for NCBC Gulfport (ABB-ES, 1993b).

4.1 LABORATORY ANALYSIS. As discussed in Chapter 3.0, environmental samples will be collected from soil, surface water, and sediment. Samples will be collected for chemical and/or geotechnical analyses. The following subsections identify analytical methods to be followed for each type of sample analysis to be performed.

4.1.1 Chemical Analyses Grab samples collected from each environmental medium, along with associated quality control (QC) samples, will be analyzed for two chlorinated herbicide compounds, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzofurans. In addition, all soil and sediment samples will be analyzed for TOC.

Chemical analysis for the chlorinated herbicides will be in accordance with USEPA SW-846 Method 8150 (USEPA, 1986). Chemical analysis for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans will be in accordance with USEPA SW-846 Method 8290 (USEPA, 1986b). TOC analyses will be performed according to USEPA SW-846 Method 9060. Holding times and preservation requirements associated with each of these analytical methods are presented in Table 4-1.

4.1.2 Geotechnical Analyses Surface water samples collected in support of off-site remediation activities will be analyzed for total dissolved solids (TDS), total suspended solids (TSS), dissolved oxygen (DO), and oxidation/reduction potential (ORP). TDS and TSS will be analyzed in accordance with USEPA Method 160.1 and 160.2, respectively (USEPA, 1983). DO will be analyzed in the field using a YSI-55 DO meter. ORP will also be analyzed in the field using an Orion 250A meter and ORP probe.

Sediment samples collected in support of offsite remediation activities will be analyzed for the following: sieve analysis by American Society for Testing and Materials (ASTM) Method D-421, hydrometer analysis by ASTM Method D-422, Atterberg limits by ASTM Method D-4318, bulk density by ASTM Method E12-70, cation exchange capacity by USEPA SW-846 Method 9081, and pH by USEPA SW-846 Method 150.1 (ASTM, 1984; USEPA, 1986b). Holding times and preservation requirements associated with these analytical methods are presented in Table 4-1.

4.2 DQOs. DQOs for the analytical program were developed to provide data of sufficient quality to support decisions associated with site conditions. The USEPA has defined five DQO levels that correspond to the intended uses of the analytical data (USEPA, 1987). Tasks for offsite delineation activities at NCBC

Table 4-1
Summary of Holding Time and Preservation Requirements

Offsite Delineation Workplan
Site 8, Former Herbicide Orange Storage Areas
Naval Construction Battalion Center
Gulfport, Mississippi

Chemical Parameter	Preservation	Holding Time (from date of sample collection)	
		Soil and Sediment	Groundwater and Surface Water
Chlorinated herbicides	Cool, 4 °C	14 days extraction 40 days analysis	7 days extraction 40 days analysis
Dioxins and furans	Cool, 4 °C	30 days extraction 45 days analysis	30 days extraction 45 days analysis
Total organic carbon	Cool, 4 °C H_2SO_4 to pH <2	28 days	---
Total dissolved solids	Cool, 4 °C	---	7 days
Total suspended solids	Cool, 4 °C	---	7 days
Dissolved oxygen	None	---	Immediately upon collection
Oxidation/reduction potential	None	---	Immediately upon collection
Sieve analysis	None	None	---
Hydrometer analysis	None	None	---
Atterberg limits	None	None	---
Bulk density	None	None	---
Cation exchange capacity	None	None	---
Soil pH	None	Immediately	---

Notes: °C = degrees Celsius.
H_2SO_4 = sulfuric acid.
< = less than.
--- = no data.

Gulfport will involve data collection with DQOs ranging from USEPA Level I to Level V (USEPA, 1994b). Level I data to be collected will provide qualitative information regarding air quality (for health and safety purposes) and aquifer stabilization during well purging. Level III data to be collected will provide quantitative information used to characterize site conditions, but do not require data validation. Level IV data collected will provide the highest quality of analytical information used to characterize site conditions and support risk assessment activities. Level IV data are required to be validated according to USEPA guidelines. Level V data collected will provide information used to evaluate remedial alternatives and support engineering design. Table 4-2 summarizes the DQO levels for each type of data that will be collected during field activities and lists the current and potential future uses associated with each data set.

