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FINAL DOCUMENTATION SUPPORT AND HAZARD RANKING SYSTEM II SCORING BARIN

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FINAL

DOCUMENTATION SUPPORT AND HAZARD RANKING SYSTEM II SCORING OUTLYING LANDING FIELD BARIN FOLEY, ALABAMA

NAVY CLEAN - DISTRICT I

OCTOBER 1992

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA
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The revised Hazard Ranking System II (HRS II) score was developed for Outlying Landing Field (OLF) Barin, Foley, Alabama. OLF Barin is a subinstallation of Naval Air Station (NAS) Whiting Field, Milton, Florida. The HRS II is used to prioritize potential hazardous waste sites for response action and for inclusion on the U.S. Environmental Protection Agency National Priorities List (NPL). The HRS II ranks a site or facility based on actual or potential contamination, contamination migration, and potential exposure from pathways: groundwater, surface water, soil, and air. At OLF Barin the HRS II was applied to eight potential sources of contamination and an HRS II score of 56.42 was calculated. This score is substantially higher than the score of 28.5, which is the threshold for listing on the NPL.

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FOREWORD

The Department of the Navy developed the Installation Restoration (IR) program to locate, identify, and remediate environmental contamination from past disposal of hazardous materials at Navy and Marine Corps installations. The Navy IR program follows the Department of Defense's Environmental Restoration Program as created by the Superfund Amendments and Reauthorization Act of 1986.

The IR program consists of three phases. Phase one consists of the Preliminary Assessment (PA) and Site Inspection (SI) to identify the location (site) and presence of pollutants and assess their potential or actual threat to public health and the environment. Phases two and three are initiated based on the degree of threat and the need for remediation of the contamination. Phase two consists of a Remedial Investigation and Feasibility Study to analyze the site contamination and determine the optimum remediation solution. Phase three is the implementation of the solution.

Preliminary Assessment results for Outlying Landing Field (OLF) Barin indicated past potential releases to the environment have taken place at five sites. An SI was performed in 1991 to verify the nature of contamination at each site. An additional three sites, for a total of eight, were identified during or after the SI program. Additional background demographic and environmental data were developed in the SI. A Hazard Ranking System II (HRS II) score has been developed based on the SI report. The HRS II is a ranking tool that is used to determine the priority for remedial response at a site and the need to include the site on the National Priorities List. OLF Barin is a subinstallation of Naval Air Station (NAS) Whiting Field.

Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) has assisted NAS Whiting Field in implementing this program. Questions regarding this report should be addressed to the Commanding Officer, NAS Whiting Field, or to SOUTHNAVFACENGCOM, Code 1859, at AUTOVON 563-0341 or (803) 743-0341.

EXECUTIVE SUMMARY

Preliminary Assessment results for Outlying Landing Field (OLF) Barin, Foley, Alabama, indicated past potential releases to the environment may have taken place at five sites. A Site Inspection (SI) was performed to verify the nature of contamination at each site. An additional three sites, for a total of eight, were identified during or after the SI program. In addition, necessary demographic and environmental data were developed and published in the SI to support a Hazard Ranking System II (HRS II) Score. The HRS II is a ranking tool used to determine the priority for remedial response at a site and the need to include the site on the National Priorities List (NPL). Currently a Phase I Remedial Investigation is planned at OLF Barin. OLF Barin is a subinstallation of Naval Air Station (NAS) Whiting Field. Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) has assisted NAS Whiting Field in implementing this program.

The purpose of this report is to support scoring OLF Barin as a Federal Facility using the revised U.S. Environmental Protection Agency (USEPA) HRS II. HRS II was promulgated as Appendix A of the National Oil and Hazardous Substances Contingency Plan (NCP) as a final rule on December 14, 1990 (55 *Federal Register* No. 241:51532-51667). The HRS II considers observed and potential releases of hazardous substances that may migrate by three pathways, groundwater, surface water, and air, and also that may result in exposure to contaminated soils. Assessment and scoring are based on three major factors: observed or potential to release, waste characteristics (including toxicity, mobility, persistence, and bioaccumulation), and targets. Targets represent human receptor population exposed or within the migration pathway and sensitive environments exposed or in the migration pathway.

HRS II is used by the USEPA to provide a common basis for prioritizing hazardous waste sites for response actions. Those sites receiving HRS II scores above 28.5 are proposed for inclusion on the National Priorities List (NPL) for priority response and action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Those sites scoring below the threshold of 28.5 are referred to other agencies for appropriate action.

OLF Barin is typical of large Department of Defense (DOD) facilities in that sites are distributed over a wide area. Because of this, the site or groups of sites have unique sets of hydrogeologic and environmental factors that affect contaminant migration, unique sets of contaminants, and unique sets of receptors or 'targets'.

