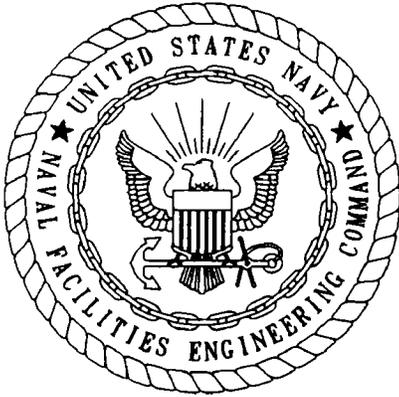


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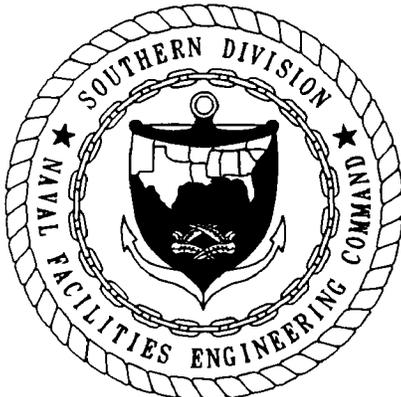


**BASEWIDE ECOLOGICAL ASSESSMENT WORKPLAN**

**NAVAL AIR STATION CECIL FIELD  
JACKSONVILLE, FLORIDA**

**UNIT IDENTIFICATION CODE: N60200  
CONTRACT NO. N62467-89-D-0317/090**

**JUNE 1995**



**SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
NORTH CHARLESTON, SOUTH CAROLINA  
29419-9010**

**BASEWIDE ECOLOGICAL ASSESSMENT WORKPLAN**

**NAVAL AIR STATION CECIL FIELD  
JACKSONVILLE, FLORIDA**

**Unit Identification Code (UIC): N60200**

**Contract No. N62467-89-D-0317/090**

**Prepared by:**

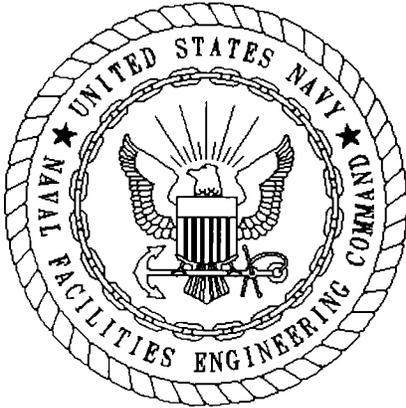
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**June 1995**



CERTIFICATION OF TECHNICAL  
DATA CONFORMITY (MAY 1987)

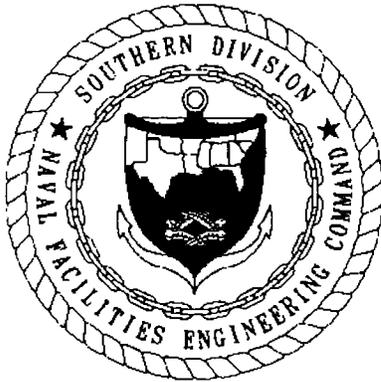
The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/090 are complete and accurate and comply with all requirements of this contract.

DATE: June 8, 1995

NAME AND TITLE OF CERTIFYING OFFICIAL: James A. Denier  
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Janet Burris  
Project Technical Lead

(DFAR 252.227-7036)



## FOREWORD

The Department of the Navy developed the Installation Restoration (IR) program to locate, identify, and remediate environmental contamination from the past disposal of hazardous materials at Navy and Marine Corps installations. The Navy IR program follows the Department of Defense Environmental Restoration Program mandated by the Superfund Amendments and Reauthorization Act of 1986 to address waste sites that may pose a threat to human health or the environment.

The IR program consists of Preliminary Assessment and Site Inspection, Remedial Investigation and Feasibility Study (RI/FS), and Remedial Design and Remedial Action at sites where disposal of chemicals allegedly occurred. The Preliminary Assessment and Site Inspection identifies the presence of pollutants. The RI/FS analyzes the nature and extent of contamination and determines the optimum remedial solution. The Remedial Design and Remedial Action complete the implementation of the solution.

Previous investigations have determined that Naval Air Station (NAS) Cecil Field has 18 waste sites that may pose a threat to human health or the environment. Therefore, an RI/FS will be performed to address the extent, magnitude, and impact of possible contamination at these waste sites.

This Basewide Ecological Assessment Report (BEAR) workplan describes how a Basewide Ecological Assessment will be completed for NAS Cecil Field. The Basewide Ecological Assessment will evaluate potential adverse ecological effects associated with exposures to contamination from all potential sources of contamination (PSCs). The Basewide Ecological Assessment will contain information on the ecological setting of NAS Cecil Field, the general methodology for ecological risk assessments (ERAs) for individual PSCs, summaries of the ERA results for each of the PSCs, and an evaluation of risks for watersheds associated with all PSCs. The workplan describes how the BEAR will be written, distributed, and updated.