Table 4-2
Summary of Data Quality Levels, Analyses, and Data Uses

Offsite Delineation Workplan
Site 8, Former Herbicide Orange Storage Areas
Naval Construction Battalion Center
Gulfport, Mississippi

DQO Level	NEESA DQO Level	Type of Analysis	Data Uses in RFI	Validation
I	---	Organic vapor screening pH Conductivity Temperature	Health and safety monitoring Qualitative site characterization Well development and groundwater sampling	Not required
III	C	TOC analyses	Indicator parameter for dioxin Site characterization Evaluation of remedial alternatives Engineering design	Not required
IV	D	Chlorinated herbicide analyses Dioxin/furan analyses	Site characterization Risk assessment Evaluation of remedial alternatives Engineering design	Yes
V	E	Geotechnical analyses	Evaluation of remedial alternatives Engineering design	Not required

Notes: DQO = data quality objective.
NEESA = Naval Energy and Environmental Support Activity.
--- = no data.
RFI = Resource Conservation and Recovery Act Facility Investigation.
TOC = total organic compound.

Naval Energy and Environmental Support Activity (NEESA) has adopted QC levels for sample collection, analysis, and data validation that, when followed, provide data of sufficient quality to meet required DQOs (NEESA, 1988). NEESA QC levels C, D, and E correspond to USEPA DQO levels III, IV, and V, respectively. In order to meet the required DQOs, investigative samples will be collected and analyzed in accordance with NEESA guidance using standard USEPA-accepted techniques and protocols. As presented in Section 4.1, only USEPA-accepted analytical methods were selected for Level III and Level IV sample analyses. In addition to selecting the appropriate sampling and analysis protocols, certain QC samples must be collected during sampling activities to meet the required DQOs. A brief description of QC samples and frequency of collection is presented below. Selected definitions were obtained from USEPA Region IV Standard Operating Procedures (USEPA, 1991a) and NEESA guidance (NEESA, 1988).

Field Duplicate Samples. Field duplicate samples are two or more samples collected simultaneously into separate containers from the same source under identical conditions. Analytical data generated from the collection and analysis of field duplicate samples are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol. Field duplicate samples will be collected at a frequency of 10 percent per sample matrix for Level III and Level IV analyses. Field duplicate samples will be collected at a frequency of 5 percent per sample matrix for Level V analyses.

Matrix Spike and Matrix Spike Duplicate (MS/MSD) Samples. MS/MSD samples are additional samples collected in the field from a single sampling location. Analytical data generated from the collection and analysis of MS/MSD samples are intended to assess the precision and accuracy of laboratory procedures. One set of MS/MSD samples will be collected at a frequency of 5 percent per sample matrix for Level IV analyses. Collection of MS/MSD samples for Level III and Level V analyses are not required. However, in accordance with laboratory methodology, laboratory precision and accuracy for Level III analyses will be measured using internal QC procedures.

Equipment Rinsate Blanks. Equipment rinsate blanks are collected by running deionized, organic-free water over and/or through sample collection equipment after it has been decontaminated. Analytical data generated from the collection and analysis of equipment rinsate blanks are used to assess the quality of decontamination procedures and to monitor potential cross-contamination that impacts the representativeness of the investigative data set. Rinsate blanks must be analyzed for the same parameters associated with Level III and IV data.

Equipment rinsate blanks will be collected at a frequency of one every other day per type of sampling tool used. This frequency was modified from the frequency stated in NEESA guidance. NEESA guidance requires that rinsate samples be collected daily, but analysis is only required on every other rinsate collected. If analytical results for blanks indicate the presence of site-related contaminants, then all rinsate samples collected must be analyzed. However, this approach is not feasible because the turn around time for sample results rarely provides enough time to extract archived samples before holding times are exceeded. The modified approach to rinsate collection has been accepted by USEPA and SOUTHNAVFACENGCOM and is considered standard protocol.

Source Water Blanks. Source water blanks include a complete set of samples collected from each water source used in the investigation. Analytical data generated from the collection and analysis of equipment rinsate blanks should account for potential artifacts that could be introduced through decontamination, which impacts the representativeness of the investigative data set. One set of samples from each water source will be collected at the beginning of each sampling event. Source water blanks must be analyzed for the same parameters associated with Level III and IV data.