At OLF Barin, three groups of sites were developed based on location, contaminant migration pathways, and receptors. These groups are shown on Figure ~~ES-1~~.

2-6 / where is this Fig.?

The HRS II scores for the three site groups at OLF Barin are as follows:

Group 1:	Sites 19B, 20B, and 23B	26.11
Group 2:	Site 21B, Abandoned WWTP, and Uncontrolled Dumpsite	50.01
Group 3:	Site 22B and Machine Gun Butt Area	7.71

Individually, both Group 1 and Group 2 generated significant HRS II scores. Group 2, with a score of 50.01, scored substantially above the 28.5 threshold score for listing on the NPL. The overall score for OLF Barin, based on the highest pathway for all groups was calculated as 56.38. This score considered the groundwater pathway score for Group 1, surface water pathway score for Group 2, soils exposure score for Group 3, and the air pathway score for Group 1. Because of this score, it is likely that the USEPA will propose that OLF Barin be placed on the NPL.

The major factors driving the Group 1 groundwater pathway score of 51.80 was the observation of Level I halocarbon contamination in the OLF Barin potable water supply well. A wellhead granular activated carbon (GAC) treatment system is in place as an interim remedial measure to mitigate exposure of base personnel to trichloroethylene, tetrachloroethylene, and trans-1,2-dichloroethylene. The Group 2 surface water pathway score was 100 due to the presence of dichlorophenyl trichloroethane (4,4'-DDT) and dieldrin ~~which resides~~ in the sediments of Sandy Creek and the presence of extensive wetlands and sensitive wetland environments as downstream receptors. Soils exposures were generally not significant due to the remoteness of the sites from extensive target populations. The Group 3 soils exposure score was based on the presence of substantial lead in surface soils at the Machine Gun Butt Area where spent bullets littered the area ~~contains lead in the surface soil~~. The air pathway was not significant at OLF Barin.

ACKNOWLEDGMENTS

In preparing this report, the Remedial Investigation/Feasibility Study personnel at ABB Environmental Services, Inc. (ABB-ES), commend the support, assistance, and cooperation provided by the personnel at Naval Air Station (NAS) Whiting Field and Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). In particular, we acknowledge the outstanding effort, dedication, and professionalism provided by the following people in the preparation of this report.

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LIST OF FULL SCALE MAP DATA DOCUMENTS

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4)	U.S. Geological Survey (USGS), 1980, 7.5 Minute Series (topographic) Map, Foley, Alabama;	B-7
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5	U.S. Fish and Wildlife Service, 1979, National Wetland Inventory Map Orange Beach, Alabama; 7.5 minute Quadrangle.	B-5

GLOSSARY (Continued)

µg/ℓ	micrograms per liter
µg/kg	micrograms per kilogram
µmhos/cm	micromhos per centimeter
mg/ℓ	milligrams per liter
MSL	mean sea level
NAAS	Naval Auxiliary Air Station
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NGVD	National Geodetic Vertical Datum (of 1929)
NOAA	National Oceanic and Atmospheric Administration
NDI	non-destructive inspection
NPL	National Priorities List
OLF	Outlying Landing Field
OVA	organic vapor analyzer
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
PVC	polyvinyl chloride
RfD	reference dose
SARA	Superfund Amendments and Reauthorization Act
SDN	Site Discovery and Notification
SI	Site Inspection
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOC	semivolatile organic compounds
TAL	target analyte list
TCL	target compound list
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	underground storage tanks
VOC	volatile organic compounds
WWII	World War II
WWTP	Wastewater treatment plant

mg/Kg milligrams per kilogram

NPDES National Pollutant Discharge Elimination System

OSWER Office of Solid Waste and Emergency Response

ppb parts per billion

RCRA Resource Conservation and Recovery Act

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AWQC	Ambient Water Quality Criteria
AWTP	Abandoned Wastewater Treatment Plant
AVGAS	aviation gasoline
bls	below land surface
CAG	Cancer Assessment Group
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIP	USEPA CLP-Caucus Inorganics Protocol
CLP	USEPA Contract Laboratory Program
cm/sec	centimeters per second
COP	USEPA CLP-Caucus Organics Protocol
°F	degrees fahrenheit
°C	degrees centigrade
DEM	Department of Environmental Management (Alabama)
DOD	Department of Defense
4,4'-DDD	dichlorophenyl dichloroethane
4,4'-DDE	dichlorophenyl dichloroethylene
4,4'-DDT	dichlorophenyl trichloroethane
EC_{50}	effective concentration (50); concentration at which 50 percent of organisms show a given effect
FID	flame ionization detector
ft/day	feet per day
ft/ft	feet per foot
$ft^3/s/mi^2$	cubic feet per second per square mile
FR	*Federal Register*
GAC	granular activated carbon
gpm	gallons per minute
gpm/ft	gallons per minute per foot
HRS	Hazard Ranking System
HRS II	Hazard Ranking System, Final Rule, December 1990
IR	Installation Restoration
JP-5	Naval jet fuel
mph	miles per hour
MCL	maximum contaminant limit
MCLG	maximum contaminant limit goal