Questions regarding this report should be addressed to the Commanding Officer, Code OOB, P.O. Box 111, NAS Cecil Field, Jacksonville, Florida 32215-0111.

## EXECUTIVE SUMMARY

This Basewide Ecological Assessment workplan describes the approach and format for the Basewide Ecological Assessment Report (BEAR) for Naval Air Station (NAS) Cecil Field. The BEAR will assess potential ecological risks for aquatic and terrestrial receptors resulting from the release of contaminants from the Installation Restoration (IR) program hazardous waste sites and potential sources of contamination (PSCs).

Completion of the BEAR will address four primary objectives:

- describe the ecological setting of NAS Cecil Field,
- describe the methodology used to complete individual ecological risk assessments (ERAs) for each of the PSCs,
- synopsise the ERA results for each site and PSC, and
- assess the total ecological risk represented by multiple sites and PSCs at NAS Cecil Field.

The assessment of "total" risks will be based on the results of the respective ERAs completed for each of the sites and PSCs as part of the Remedial Investigation (RI) and Feasibility Study (FS) process. Additional analyses of the total risks represented by the release of contamination from multiple sites and PSCs will be completed and included as the last chapter of the BEAR.

The workplan is organized according to the proposed structure of the BEAR and serves as an annotated outline. The BEAR will be a dynamic document that will be updated periodically based on the results of the ERA for each PSC. Considering the dynamic nature of the document, the structure of the BEAR is proposed to facilitate quick and easy changes.

The BEAR will contain information on the ecological setting of NAS Cecil Field, the general methodology for completion of ERAs for individual PSCs, a summary of biological sampling events across the facility, a summary of the ecological contaminants of concern (ECCs) for all sites and PSCs, a summary of the ERA results for each of the operable unit (OU) sites and PSCs, and an evaluation of risks for watersheds associated with all sites and PSCs. The workplan describes how the BEAR will be completed including structure, basewide assessment process, report distribution, and updating.

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## GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
BEAR	Basewide Ecological Assessment Report
BRAC	Base Realignment and Closure
CDM	CDM Federal Program
ECCs	ecological contaminants of potential concern
ERA	Ecological Risk Assessment
ESP	Environmental Services and Permitting
FDEP	Florida Department of Environmental Protection
FGFWFC	Florida Game and Fresh Water Fish Commission
FS	Feasibility Study
IR	Installation Restoration
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetlands Inventory
OU	Operable Unit
PSC	potential source of contamination
RI	Remedial Investigation
ROD	Record of Decision
SMP	Site Management Plan
SOUTHNAV - FACENCOM	Southern Division, Naval Facilities Engineering Command
USEPA	U.S. Environmental Protection Agency

## 1.0 INTRODUCTION

1.1 PURPOSE. The Basewide Ecological Assessment Workplan describes the approach and format for the Basewide Ecological Assessment Report (BEAR) for Naval Air Station (NAS) Cecil Field. The BEAR will assess potential ecological risks for aquatic and terrestrial receptors resulting from the release of contaminants from the Installation Restoration (IR) program waste sites and potential sources of contamination (PSCs) (ABB Environmental Services, Inc., [ABB-ES], 1993).

This workplan serves as an annotated outline of the BEAR report and is intended to relate the scope and structure of the BEAR. Sites and PSCs at NAS Cecil Field are described in the Site Management Plan (SMP) (ABB-ES, 1993). Operable units (OUs) are used to define investigative sets of PSCs at NAS Cecil based on types of waste disposed of and the suspected contaminants of concern. Currently there are 8 OUs at NAS Cecil Field and 35 PSCs. Figure 1-1 in the BEAR will be a map that shows the general location of NAS Cecil Field. Figure 1-2 in the BEAR will show the location of each of the PSCs at NAS Cecil Field.

Completion of the BEAR will address four primary objectives:

- description of the ecological setting of NAS Cecil Field,
- description of the methodology used to complete individual Ecological Risk Assessments (ERAs) for each of the PSCs,
- synopsis of the ERA results for each PSC, and
- assessment of the total ecological risk represented by multiple PSCs at NAS Cecil.

The assessment of "total" risk will be based on the results of the respective ERAs completed for each of the OUs and PSCs as part of the Remedial Investigation (RI) and Feasibility Study (FS) process. Additional analyses of the total risk represented by the release of contamination from multiple PSCs will be completed and included as the last chapter of the BEAR. Risk associated with contamination not associated with PSCs may be evaluated if it has a bearing on the interpretation and assignment of risk from the PSCs.

1.2 SCOPE. The workplan is organized according to the proposed structure of the BEAR and serves as an annotated outline. The BEAR will be a "living" document that will be updated on a periodic basis (see Chapter 9.0). Based on the results of the ERA for each PSC, portions of the BEAR will be updated and reissued. The entire BEAR will not be rewritten. Considering the dynamic nature of the document, the structure of the BEAR is proposed to facilitate quick and easy changes. Special references are made to indicate the portions of the BEAR that will be subject to change and those that will remain unchanged.