4.3 DATA QUALITY ASSESSMENT. DQOs are based on the premise that different data uses require different levels of data quality. Data quality refers to the degree of uncertainty with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC). NEESA outlines data set deliverable requirements for each DQO level (NEESA, 1988). Based on the intended use of the Level III and Level V data to be collected during offsite delineation activities, laboratory deliverables will be reviewed by the project chemist for adherence to the specified analytical method, data completeness, and precision. Data precision for Level III and Level V data will be measured by evaluating field duplicate sample results and laboratory QC results, if applicable. To meet Level IV DQOs for this project, Level IV laboratory data must be validated according the USEPA guidelines and assessed to determine the validity of the data set. The following subsections discuss the data validation procedures to be followed for Level IV data and define the data quality indicators that are required to be assessed.

4.3.1 **Level IV Data Validation** Validation of data is a systematic process of reviewing a body of data to provide assurance that the data are adequate for their intended uses. The useability of Level IV data generated during this investigation will be determined by evaluating the data against criteria and procedures established by the USEPA, NEESA, and method-specific quality assurance and quality control (QA/QC) guidance. In general, USEPA and NEESA guidelines provide a systematic procedure for evaluating laboratory QA/QC measures such as holding times, blank analyses, surrogate recoveries, MS/MSD results, instrument calibration, compound identification, and method performance.

Upon receipt, Level IV data packages will be validated according to USEPA Level IV (NEESA Level D QC criteria) and QA/QC criteria specified by each analytical method. These criteria are described in Subsection 7.3.1 of NEESA Document 20.2-047B (NEESA, 1988). The USEPA *National Functional Guidelines for Organic Data Review* (USEPA, 1991b) will also be used, where applicable, to validate the laboratory data. Validated data will be prepared in three initial formats: raw laboratory data, data marked with validation qualifiers or annotations, and corrected or validated data. The validated data can then be used for site contaminant characterization and assessment.

4.3.2 **PARCC Evaluation** The acceptance criteria for PARCC parameters for Level IV DQOs outlined in this subsection are consistent with the QC requirements of the USEPA SW-846 analytical methods chosen and USEPA guidelines for data review.

Precision. Precision is defined as the agreement among individual measurements of the same chemical constituent in a sample, obtained under similar conditions. Precision objectives for analysis of site samples will be measured using field duplicates samples (including matrix spike duplicates). Acceptance criteria for field duplicate precision for Level IV DQOs have been set at 30 and 50 for aqueous and solid analyses, respectively. Acceptance criteria for laboratory duplicate precision for Level IV DQOs have been set at 20 and 35 for aqueous and solid analyses, respectively.

The precision criteria to be used for matrix spike duplicates are compound-specific and will be consistent with the QC requirements of the USEPA SW-846 methods chosen. Precision will be shown as a relative percent difference (RPD) where

$$RPD = |X1-X2| / \frac{X1+X2}{2} * 100 \quad (1)$$

where:

RPD = relative percent difference between results
X1 and X2 = results of duplicate analysis
|X1-X2| = absolute difference between duplicates X1 and X2.

Precision objectives apply to both field and laboratory duplicates. However, field duplicates based on the analytical results take into account the level of error introduced by field sampling techniques, field conditions, and analytical variability. The RPD of all laboratory duplicates will be reported by the laboratory, and the RPD of field duplicates will be calculated to evaluate the sample precision.

Accuracy. Accuracy is defined as the degree to which the analytical measurement reflects the true concentration level present. Accuracy will be measured as percentage recovery for matrix spikes as the primary QC criterion and percentage recovery of surrogate spikes as a secondary QC criterion. The acceptance criteria for data meeting Level IV DQOs will be designated by the laboratory based on their historical performance for each analytical method used and method-specific QC criteria.

A matrix spike is a sample (of a particular matrix) to which predetermined quantities of standard solutions of certain target analytes are added prior to sample extraction and/or digestion and analysis. Samples are split into replicates, one replicate is spiked, and both aliquots are analyzed.