CaCO3 Calcium Carbonate

LOEL Lowest Observed effect level

1.0 INTRODUCTION

The purpose of this summary report is to support the scoring of the Outlying Landing Field (OLF) Barin, Foley, Alabama using the U.S. Environmental Protection Agency's (USEPA) Revised Hazard Ranking System (HRS II). The HRS II is the principal mechanism the USEPA uses to place federal facilities on the National Priorities List (NPL). The HRS II is a screening device that evaluates the effects to human health and the environment due to potential for release of uncontrolled hazardous substances at a site. HRS II was promulgated as Appendix A of the National Oil and Hazardous Substances Contingency Plan (NCP) as a final rule on December 14, 1990 (55 *Federal Register* No. 241:51532-51667).

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of the Navy is submitting this report and HRS II score to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) as a component of Amendment 4 under Contract number N62467-88-C-0382. OLF Barin is undergoing investigation as a component of the Navy Installation Restoration (IR) program. The IR program has been designed to identify, prioritize, and abate or control contaminant migration resulting from past operations at Naval Installations. The IR program is the Navy response authority under Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and Executive Order 12580. This section requires that all federal facilities comply substantively and procedurally with the act. SOUTHNAVFACENGCOM is the agency responsible for the Navy IR program in the Southeastern United States. SOUTHNAVFACENGCOM, therefore, has the responsibility to process these naval facilities through Preliminary Assessment (PA), Site Inspection (SI), priority listing, and remedial response selection in compliance with the NCP.

The HRS II considers observed or potential releases of hazardous substances to any one of three pathways: groundwater, surface water, and air. In addition, it considers documented or potential public exposure to contaminated soils. Assessment and scoring is based on three major factors; observed or potential to release, waste characteristics (including toxicity, mobility, persistence, and bioaccumulation), and targets. Targets represent human receptor population exposed or within the migration pathway and sensitive environments exposed or within the migration pathway.

This report is organized to score and support OLF Barin using HRS II in the following manner. The remaining portion of Chapter 1.0 provides a description of the installation and the adjacent area and the investigative history and permits. Chapter 2.0 provides a summary description of each site, and a discussion of the application of HRS II to OLF Barin to support scoring three separate groups of sites, organized by proximity on the facility and similarity of pathways and receptors or targets. Chapter 2.0 also discusses the completeness of the database as it relates to HRS II scoring for waste characteristics and waste quantities. Chapter 3.0 provides the HRS II scores and scoresheets for OLF Barin as a whole and contains the individual site group pathway scores. Chapter 4.0 of the report provides the documentation support for the pathway

scores, which includes specific data and information required to document the scoring, and Chapter 5.0 includes references and maps used in the HRS II scoring.

1.1 INSTALLATION DESCRIPTION. OLF Barin is located in Baldwin County, Alabama, 40 miles southeast of Mobile, Alabama. It is approximately 10 miles north-northeast of Gulf Shores, Alabama, and 35 miles west of Pensacola, Florida, near the coast of the Gulf of Mexico (Figure 1-1). Presently, OLF Barin consists of approximately 490 acres, considerably less than the nearly 1,000 acres that comprised the station during World War II (WWII) and the Korean Conflict. A major part of the land within the activity boundaries is used for three active airstrips.

The U.S. Navy leased the Foley, Alabama, municipal airport from the City of Foley on December 5, 1942. The facility was commissioned as the Naval Auxiliary Air Station (NAAS) Barin. The airport consisted of three airstrips covering 310 acres that became the OLF Barin West Field. The Navy acquired another 655 acres east of the original airport to build another three airstrips (East Field) and an administration and housing area (ABB-ES, 1991; reference 1).

After commissioning, NAAS Barin was used for basic and advanced flight training and as an indoctrination center for enlisted personnel. During WWII, NAAS Barin grew to include four large aircraft hangars, an underground refueling system with eight 25,000-gallon tanks connected to 2.15 miles of fuel lines and 60 fuel pits, as well as approximately 65 structures used to support station personnel, and six active airstrips. NAAS Barin was deactivated on January 5, 1947, and remained closed until the Korean Conflict. Reopened in 1952, the airfield again functioned as a training facility until 1959. Upon closing in 1959, the original airstrip area west of the facility was transferred back to the City of Foley. The majority of the installation buildings were either sold or dismantled at this time. The east field remained unoccupied until 1985. At that time, pilots from Naval Air Station (NAS) Whiting Field, Milton, Florida, began using the field for "touch-and-go" practice. NAS Whiting Field began construction of a crash crew building in 1985 and the field was officially reopened in May 1988 and renamed OLF Barin (ABB-ES, 1991; reference 1).