Chapter 1.0 of the BEAR will describe the purpose, scope, organization, and intended uses of the BEAR. Other introductory information pertaining to the status of the facility under Base Realignment and Closure (BRAC), site management, and remediation may be included.

Chapter 2.0 of the BEAR will provide ecological setting information for NAS Cecil Field and for each of the PSCs or other sites. Chapter 3.0 will describe the

general approach for the ERAs completed for the individual PSCs. Chapter 4.0 will summarize analytical and biological sampling completed for use in the ERAs. Chapter 5.0 will summarize the ecological contaminants of concern (ECCs). Chapter 6.0 will summarize the findings of the ERAs completed for each of the PSCs or other sites. Chapter 7.0 will provide the analyses of potential risks resulting from the presence of all PSCs.

## 2.0 ECOLOGICAL SETTING

The ecological setting at NAS Cecil Field will be described in Chapter 2.0 of the BEAR. Aquatic habitats, upland habitats, and wetlands will be described in separate subsections. A subsection discussing the possible presence of rare, endangered, and threatened species will be included.

**2.1 AQUATIC HABITATS.** This section of the BEAR will describe the general surface hydrology at NAS Cecil Field. The habitat provided by the surface water at NAS Cecil Field will be described according to the watershed. Habitats will be described based on previous biological sampling events at NAS Cecil Field (ABB-ES, 1993; CDM Federal Program [CDM], 1994; EA Engineering, Science, and Technology, 1993) and previous reports (Envirodyne Engineers, 1985). Aquatic habitats will be described for each of the three watersheds present at NAS Cecil, including Rowell Creek, Sal Taylor Creek, and Yellow Water Creek. Figure 2-1 will show the locations of the surface drainage features at NAS Cecil Field.

A list of resident aquatic species will be generated for each watershed and will be included in Appendix A, Ecological Receptor Species at NAS Cecil Field. The list will be based on those aquatic species collected from the aquatic habitats as well as species that are suspected to be resident but were not collected and identified. Appendix A will include lists of mammals, birds, reptiles, amphibians, and plants associated with the aquatic habitats.

**2.1.1 Rowell Creek** Rowell Creek will be subdivided into at least four separate segments for the purposes of discussing habitat and risk. The tentative subsections are Rowell Creek upstream (upstream of Lake Fretwell), Lake Fretwell, Lake Newman, and Rowell Creek downstream (downstream of Lake Fretwell). Tributaries to Rowell Creek will also be discussed separately.

**2.1.2 Sal Taylor Creek** The aquatic habitat provided by Sal Taylor Creek will be discussed in this section. Sal Taylor Creek may be subdivided with separate discussions of the upstream (altered and channelized on the eastern side of the flightline) and downstream sections.

**2.1.3 Yellow Water Creek** Because Rowell Creek drains to Sal Taylor Creek and Sal Taylor Creek drains into Yellow Water Creek south of NAS Cecil Field, Yellow Water Creek ultimately receives flow from all of NAS Cecil Field. It also may receive runoff from PSCs located on the northern part of the facility.

**2.2 UPLAND WILDLIFE HABITATS.** Habitat provided for terrestrial wildlife species at NAS Cecil Field will be described. The term "upland" refers to land not considered to be a jurisdictional wetland by the State of Florida. In general, upland habitat will be described for the facility based on a review of information gathered from biological sampling events (ABB-ES, 1993; EA, 1993) and previous reports (CDM, 1994). The system for description and classification of upland habitats will be according to the Florida Natural Areas Inventory (FNAI) and Department of Natural Resources, 1990. The location of habitats at NAS Cecil Field will be shown on Figure 2-3.

2.3 WETLANDS. The location of wetlands at NAS Cecil Field will be shown on Figure 2-3. The map will be generated based on information available from previous reports (Envirodyne Engineers, 1985), a previous wetland study (CDM, 1994), and National Wetlands Inventory (NWI) maps. Information on wetlands specific to PSCs will be included as part of Section 2.5.

2.4 RARE, ENDANGERED, AND THREATENED SPECIES. Federal and State listed rare, endangered, and threatened species that are present or may be present at NAS Cecil Field will be listed in Table 2-1. A prototype of this table is included. Separate subsections for each species discussing the possible occurrence of the species and possible exposure of the species to contamination from the PSCs will be written.

2.5 SITE SPECIFIC INFORMATION. As ERAs are completed for each of the PSCs, more detailed information on the ecological setting may become available. The following sections will describe any PSC-specific ecological information, which may include vegetative cover, the location and type of wetlands, characterization of aquatic habitats, and identification of ecological receptor species. The section will be organized according to the following outline:

- 2.5.1 Operable Units
  - 2.5.1.1 Operable Unit 1
  - 2.5.1.2 Operable Unit 2
  - 2.5.1.3 Operable Unit 3
  - 2.5.1.4 Operable Unit 4
  - 2.5.1.5 Operable Unit 5
  - 2.5.1.6 Operable Unit 6
  - 2.5.1.7 Operable Unit 7
  - 2.5.1.8 Operable Unit 8
- 2.5.2 Other Sites and PSCs

This structure will facilitate incorporation of information gathered in the future as additional sections. Currently, there is site-specific ecological information available for OUs 1, 2, 7, and 8. This information will be included in the first BEAR.