Accuracy can also be evaluated using the recovery of surrogate spikes in the organic analyses. These spikes consist of organic compounds that are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. These compounds are spiked into all blanks, standards, and samples prior to analysis.

Percentage recoveries of the surrogate and matrix spikes will be reported by the laboratory for all analyses with the samples. The percentage recovery of the spikes can be calculated from the following equation:

$$\text{Percentage recovery} = (X-B)/T * 100 \quad (2)$$

where:

X = measured amount in sample after spiking
B = background amount in sample
T = amount of spike added.

Representativeness. Representativeness expresses the degree to which sample data depict an existing environmental condition. Representativeness is accomplished through proper selection of sampling locations and sampling techniques and collection of a sufficient number of samples. The sampling locations for this investigation will be chosen in a biased approach based on previous analytical data, screening data collected in the field, and apparent and measured flow directions.

Sampling and analytical protocols were chosen so that measurements of samples will be as representative of the media and conditions being measured as possible. Sample collection, handling, and documentation will be performed in accordance with USEPA Region IV Standard Operating Procedures (USEPA, 1991a) to ensure that collection and handling techniques do not alter the sample and to provide an adequate tracking mechanism from the time of collection through laboratory analysis.

The collection and analysis of field blanks, trip blanks, and equipment rinsate blanks and conformance with requirements for analytical methods, such as extraction and analysis holding times and analysis of method blanks, will also be used to ensure representativeness of sample data.

Completeness. The characteristic of completeness is a measure of the amount of valid data obtained compared to the amount of data originally intended to be obtained. The completeness goal for DQO Levels III, IV, and V has been chosen as 95 percent.

Comparability. The characteristic of comparability reflects the confidence with which one data set can be compared with other measurements and the expression of results consistent with other organizations reporting similar data. In general, comparability can be determined by comparing data from replicate split samples that are analyzed by two separate contract laboratories. However, for this investigation, analysis of split samples is not required. Comparability for this investigation will be accomplished through the use of standard, USEPA-approved techniques and procedures for sample collection, handling, analysis, validation, and reporting.

4.4 DATA MANAGEMENT. Three broad categories make up data management: laboratory data management, sample data management, and field data management. Laboratory data management consists of storing, retrieving, editing, validating, and reporting the results of the laboratory chemical analyses. Sample data management consists of tracking the origin, location, and status of a set of chemical data obtained from the analysis of an environmental sample. Field data management consists of storing, retrieving, and reporting the results of measurements taken in the field.

Laboratory data management begins with receipt of invalidated data (one hard copy and one electronic copy) from the laboratory. The laboratory data manager later receives validated data from the data validator. One hard copy of all chemical data is kept in-house in a locked file cabinet to allow access to the raw data. A second hard copy of the invalidated data is stored offsite. Upon receipt of the validated data, the laboratory data manager uploads the electronic copy into a secure database. Data in the database are backed up daily and the backups are stored for 2 weeks in a fire-safe vault. At the conclusion of the project, the laboratory data manager archives the electronic data and moves the in-house copy of the invalidated data to a storage site separate from the first storage site. This minimizes the risk of catastrophic data loss.

Sample management begins upon creation of the sample. The sample data manager tracks the life cycle of each sample and uses milestones in the life cycle as reference points to judge the status of individual samples. Milestones include sample collection, sample receipt by the laboratory, invalidated sample data receipt, and validated sample receipt, as well as various steps in the process needed to confirm the quality of the electronic data. As each milestone is achieved, the sample data manager records the achievement in a sample data management database. This database is a secure database backed up daily on a 14-day cycle. The backup is stored in a fire-safe vault for 2 weeks. At the conclusion of the project, the sample data manager archives the database and makes two copies to store in separate storage facilities.

Field data management procedures vary depending on the type of data collected. In all cases, two hard copies of the data exist. One copy resides in the field office, and one copy resides in the home office. Where appropriate, electronic field data also exist. The main objectives of the field data manager are to store the field data and to ensure the integrity of any reproductions of the field data. When the project is completed, the field data manager ensures that two correct copies of all field data exist. The field data manager stores each copy in a separate storage facility.