Under the command of NAS Whiting Field, OLF Barin functions as a practice landing strip for pilots training at NAS Whiting Field. A major part of the land within the activity boundaries is used for three active airstrips. A small part of the field is occupied by station personnel as operational building and equipment storage. A small contingent of firefighters (63 personnel) is assigned to the station to be on hand in case of an aircraft accident. This is the only currently ongoing activity at OLF Barin. The remaining acreage consists primarily of mowed and open grasslands and pine plantations (ABB-ES, 1991; reference 1).

OLF Barin is located in the Southern Pine Hills/Coastal Lowlands District Region, which is part of the East Gulf Coastal Plan ~~portion~~ part of the Coastal Plain Physiographic Province. Elevations at OLF Barin, taken from the Foley and Elberta, Alabama, U.S. Geological Survey (USGS) quadrangle maps (7.5 minutes) (USGS, 1980a; 1980b; reference maps 4 and 5), range from 10 feet (3.1 meters) to

7 8

Figure 1-1 Location of OLF Barin

53 feet (16.2 meters) above the National Geodetic Vertical Datum (NGVD) of 1929. The station is characterized by a relatively flat topographic surface, except in the extreme eastern part where topography slopes steeply down to the narrow floodplain of Sandy Creek.

In general, the major relief features are the floodplains of Sandy Creek and Wolf Creek. The land surface reaches mean sea level in the salt marshes and coastal swamp forests adjacent to Wolf Bay.

1.2 SURROUNDING AREA POPULATION CHARACTERISTICS AND LAND USE. The following subsections provide a description of the land adjacent to the facility and the population characteristics.

1.2.1 Land Use Three airstrips with associated flat grassland and pine plantations cover the major part of the 490-acre area of OLF Barin. Onsite activity at the facility occurs on approximately 4 acres. This area comprises the firefighting operations and storage buildings, parking lot, and recreational area. The northeastern and eastern edge of the installation, consisting of the slope to and the floodplain of Sandy Creek, are forested. This forested area represents approximately 70 acres. Approximately 6 acres at the southern boundary are also forested.

In general, land use surrounding OLF Barin within a 4-mile radius includes a sparsely populated area of few residential homes, mobile homes, agricultural lands, commercial lands, pasture lands, timberland, fallow land, the suburban residential areas of Foley and Elberta, institutional uses (churches and schools), and urban commercial uses in the centers of Elberta and Foley.

To evaluate the land uses adjacent to OLF Barin for the purposes of HRS II scoring, 1986 aerial photographs (U.S. Department of Agriculture, Soil Conservation Service; ~~reference 19~~ map reference 2) and the Baldwin County Land Atlas and Plat Book (Baldwin County Soil and Water Conservation District, ~~1990a~~ 1988; reference 5) were reviewed to tabulate land use classification within ¼, ½, 1, 2, 3, and 4 miles ~~from~~ of OLF Barin. Table 1-1 is a land use summary for the area surrounding OLF Barin. No heavy industry is located in the area of OLF Barin. Principal local industry has traditionally been forestry, cropland agriculture, and service-oriented commercial activities. According to the South Baldwin Chamber of Commerce (1990(a); reference 16), manufacturing in Foley includes assembly of aluminum, steel, silk-screened products, synthetic fiber, marine nets, and filters; seafood processing; precision tool manufacture; lingerie; and three aerospace-related companies. The Town of Foley has purchased 284 acres formerly belonging to the U.S. Navy adjacent to OLF Barin. ~~As of 1988~~, industrial development had not commenced in the latter area. at this time the

1.2.2 Public Water Supply and Groundwater Use The following paragraphs describe the sources and distribution of potable water in the area of OLF Barin. No surface water is used as a source of drinking water or an agricultural supply within 4 miles of OLF Barin or within 15 river miles downstream.

Outlying Landing Field Barin (OLF) Water Supply Wells. The OLF Barin facility receives its water from a water supply well located north of the station

Table 1-1
Distribution of Land Use Within 4 Miles of Outlying Landing Field (OLF) Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Distance (miles)	Percentage of land in:							
	Institutional Use (schools and churches)	Commercial or Light Industrial	Single Family	Multi-family	Prime	Non-prime	Forest	Wetland
0 to ¼	0	<1	2	0	30	8	30	20
¼ to ½	0	5	2	0	13	10	60	10
½ to 1	0	2	10	0	43	10	30	5
1 to 2	0	5	10	2	55	5	15	8
2 to 3	<1	10	25	3	30	2	20	10
3 to 4	1	4	16	1	50	5	15	8