**Table 2-1  
Rare, Endangered, and Threatened Flora and Fauna at or in the Vicinity of  
Naval Air Station (NAS) Cecil Field**

Basewide Ecological Assessment Workplan  
Naval Air Station Cecil Field  
Jacksonville, Florida

Common Name	FGFWFC <sup>1</sup>	USFWS <sup>2</sup>	FDA <sup>3</sup>	Comments
Florida gopher frog ( <i>Rana capito</i> )	SSC	C2		Possible resident at NAS Cecil Field. (Envirodyne Engineers, 1985).
American alligator ( <i>Alligator mississippiensis</i> )	SSC	T(S/A)		Confirmed resident in Lake Fretwell (Envirodyne Engineers, 1985).
Eastern indigo snake ( <i>Drymarchon corais couperi</i> )	T	T		Confirmed resident at NAS Cecil Field. (Envirodyne Engineers, 1985).
Gopher tortoise ( <i>Gopherus polyphemus</i> )	SSC	C2		Confirmed resident at NAS Cecil Field. (Envirodyne Engineers, 1985).
Wood stork ( <i>Mycteria americana</i> )	E	E		Suitable habitat for feeding may be present in shallow water areas at NAS Cecil Field (Envirodyne Engineers, 1985).
Southeastern kestrel ( <i>Falco sparverius paulus</i> )	T	C2		Confirmed migrant (Envirodyne Engineers, 1985).
Arctic peregrine falcon ( <i>Falco peregrinus tundrius</i> )	E	T		Confirmed migrant (Envirodyne Engineers, 1985).
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	T	E		Confirmed migrant (Envirodyne Engineers, 1985).
Sherman's fox squirrel ( <i>Sciurus niger shermani</i> )	SSC	C2		Possible resident of pine woods. Confirmed resident of similar habitat at NAS Jacksonville. Not known to be a resident species at NAS Cecil Field (Envirodyne Engineers, 1985).
Florida black bear ( <i>Ursus americanus floridanus</i> )	T	C2		Evidence of black bears reported in outlying areas in 1982 (Envirodyne Engineers, 1985).
Florida mouse ( <i>Peromyscus floridanus</i> )	SSC	C2		Known from Clay County, may range into habitats (sand pine scrub and longleaf pine-turkey oak communities) present at NAS Cecil. Not known to be a resident at NAS Cecil Field (Envirodyne Engineers, 1985).
Hooded pitcher plant ( <i>Sarracenia minor</i> )			T	Found in wetlands at Site 17.
Spoon-leaved sundew ( <i>Drosera intermedia</i> )			T	Found at one location at Yellow Water Weapons Area in drainage ditch (Environmental Services & Permitting [ESP], 1990).
See notes at end of table.				

**Table 2-1 (Continued)**  
**Rare, Endangered, and Threatened Flora and Fauna at or in the Vicinity of**  
**Naval Air Station (NAS) Cecil Field**

Basewide Ecological Assessment Workplan  
 Naval Air Station Cecil Field  
 Jacksonville, Florida

Common Name	FGFWFC <sup>1</sup>	USFWS <sup>2</sup>	FDA <sup>3</sup>	Comments
Cinnamon fern ( <i>Osmunda cinnamomea</i> )			CE	Found at Site 5 and Site 17 (CDM Federal Programs, 1994).
Royal fern ( <i>Osmunda regalis</i> )			CE	Found in wetlands at Site 5 and Site 17 (CDM, 1994).
Bartram's ixia ( <i>Salpingostylis coelestinum</i> )			E	Not encountered although appropriate habitat exists and associated plants were common (ESP, 1990).
Variable-leaf crown beard ( <i>Verbesina heterophylla</i> )		C2		Found at one location at NAS Cecil Field in sandhill habitat (ESP, 1990).
Netted chain fern ( <i>Woodwardia areolata</i> )			T	Found at Site 5 and Site 17 by ABB Environmental Services, Inc. (ABB-ES) ecologist.
Grass pink ( <i>Calopogon tuberosus</i> )			T	Found at Site 17 by ABB-ES ecologist.

<sup>1</sup> Florida Game and Fresh Water Fish Commission (list published in Section 39-27.003-005, Florida Administrative Code [FAC]) (Wood, 1994).

<sup>2</sup> U.S. Fish and Wildlife Service (list published in List of Endangered and Threatened Wildlife and Plants, 50 Code of Federal Regulations [CFR] 17.11-12) (Wood, 1994).