5.0 DATA EVALUATION AND INTERPRETATION

5.1 DATA EVALUATION. Data evaluation is the process of organizing validated data into a working format and then reviewing it to confirm that project DQOs have been met. Data quality indicators of representativeness and completeness are measured to evaluate conformance to the DQOs.

5.2 DATA INTERPRETATION. Data interpretation is the process of reviewing the validated data and identifying the presence or absence of site-related chemical compounds in environmental samples collected during the investigation. In this investigation, the data interpretation process will be extended to incorporate elements of the baseline risk assessment and engineering evaluation to guide the sample collection process in the Phase II investigation. A summary report of the Phase I analytical results will present the data in graphical and tabular form and make recommendations for Phase II sampling. This summary report will present the technical justification for continuing with Phase II samples.

5.3 PHASE I SUMMARY REPORT. The technical evaluation of Phase I results and recommendations regarding Phase II actions will be provided in the Phase I Summary Report. Included in this report are graphical interpretation of TOC as an indicator parameter, maps showing the approximate lines of delineation of dioxin, and a cost analysis, which compares the cost of additional samples versus simply remediating areas that are not as well defined. Additionally, justification for additional samples must also meet one of the following criteria: needs of the requirements of the AO, samples required for engineering evaluation, or samples required for baseline risk assessment. The sample logic diagrams in Chapter 2.0 provide the basis for this analysis and the decision points for Phase II samples.

6.0 PROJECT SEQUENCE

6.1 PROJECT SEQUENCE. Activities related to the Offsite Delineation Workplan follow both parallel and sequential tracks with other activities to reach project objectives. A schedule depicting these activities is shown on Figure 6-1. The onsite and offsite delineation workplan activities will be staggered to allow parallel completion of both.

6.1.1 Review and Approval of the Offsite Delineation Workplan The draft Offsite Delineation Workplan will be delivered to the regulatory agency, MSDEQ, for review and approval. Review comments will be addressed in the final Offsite Delineation Workplan. The workplan becomes final after the MSDEQ comments are addressed.

6.1.2 Contract Award The contract award process will include the preparation of a plan of action, which will be the basis for contract negotiations. When contract negotiations have been completed, a notice to proceed will be issued that will allow preliminary activities to begin.

6.1.3 Preliminary Activities Mobilization tasks must be completed, prior to the initiation of field activities, to ensure efficient field sampling events. The project team will prepare specifications to initiate procurement of subcontractors and vendors for specialized services and equipment. Anticipated items for procurement include a drilling contractor, analytical laboratory, and surveying contractor. Standard items for mobilization will be handled through the contractor's program office with individual specialized items being coordinated through the FOL and TOM.