Source: 1988 aerial photograph interpretation (U.S.Department of Agriculture, Soil Conservation Service, 1988; reference 19).

headquarters adjacent to Guadalcanal Road. The water is used for firefighting activities, cleaning, and personal consumption by the station personnel. The water is obtained from the Pliocene-Miocene aquifer from a depth of approximately 100 feet bls. Prior to the use of this well, the station water supply was from an old supply well about 200 feet due west of the new well. The old supply well subsequently has been abandoned and grouted. The OLF Barin supply well is located adjacent to the Former Hangar Maintenance Area and within 400 feet of the abandoned underground storage tank (UST). Presently, water from the installation supply well is treated with activated carbon prior to use to remove volatile organic compounds (VOC).

Public Water Supply Wells and Private Residential Supply Wells. Public water supply wells near OLF Barin and Foley draw water from depths of 80 to 157 feet below land surface (bls) and can yield up to 700 gallons per minute (gpm). Foley is listed as having three high capacity wells ranging in depth from 138 to 157 feet. The locations of the Foley wells are indicated on Figure 1-2. Records indicate these wells are drilled to the Miocene, although the screened interval most likely overlaps the Miocene/Citronelle contact. Capacity of these wells was reported by the Town of Foley to be 400, 550, and 550 gpm, respectively (Foley, Alabama, Department of Public Works, 1991; reference 7). The Town of Elberta, Alabama, is served by a single well with a capacity of 45,000 gallons per day (Scott, 1991; reference 15). The location of this well is also shown on Figure 1-2.

1.2.3 Population Distribution. The total population of Baldwin County was 88,673 in 1985, which translates into a population density of 50 people per square mile (South Baldwin Chamber of Commerce, 1990a; reference 17). Foley, Alabama (1985 population 4,490), is approximately 2 miles northwest of OLF Barin. Elberta, located approximately 1.9 miles northeast, had a 1985 population of 558 (South Baldwin Chamber of Commerce, 1990a; reference 17). The population of the beach areas 15 to 20 miles to the south increases 12- to 15-fold during the summer months, to approximately 50,000. The population within a 4-mile radius of OLF Barin has been estimated to be 6,499. Population estimates were developed by review of the 1988 aerial photographs (reference 19), 1980 USGS quadrangle maps (reference maps 4, 5, 6, and 10), 1980 census for the Town of Foley (U.S. Department of Commerce, 1988; reference 21), and South Baldwin Chamber of Commerce (1990a; reference 17) for Elberta. No especially sensitive subpopulations (hospitals, schools, day care centers, or nursing homes) lie within 2.0 miles of OLF Barin. Table 1-2 shows the population distribution centered in the area of Sites 19B and 20B, the Former Hangar Maintenance Area and Abandoned UST and Fuel Pit Area. The Old Firefighting Demonstration Area (Site 22B), the Uncontrolled Dumpsite, and Rubble Landfill areas are remote from this center. The population living within ¼ and ½ miles for these sites was estimated from the 1988 aerial photography as follows:

Old Firefighting Demonstration Area		Uncontrolled Dumpsite and Rubble Landfill	
0 to ¼ mile	0	0 to ¼ mile	83
¼ to ½ mile	33	¼ to ½ mile	10
½ to 1 mile	17	½ to 1 mile	16

Figure 1-2 Location of Public Water Supply Wells Near OLF Barin

outLying Landing Field

spell out

Table 1-2
Estimated Human Population Near (OLF) Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Mile Radius from OLF Barin Supply Well[1]	Population Estimate
Onsite	[2]63
0 to ¼	[3]30
¼ to ½	[4]88
½ to 1	[3]200
1 to 2	[4]1,370
2 to 3	[5]2,308
3 to 4	[5]2,440
Total	6,499

[1] See Figure 4-1 for mile radius map.

[2] NEESA 1984 Preliminary Assessment Report; reference 11
~~Information from OLF Barin personnel (personal communication, station fire chief, 1991).~~

[3] Based on the number of residences counted on 1988 aerial photographs times 2.75 people per household (1988 census for Baldwin County).
6
8; reference 5

[4] Total population of Elberta of 600 plus the number of residences counted at 2.75 people per household.

[5] Based on percentage of the Town of Foley within the respective mile radius plus isolated residences.