<sup>3</sup> Florida Department of Agriculture and Consumer Services (list is statutorily designated by the Preservation of Native Flora of Florida Act (581.185-187, Florida Statutes)) (Wood, 1994).

Notes: FGWFC = Florida Game and Fresh Water Fish Commission

USFWS = United States Fish and Wildlife Service

FDA = Federal Drug Administration

SSC = species of special concern.

C2 = a candidate for federal listing with some evidence of vulnerability, but for which not enough information exists to justify listing.

T(S/A) = threatened due to similarity of appearance.

T = threatened: any species that is likely to become an endangered species within the foreseeable future throughout all or a significant part of its range.

E = endangered: any species that is in danger of extinction throughout all or a significant part of its range.

CE = commercially exploited.

### 3.0 ECOLOGICAL RISK ASSESSMENT METHODOLOGY

An ERA is the process that evaluates actual or potential adverse effects to the ecosystem or ecosystem components associated with exposure(s) to contamination from a hazardous waste site. The ERAs for each of the OUs and PSCs at NAS Cecil Field will be completed in accordance with current U.S. Environmental Protection Agency (USEPA) guidance for ecological assessment at Superfund sites (USEPA, 1989a; 1989b; 1991a; 1991b; 1991c). Each ERA examines the potential or actual adverse effects associated with exposure to contamination in surface soil, surface water, sediment, and groundwater to ecological receptors. The general methodology used for completing the ERAs will be described in this chapter of the BEAR including regulatory requirements.

The approach for ERA at NAS Cecil Field integrates both predictive and field measurement methodologies to assess risk. Decisions regarding overall risk for ecological receptors are based on the weight of evidence from the results of all components of the assessment methodology. The components are designed to provide measures of risk for various ecological receptors, exposure pathways, and potential adverse effects.

Chapter 3.0 of the BEAR will describe the following components of the ERA presented as the following subsections.

- 3.1.1 Problem Formulation
  - 3.1.1.1 Identification of Receptors
  - 3.1.1.2 Identification of Exposure Pathways
  - 3.1.1.3 Identification of Endpoints
- 3.1.2 Selection of Ecological Contaminants of Potential Concern
- 3.1.3 Exposure Assessment
- 3.1.4 Ecological Effects Assessment
- 3.1.5 Risk Characterization
- 3.1.6 Uncertainty Analyses

#### 4.0 SUMMARY OF ECOLOGICAL CONTAMINANTS OF CONCERN

Ecological Contaminants of Concern (ECCs) are the analytes associated with an ecological risk. The ECCs identified for each of the PSCs for surface soil, groundwater, surface water, and sediment will be summarized in Chapter 4.0 of the BEAR. The purpose of the summaries is to identify any trends in contamination among the PSCs to identify contaminants that may be of concern basewide. This portion of the BEAR is critical to the assessment of total risk for the aquatic habitats at NAS Cecil Field because it provides for examination of the extent of contamination within the entire watershed.

The method for selection of ECCs will be included in the individual ERAs for each OU and PSC and will not be specified in the BEAR except to note any differences in the selection process among the PSC-specific ERAs. The process for selection may change over time and could be different for each of the PSCs.

4.1 SURFACE SOIL. The ECCs selected for each PSC will be presented and summarized in tabular format to provide for quick updating of the BEAR. A prototype of the table (Table 4-1) is provided.

4.2 GROUNDWATER. The ECCs for each PSC will be presented and summarized in tabular format to provide for quick updating of the BEAR. A prototype of the table (Table 4-2) is provided.

4.3 SURFACE WATER AND SEDIMENT. The distribution of ECCs in surface water and sediment will be presented in both tabular and geographic format. Figure 4-1 will indicate the surface water and sediment sampling locations for Rowell Creek. Figure 4-2 will show the surface water and sediment sampling locations and distribution of contamination in Sal Taylor Creek. Figure 4-3 will show the sampling stations and results for Yellow Water Creek. Figure 4-4 will show the sampling stations and results for Lake Fretwell. Surface water and sediment data will be included as Appendix B of the BEAR. Table 4-3 will provide a summary of the ECPCs for surface water and sediment.

**Table 4-1**  
**Prototype of Table for Summary of Ecological Contaminants of Concern for Surface Soils**

Basewide Ecological Assessment Workplan  
Naval Air Station Cecil Field  
Jacksonville, Florida

Contaminant of Potential Concern	OU 1		OU 2		OU 3		OU 4	OU 5		OU 6	OU 7	OU 8	Other PSCs			
	PSC 1	PSC 2	PSC 5	PSC 17	PSC 7	PSC 8	PSC 10	PSC 14	PSC 15	PSC 11	PSC 16	PSC 3	PSC 21	PSC 18	PSC 6	PSC 4
Lead	X	X	X	X							X					
Chlordane														X		

Notes: OU = operable unit.  
PSC = potential source of contamination.  
X = analyte is an ecological contaminant of potential concern.