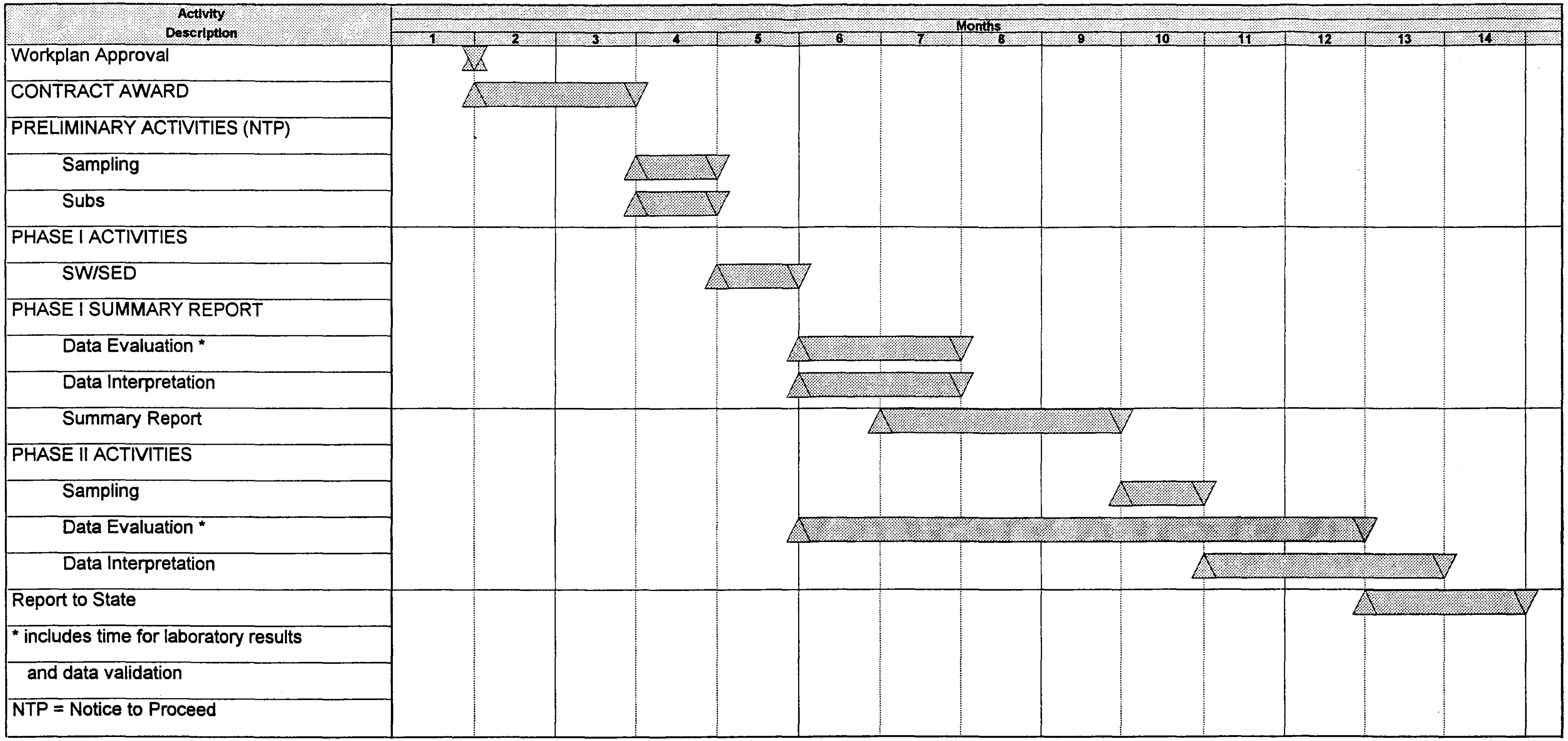
6.1.4 Phase I Activities Phase I activities include surface water and sediment sampling in the offbase drainage system, surface soil sampling in areas that receive bed load sediment from the ditches and streams, and sediment sampling in the Outfall 3 Swamp. The sample collection in Phase I is at locations identified through the conceptual model process and will be followed by a Phase I summary report.

6.1.5 Phase I Summary Report The summary report following the Phase I sampling activities will provide an evaluation of horizontal and vertical delineation activities performed in Phase I. This evaluation will include a data evaluation (validation and useability), data interpretation, and the preparation of the Summary Report. The Summary Report will make recommendations for Phase II activities.

6.1.6 Phase II Activities Phase II activities will follow the Phase I Summary Report. Based on the recommendations of the Summary Report, Phase II activities may be performed to meet engineering requirements or the needs of the AO.

6.1.7 Offsite Delineation Report The Offsite Delineation Report will present the results and findings from both phases of the field activities. A comparison of the requirements of the AO and the results of the field investigations will be provided to demonstrate compliance with the AO.

THIS PAGE INTENTIONALLY LEFT BLANK.



Project Start	01 May 1996
Project Finish	
Data Date	01 May 1996
Plot Date	26 April 1996

FIGURE 6-1

SCHEDULE

OFFSITE DELINEATION WORKPLAN

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1993a, MILCON Construction Site Assessment, Project P-745, Technical Memorandum, Naval Construction Battalion Center, Gulfport, Mississippi: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Task Order No. 096, Contract No. N62467-89-D-0317, September.

ABB-ES, 1993b, Remedial Investigation and Feasibility Sampling and Analysis Plan, Vols. I. and II, Naval Construction Battalion Center, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 096, Contract No. N62467-89-D-0317.