The population using groundwater drawn from wells within a 4-mile radius of OLF Barin was estimated to be 6,499 people, based on the total estimated population. Groundwater is used as a potable water supply, industrial uses, irrigation, and stock watering. The number of well completion reports completed for private groundwater supply wells within the area is 298, but there are no records of wells installed prior to 1975. The number of isolated residences (assumed to be on well water) were multiplied by the number of people per household in Baldwin County, Alabama, of 2.75 (available from the 1980 U.S. Census [U.S. Department of Commerce 1988; reference 19]) and added to the population of Foley and Elberta to obtain the population drinking groundwater from wells within a 4-mile radius of OLF Barin. The nearest public water supply well is the station water supply well located on OLF Barin within 400 feet of the nearest potential contaminant source and the well has a documented history of contamination. The nearest residential wells are located between 0.25 and 0.5 mile from OLF Barin to the north and northwest and 0.17 mile to the south. At distances ranging from 2 to 4 miles, the population served by groundwater is served by a combination of the Foley and Elberta municipal supplies and private wells. Based on the number of residential water meters in the two towns, 4,610 people are estimated to be served by the public supply and 138 are estimated as having private supplies (based on an average of 2.75 people per household). In the distance ranges from ¼ to 2 miles, the population is entirely served by private wells.

1.2.4 Federal and State Permits. To date, OLF Barin does not hold any Federal or State environmental permits (i.e., RCRA Part B, NPDES).

Spill out

National Pollutant Elimination System Discharge

Resource Conservation and Recovery act (RCRA)

2.0 SOURCE NARRATIVE

The purpose of Chapter 2.0 is to describe potential or documented contamination at each of the sites at OLF Barin and to identify hazardous substances constituting "observed releases" or potential releases as defined in the HRS II. Section 2.1 presents site characteristics including disposal history, a site map, containment, if any, evidence of analytical results indicating evidence of release or migration, and an estimate of waste quantities. Section 2.2 describes the justification for grouping the eight sites into three groups based on receptors, pathways, and physical locations. Section 2.2 also discusses the quality of the available data, especially as it relates to development of HRS II scoring criteria. Section 2.3 is a tabular presentation of waste types, quantities, and containment assigned to each site in two tables: one that provides disposal history, type, and containment and the other estimates the quantity of wastes present at each site and provides an estimate of the area of each site. Section 2.4 presents the chemical and toxicological properties and regulatory standards necessary for developing the toxicity, mobility, and persistence scores for each chemical of concern at the sites. This information is critical in determining whether HRS II Level I or Level II concentrations impact targets. Information provided for each site in this subsection will substantiate the definition of waste quantity factors for the HRS II score.

Historical records indicate that throughout the years of operation, OLF Barin has generated a variety of wastes related to the operation and maintenance of aircraft, the operation and maintenance of ground support equipment, and the station's facility maintenance activities. Documentation of these activities has previously been submitted in the form of a PA (Naval Energy and Environmental Support Activity [NEESA], 1989; reference 11) and an SI Report (ABB-ES, 1992; reference 1).

Five sites identified during the PA were investigated during the SI. Three additional potential sites were identified during the SI field program, these sites are identified as follows:

Previously Identified Sites

Site 19B, Former Hangar Maintenance Area
Site 20B, Abandoned USTs and Fuel Pit Area
Site 21B, Rubble Landfill
Site 22B, Old Firefighting Demonstration Area
Site 23B, Drainage Ditch Leading to Sandy Creek

Sites Identified during the SI

Machine Gun Butt Area
Uncontrolled Dumpsite
Abandoned Wastewater Treatment Plant

The Former Hangar Maintenance Area, Site 19B, was the location of four large hangars where maintenance and storage activities were conducted during the period of active operations at OLF Barin. All aboveground structures associated with this site were demolished in 1959. Site 20B is located adjacent to the Former Hangar Maintenance Area. Site 20B, the Abandoned UST and Fuel Pit Area, provided fueling and fuel storage for aircraft. Site 21B, the Rubble Landfill, is located in the northeastern quadrant of the installation. Reportedly, this site received demolition debris when the field was deactivated in 1959. During WWII, reports indicated that a Firefighting Demonstration Area existed to the south of the runway at OLF Barin; this site has been designated Site 22B (Old Firefighting Demonstration Area). The remaining previously identified site, Site 23B, is a Stormwater Drainage Ditch leading from the former hangars and fuels storage area to Sandy Creek. Reportedly, in 1954 a 2,000-gallon aviation fuel spill migrated into this ditch.

During the SI field program, the three additional sites (listed above) were identified as having potential for environmental contamination. The first of these is the Machine Gun Butt Area. Apparently, this site was previously used for small arms training and test firing of 0.50-caliber machine guns. The soil surface at this site is littered with corroding spent bullets.

The Abandoned Wastewater Treatment Plant (WWTP) and the Uncontrolled Dumpsite were identified as sites during reconnaissance in the northeastern corner of OLF Barin. The Abandoned WWTP was decommissioned in 1959. The status of sludge drying beds or underground or aboveground structures is unknown. The uncontrolled dumpsite lies north of the Abandoned WWTP, and adjacent to Sandy Creek. The site investigation reported that household trash, used oil cans, paint cans, and other debris has been dumped by unknown persons. Public access exists due to a breach in the OLF Barin boundary fence.