**Table 4-2**  
**Prototype of Table for Summary of Ecological Contaminants of Concern for Groundwater**

Basewide Ecological Assessment Workplan  
Naval Air Station Cecil Field  
Jacksonville, Florida

Contaminant of Potential Concern	OU 1		OU 2		OU 3		OU 4	OU 5		OU 6	OU 7	OU 8	Other PSCs			
	PSC 1	PSC 2	PSC 5	PSC 17	PSC 7	PSC 8	PSC 10	PSC 14	PSC 15	PSC 11	PSC 16	PSC 3	PSC 21	PSC 18	PSC 6	PSC 4
Lead	X	X														
Aluminum	X	X	X	X												

Notes: OU = operable unit.  
PSC = potential source of contamination.  
X = analyte is an ecological contaminant of potential concern.

**Table 4-3  
 Prototype of Table for Summary of Ecological Contaminants of Concern  
 for Surface Water and Sediment**

Basewide Ecological Assessment Workplan  
 Naval Air Station Cecil Field  
 Jacksonville, Florida

Contaminant of Potential Concern	Rowell Creek OU 1	Rowell Creek Upstream of OU 1	Lake Fretwell	PSC 5 Tributary	PSC 2 Tributary	Sal Taylor Creek	Yellow Water Creek
1,4-Dichlorobenzene	SW/SD						
4,4-DDT		SD					
Aroclor-1254		SD					
Aroclor-1260		SD				SD	
Arsenic		SW					
Notes: OU = operable unit. PSC = potential source of contamination. SW = surface water. SD = sediment. DDT = dichlorodiphenyltrichloroethane.							

## 5.0 SUMMARY OF BIOLOGICAL SAMPLING

Chapter 5.0 of the BEAR will summarize biological studies that have been completed at NAS Cecil Field. The biological studies include (1) toxicity tests, (2) aquatic studies, (3) terrestrial studies, (4) wetland studies, and (5) chemical analyses of plant and animal tissue. The biological sampling studies will be described according to the OU and PSC for which the information was collected. This structure will facilitate the addition of other information as further biological sampling at NAS Cecil Field is completed. The biological sampling events will be described in chronological order in Appendix C of the BEAR. Appendix C will serve as a record of biological sampling activities completed at NAS Cecil Field. Included in Appendix C will be a base map which records where all biological samples have been collected.

**5.1 TOXICITY TESTING.** An important part of the approach for the ERA at NAS Cecil Field is toxicity testing of media samples collected from the PSCs (soil, water, and sediment). This provides direct measurement of any adverse effects associated with the mixture of contaminants present in the medium. Toxicity testing of surface soil, sediment, and groundwater has been completed. Section 4.1 of the BEAR will summarize for each PSC the toxicity testing methods, results, uncertainties, and conclusions.

**5.1.1 Operable Units** Subsection 5.1.1 will describe the toxicity testing completed for each of the eight OUs at NAS Cecil Field. If additional OUs are added to the SMP, additional sections will be added.

**5.1.2 Other Sites and PSCs** Subsection 5.1.2 will describe the toxicity testing results for PSCs that are not part of OUs.

**5.1.3 Sediment Toxicity Testing** Subsection 5.1.3 of the BEAR will address sediment toxicity testing that is not associated with a particular OU or PSC. The results of PSC and OU-specific sediment toxicity testing described in Subsections 5.1.1 and 5.1.2 will also be summarized in this section. The inclusion of all sediment toxicity testing results will provide easy reference for the reader and will facilitate summarization of sediment toxicity within the watersheds at NAS Cecil Field.

**5.2 AQUATIC STUDIES.** Aquatic studies include examination or sampling of aquatic resources or habitat at NAS Cecil Field. Aquatic resources include fish, invertebrates, and aquatic plants. The timing and scope of aquatic studies will be reported in Appendix C. Study results will be summarized in this section according to OUs and PSCs. Any studies not completed for a specific PSC or OU will be summarized in Subsection 5.2.3.

The information will be presented as follows.

- 5.2.1 Operable Units
- 5.2.2 Other Sites and PSCs
- 5.2.3 Other Studies

5.3 TERRESTRIAL STUDIES. Terrestrial studies include examination or sampling of terrestrial wildlife or habitat at NAS Cecil Field. Terrestrial wildlife includes mammals, birds, reptiles, amphibians, terrestrial invertebrates, and plants. The timing and scope of terrestrial studies will be reported in Appendix C. Study results will be summarized in this section according to OUs and PSCs. Any studies not completed for a specific PSC or OU will be summarized in Subsection 5.3.3. Studies of wetlands are summarized in Section 5.4.

The information will be presented as follows:

- 5.3.1 Operable Units
- 5.3.2 Other Sites and PSCs
- 5.3.3 Other Studies

5.4 WETLAND STUDIES. Wetland studies include examination and sampling of wetlands at NAS Cecil Field. The timing and scope of wetlands studies will be reported in Appendix C. Study results will be summarized in this section according to OUs and PSCs. Any studies not completed for a specific PSC or OU will be summarized in Section 5.4.3.