ABB-ES, 1994, Technical Memorandum No. 1, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995a, Technical Memorandum No. 2, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995b, Technical Memorandum No. 3, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995c, Technical Memorandum No. 4, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995d, Technical Memorandum No. 5, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995e, Letter Report: Surface Soil Sampling Field Program and Analytical Results for Area A, Former Herbicide Orange Storage Area, Naval Construction Battalion Center (NCBC), Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1995f, Letter Report: Basewide Groundwater, Sediment and Surface Water Study, Naval Construction Battalion Center, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 096, Contract No. N62467-89-D-0317.

ABB-ES, 1995g, Letter Report: Interim Removal Action - 28th Street Road Construction, NCBC, Gulfport, Mississippi: prepared for SOUTHNAVFAC-ENGCOM, Task Order No. 096, Contract No. N62467-89-D-0317.

ABB-ES, 1995h, Letter Report: Removal Action Technical Support, Contaminated Sediment and Surface Soil and Analytical Results in 28th Street Roadway, NCBC, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 096, Contract No. N62467-89-D-0317.

ABB-ES, 1996a, Technical Memorandum No. 6, Former Herbicide Orange Storage Area, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317.

ABB-ES, 1996b, Addendum to Delisting Petition, Naval Construction Battalion Center, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 092, Contract No. N62467-89-D-0317 (in progress).

ABB-ES, 1996c, Interim Corrective Measures Workplan, Site 8, Former Herbicide Orange Storage Areas, Naval Construction Battalion Center, Gulfport Mississippi: prepared for SOUTHNAVFACENGCOM, Task Order No. 096, Contract No. N62467-89-D-0317 (in progress).

ABB-ES, 1996d, Letter Report: Soil and Sediment Dioxin Triplicate Study, Naval Construction Battalion Center, Gulfport, Mississippi: prepared for SOUTHNAVFACENGCOM, Contract No. N62467-89-D-0317.

ASTM, 1985, Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants: D 421-85, September.

Arienti, M., L. Wilk, M. Jasinski, N. Prominski, 1988, Dioxin-Containing Wastes Treatment Technologies, Pollution Technology review No. 160: published by Noyes Data Corporation, park Ridge, New Jersey, U.S.A.

EG&G Idaho, Inc., Idaho Falls, Idaho, 1987, Naval Construction Battalion Center Trail Burn Report, June 16.

EG&G, 1988, Comprehensive Soil Study of Naval Construction Battalion Center, Gulfport, Mississippi.

Hazardous Waste Remedial Action Program (HAZWRAP), 1991, U.S. Air Force Installation Restoration Program, Summary Report Remedial Characterization and Soil Remediation Technology Review for the Former Herbicide Storage Site at the Naval Construction Battalion Center, Gulfport, Mississippi: prepared for U.S. Air Force/CEVV under contract DE-AC05-84OR21400.

Mississippi State Department of Environmental Quality (MSDEQ), 1996, Administrative Orders No. 3193-96 and No. 3194-96, February 14.

NEESA, 1988, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, Naval Energy and Environmental Support Activity, NEESA 20.2-47B, Port Hueneme, California.

Occupational and Environmental Health Laboratory, 1979, Initial Herbicide Orange Monitoring Program.

U.S. Environmental Protection Agency (USEPA), 1983, Methods for Chemical Analysis of Water and Wastes, 600/4-79-02, March.

USEPA, 1986a, Research Development and Demonstration permit issued in July.

USEPA, 1986b, Test Methods for Evaluating Solid Waste, Volume 1B: Laboratory Manual Physical/Chemical Methods, 3rd Edition, Office of Solid Waste and Emergency Response, Washington, DC, November.

USEPA, 1987, Data Quality Objectives for Remedial Response Activities, EPA/540/G-87/003, March.

USEPA, 1989, Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenxofurans, March.

USEPA, 1991a, Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, Environmental Compliance Branch, Environmental Services Division, Athens, Georgia, February.

USEPA, 1991b, National Functional Guideline for Organic Data Review, Office of Energy and Remedial Response, June.

USEPA, 1994a, Title 40 CFR, Part 264, Appendix IX, Groundwater Monitoring List: July.

USEPA, 1994b, Guidance for the Data Quality Objectives Process, EPA QA/G-4, USEPA Quality Assurance Management Staff, Washington, D.C., September.

Versar, 1990, Ground-Water Monitoring Program Plan, Naval Construction Battalion Center, Gulfport, Mississippi, November 20.