2.1 SITE 19B, FORMER HANGAR MAINTENANCE AREA.

Site Location. Site 19B covers an area of approximately 12 acres and is adjacent to grassy, non-paved areas to the east, west, and north along Guadalcanal Road. Any solvents, oils, or fuels spilled onto the concrete in these areas would be washed into the soil by either stormwater runoff or rinsing of the hardstand. Figure 2-1 shows the relationship of the site to Site 20B, Underground Storage Tanks and Fuel Pit Area. As reported in the PA, maintenance shops were located at the northern end of each hangar area.

Site Description. Site 19B consists of the location of four former large aircraft maintenance hangars; these hangars are depicted on Figure 2-1. The hangars (formerly Buildings 1221, 1222, 1223, and 1235) were built during WWII in order to perform aircraft maintenance. The hangars were used during periods of active flying operations until 1959. In 1959, the installation was deactivated and these aboveground structures were demolished.

Currently, Buildings 2768 and 3029 occupy the site of the former Hangar 1223. The existing buildings were built in 1985 to house the existing emergency equipment and crash crew operations and storage areas. According to

Figure 2-1 Location of Sites 19B, Former Hangar Maintenance Area, and 20B, Abandoned Underground Storage Tank and Fuel Pit Area

the OLF Barin fire chief, a total of 63 full-time personnel provide 24-hour emergency services for NAS Whiting Field flight operations involving OLF Barin.

The total waste oil storage capacity at Site 19B was 6,310 gallons, based on the volumes of tanks 1221A through 1235B (Table 2-1). Currently, no oily product exists in any of the tanks. Materials that may have been handled in the hangars include: halogenated and nonhalogenated solvents, aliphatic and aromatic hydrocarbons, AVGAS (containing tetraethyl lead), kerosene, lubrication oils, and hydraulic fluids. Materials possibly disposed of in the vicinity of Site 19B include paint (containing solvents and metals in pigments), corrosion products from airframes and internal aircraft parts, and possibly X-ray-opaque material from non-destructive inspection (NDI) operations. The quantities released through spills or leaks are unknown. Migration pathways available to any waste residuals are infiltration to groundwater, migration toward surface water via overland flow of contaminated soil particles, or migration as dissolved materials in runoff.

Site History. Between 1942 and 1959, the Site 19B hangars were periodically used for aircraft maintenance. The periods of activity mainly occurred during WWII and the Korean Conflict. Numerous types of solvents, oils, and fuels were reportedly used by maintenance personnel in these operations. Based on the types of solvents used for aircraft maintenance during the time period, toluene, carbon tetrachloride, trichloroethylene, tetrachloroethylene, and trichloroethane, as well as petroleum distillates, were most likely used by maintenance personnel; however, no documentation of the solvents used for maintenance exists. It is unknown whether corrosion control (painting) operations, NDI operations, or storage battery service were in use during the activity time period at these hangars. However, if these operations were in place at OLF Barin, wastes containing metals could have been used at this site. If NDI operations or battery rework processes were in place at OLF Barin during this time, degreasers and X-ray opaque salts (i.e., barium), and electrolytes (i.e., lead or dry cells containing nickel, cadmium, or mercury) may have been inadvertently spilled during operations. The use rate of these materials is unknown.

The aircraft at OLF Barin required oil changes for every 40 hours of flying time. The waste oils from oil changing operations were put into underground storage tanks at the north and south ends of each hangar. When the tanks were full, the wastes were reportedly pumped out by local contractors and transported off station (NEESA, 1989; reference 11).

Tank locations were approximated during the PA. Subsequent to the PA (NEESA, 1989; reference 11), SOUTHNAVFACENGCOM has located and evaluated the USTs associated with the Former Hangars and the aviation fuels storage and dispensing system (Site 20B). Remedial action plans and specifications for removal and closure of these tanks were prepared by ERC Environmental and Energy Services Company from Nashville, Tennessee, in July 1990. Removal of the tanks was completed in January 1992 by Barnes Electric from Pensacola, Florida.