The information will be presented as follows.

- 5.4.1 Operable Units
- 5.4.2 Other Sites and PSCs
- 5.4.3 Other Studies

5.5 CHEMICAL ANALYSES OF PLANT OR ANIMAL TISSUE. Chemical analyses of plant and animal tissue may be completed to provide information necessary for OU or PSC-specific ERAs. This section of the BEAR will provide a summary of the chemical analyses of plant and/or animal tissue for each PSC. A table will be included to summarize the contaminants of concern in plant and/or animal tissue for each PSC.

The information will be presented as follows.

- 5.5.1 Operable Units
- 5.5.2 Other Sites and PSCs

## 6.0 ECOLOGICAL RISK ASSESSMENT RESULTS

The results and conclusions of the ERAs for each of the PSCs will be summarized in Chapter 6.0 of the BEAR. The results will be reported according to OUs and PSCs and will also be presented in tabular format. The results for OUs 1 and 2 are currently available and will be included in the first draft of the BEAR. Subsequent ERA results will be added as additional sections according to the following structure as they become available:

- 6.1 OPERABLE UNITS
  - 6.1.1 Operable Unit 1
    - 6.1.1.1 Site 1
    - 6.1.1.2 Site 2
  - 6.1.2 Operable Unit 2
- 6.2 OTHER SITES AND PSCS

Each section will include available information on remedial goals, remedial response objectives, and records of decision (RODs).

## 7.0 ANALYSES OF OVERALL ECOLOGICAL RISKS

The BEAR will discuss potential risk to the environment associated with contamination from all of the OUs and PSCs. The analyses of overall risk will pertain to the aquatic environments at NAS Cecil Field.

Examination of total risks for terrestrial wildlife associated with contamination in surface soil is expected to be unnecessary. The ERA completed for each OU or PSC at NAS Cecil Field includes examination of worst-case exposure conditions where species are assumed to be resident and exposed over a lifetime to contamination within the area of the particular OU or PSC. Risks for a wildlife species exposed to contamination in surface soil from a variety of PSCs would be expected to result in lower contaminant exposures than the worst-case scenario. If, upon examination of the ECC data in Chapter 4.0, persistent and potentially bioaccumulative contaminants are identified across several OUs and PSCs that are located in close proximity (close enough for a species to forage in both areas), a risk evaluation for multiple exposures will be completed.

The watersheds at NAS Cecil Field may receive contamination from more than one PSC. If so, it becomes important to assess risks associated with multiple exposures. Risks for the watersheds will be discussed in the following subsections. Risk assessment will be based on the ERA results reported in Chapter 6.0, the extent of contamination of the watershed reported in Chapter 4.0, and the status of the aquatic communities reported in Chapter 5.0. Where permitted, based on the available results from the PSC-specific ERAs, risks for the watershed will be discussed quantitatively. The goals of the risk analyses include:

- identification of contamination in watersheds that has migrated from PSCs,
- assessment of risks associated with particular contaminants with the intent of identifying the necessity for source controls, and
- identification of any areas within the watershed that are at risk associated with contamination present in surface water or sediment regardless of contaminant source.

Potential ecological risk will be evaluated for Rowell Creek in Section 7.1, Sal Taylor Creek in Section 7.2, Yellow Water Creek in Section 7.3, and wetlands in Section 7.4.

7.1 ROWELL CREEK. For ease of evaluation, Rowell Creek will be subdivided into three segments. Tributaries to Rowell Creek will be discussed separately. Further subdivision of the segments may be necessary in the future and can be ladded as subsections easily. The proposed subsections of the BEAR include:

- 7.1.1 Rowell Creek Upstream of Lake Fretwell
- 7.1.2 Lake Fretwell
- 7.1.3 Rowell Creek Downstream of Lake Fretwell
- 7.1.4 Tributaries to Rowell Creek

**7.2 SAL TAYLOR CREEK.** Sal Taylor Creek will be subdivided for ease of risk evaluation. Tributaries to Sal Taylor Creek will be discussed separately. The proposed subsections of the BEAR include:

- 7.2.1 Upstream East of Flightline
- 7.2.2 Downstream of Site 8 Tributary and Upstream of Rowell Creek Confluence
- 7.2.3 Downstream of Confluence with Rowell Creek
- 7.2.4 Sal Taylor Creek Tributaries

**7.3 YELLOW WATER CREEK.** Section 7.3 will evaluate risk for Yellow Water Creek.

**7.4 WETLAND HABITATS.** This section will evaluate risk for wetland habitats at NAS Cecil Field. Risk for wetlands will be evaluated where possible according to a PSC. The subsections of the BEAR for wetland habitats include:

- 7.4.1 Operable Units
- 7.4.2 Other Sites and PSCs
- 7.4.3 Other Wetlands

## 8.0 RECOMMENDATIONS

This section of the BEAR will provide for discussion of recommendations for further action based on the risk results in Chapter 7.0. Further action may include further sampling and analyses and possibly remediation. The Section will be organized according to watersheds in the same manner as Chapter 7.0.

### 8.1 ROWELL CREEK

### 8.2 SAL TAYLOR CREEK

### 8.3 YELLOW WATER CREEK

### 8.4 WETLAND HABITATS

## 9.0 DISTRIBUTION OF DOCUMENT AND UPDATING

9.1 DOCUMENT REVIEW AND DISTRIBUTION. After Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) review, the workplan for the BEAR will be distributed to the following parties for review and comment:

- Florida Department of Environmental Protection (FDEP),
- USEPA Region IV,
- NAS Cecil Field,
- U.S. Fish and Wildlife Service, and
- National Oceanic and Atmospheric Administration (NOAA).

9.2 DRAFT BEAR. After workplan approval, the first BEAR will be issued to SOUTHNAVFACENGCOM. The BEAR will be referred to as interim until the last (final) BEAR is issued. The interim BEAR will be distributed according to the direction of SOUTHNAVFACENGCOM.

9.3 UPDATING. The BEAR will be updated after each OU RI/FS has been finalized or once a year, whichever is greater, as long as new ERAs are completed for OUs and PSCs at NAS Cecil Field. The updates will be completed by providing revised pages or additional pages with instructions to insert in place of obsolete pages.

## REFERENCES

- ABB Environmental Services, Inc. (ABB-ES), 1992, Technical Memorandum for Supplemental Sampling at Operable Units 1, 2, and 7, Naval Air Station, Cecil Field, Jacksonville, Florida; Tallahassee, Florida: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENG-COM), Charleston, South Carolina, September.
- ABB-ES, 1993, Site Management Plan, Naval Air Station Cecil Field, Jacksonville, Florida: prepared for SOUTHNAVFACENGCOM, Charleston, South Carolina, October.
- CDM Federal Programs (CDM), 1994, Wetlands Assessment, Wetland Delineation and Terrestrial Habitat Mapping at Operable Units 1, 2, and 7, Naval Air Station Cecil Field, Jacksonville, Florida: Contract Task Order No. 090, Navy CLEAN District 1, Contract No. N62467-89-D-0317, April.
- EA Engineering, Science, and Technology, 1993, Aquatic Biological Sampling Services Conducted at Naval Air Station Cecil Field, Jacksonville, Florida: prepared for ABB Environmental Services, Inc., Arlington, Virginia, December.
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- Florida Game and Freshwater Fish Commission (FGFWFC), 1993, Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida: compiled by D.A. Wood, Endangered Species Coordinator.
- Florida Legislature, 1990, Surface Waters of the State: Chapter 62-301, Florida Administrative Code.
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- USEPA, 1991a, Ecological Assessment of Superfund Sites, An Overview: Office of Solid Waste and Emergency Response, Washington, D.C., Publication 9345.0-05I, December.
- USEPA, 1991b, ECO Update Volume 1, Number 1: Publication 9345.0-051; 1991, December.
- USEPA, 1991c, Region IV Risk Assessment Guidance: Letter from Elmer W. Aiken, Health Assessment Officer, to Hazardous Waste Contractors, Atlanta, Georgia, March 20.
- USEPA, 1992a, ECO Update, Volume 1, Number 2: Publication 9345.0-051, May.
- USEPA, 1992b, ECO Update, Volume 1, Number 3: Publication 9345.0-051, August.
- USEPA, 1992c, Waste Management Division Freshwater Water Quality Chronic Screening Values for Hazardous Waste Sites: USEPA Region IV.
- USEPA, 1994, Draft Region IV Waste Management Division Sediment Screening Values: Internal memorandum, Atlanta, Georgia, February 22.
- Wood, D.A., 1994, Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida: Florida Game and Fresh Water Fish Commission.

**APPENDIX A**

**ECOLOGICAL RECEPTOR SPECIES AT NAS CECIL FIELD**

Appendix A will contain separate lists of potential ecological receptors of contamination from the PSCs including terrestrial plants, mammals, birds, reptiles, amphibians, aquatic invertebrates, and fish.

**APPENDIX B**

**SURFACE WATER AND SEDIMENT ANALYTICAL DATA**

Appendix B will contain a summary of the chemical analyses of surface water and sediment samples from NAS Cecil Field. The results, sorted according to chemical, will include only detected concentrations of analytes in the respective samples.

**APPENDIX C**

**BIOLOGICAL STUDIES AT NAS CECIL FIELD**

Appendix C will contain a chronological summary of the biological studies completed for NAS Cecil Field. Biological studies include aquatic studies, terrestrial studies, toxicity testing, and wetlands studies. The appendix is intended to be a quick reference for the reader to determine the history of biological sampling activities for the facility.

**APPENDIX D**

**DISTRIBUTION LIST**

This appendix will record the updates and a list of parties to whom the BEAR is distributed.