make table 8½ x 11

Table 2-1
Underground Storage Tank (UST) Removal Schedule

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Navy Tank No.	Tank Capacity (gallons)	Material of Construction	Tank Diameter (inches)	Tank Length (feet)	Cover Over Tank	Depth of Cover (inches)	Tank Contents	Depth of Fluid (inches)		Volume of Contents in Tank (gallons)		Estimated Material to be Excavated (~~cy~~ cubic yards)
								Product	Water	Product	Water	
1226	25,000	Steel	126	39	Concrete vault and soil	54	Water with gasoline sheen	<1/8	126	N/A	25,000	[1]656
1227	25,000	Steel	126	39	Concrete vault and soil	54	Water with gasoline sheen	<1/8	126	N/A	25,000	
1228	25,000	Steel	126	39	Concrete vault and soil	54	Water with gasoline sheen	<1/8	126	N/A	25,000	[1]656
1229	25,000	Steel	126	39	Concrete vault and soil	54	Water with gasoline sheen	<1/8	126	N/A	25,000	
1230	15,000	Steel	120	39	Concrete vault and soil	52	Water with gasoline sheen	<1/8	3	N/A	120	183
1231	25,000	Steel	126	39	Concrete vault and soil	52	Water with gasoline sheen	<1/8	126	N/A	25,000	[1]656
1232	25,000	Steel	126	39	Concrete vault and soil	52	Water with gasoline sheen	<1/8	126	N/A	25,000	
1233	25,000	Steel	126	39	Concrete vault and soil	52	Water with gasoline sheen	<1/8	126	N/A	25,000	[1]656
1234	25,000	Concrete	[2]48 × 36	8.0	Concrete manway and soil	52	Water with gasoline sheen	<1/8	126	N/A	25,000	
1221-A	720	Concrete	[2]48 × 24	3.0	Concrete manway and soil	24	Water with fuel oil sheen	<1/8	[3]56	N/A	740	23
1221-B	175	Concrete	[2]48 × 36	8.0	Concrete manway and soil	19	Water with gasoline sheen	<1/8	10	N/A	40	11
1221-C	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Soil[4]	N/A	N/A	N/A	N/A	26
1222-A	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Water with fuel oil sheen	<1/8	[3]54	N/A	740	23
1222-B	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Soil[4]	N/A	N/A	N/A	N/A	26
1235-A	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Water with fuel oil sheen	<1/8	48	N/A	720	23
1235-B	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Water with fuel oil sheen	<1/8	[3]61	N/A	750	23
1223-A	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Water with fuel oil sheen	<1/8	47	N/A	700	23
1223-B	720	Concrete	[2]48 × 36	8.0	Concrete manway and soil	24	Soil[4]	N/A	N/A	N/A	N/A	26
1223-C	375	Concrete	[2]48 × 36	4.0	Concrete manway and soil	24	Soil[4]	N/A	N/A	N/A	N/A	17

[1] Two underground storage tanks are located within one tank pit.
[2] Tanks are rectangular concrete vaults (depth × width).
[3] Depth of each tank is 48 inches. The water level extends up into the manway, thus giving a depth of water greater than 48 inches.
[4] Each of these tanks are filled, to the top of the manway, with soil.

Notes: Actual contents and the volume of the tanks contents are based on information obtained in the field. Actual contents and volume of contents may vary from those indicated above at the time of the tank removal project.

[redacted] ?

N/A = Not applicable

Other operations at Site 19B included the cleaning of aircraft. Aircraft were typically washed with kerosene at wash racks located at the east and west end of the hangars; this practice was discontinued in the early 1950's because it left a slippery residue on the wings and fuselage. The wash racks were reportedly connected to an oil-water separator designed to collect the kerosene and water runoff. The recovered kerosene was stored in three tanks located at each wash rack. The size of each of the tanks connected to the wash racks is unknown. Local residents interviewed during the PA site visit reported that fishing in Sandy Creek had to be stopped during active OLF Barin operations because of kerosene contamination. Table 2-2 summarizes disposal activities from Site 19B. Based on historical records of the site, the following are the most likely hazardous or toxic chemicals to have been used, stored, and possibly released at Site 19B.

Table 2-2
Summary of Site 19B Disposal Activities

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Class	Analyte	Probable Sources
Metals	Chromium Cadmium Mercury Nickel	Chromate cleaners, paint pigments, batteries, or paints.
	Antimony	Paints
	Zinc	Corrosion control
VOCs	Halocarbons Ketones	Solvents and degreasers
	Aliphatic VOCs Aromatic VOCs	Solvents, degreasers, and fuels
SVOCs	Phenolics	Cleaners
	PAHs	Waste oil and fuels

Notes: VOCs = volatile organic compounds.
SVOCs = semivolatile organic compounds.
PAHs = polycyclic aromatic hydrocarbons.

Results of Previous Investigation. The SI field investigation at site 19B consisted of a hydrogeologic assessment based on installation of eight soil boring and monitoring wells, the estimation of aquifer properties by means of *in-situ* aquifer testing, field screening of subsurface soils for the presence of (VOCs), field analysis of pH and specific conductance, and sampling of groundwater for laboratory analysis of the target compound list (TCL) and target analyte list (TAL) chemicals. No samples from USTs or from surface soil were collected.

The SI reported that the unconsolidated sediments consisted of layers of silty sands with interspersed silts and clays. The water table was encountered at

depths ranging from 15 to 20 feet bls at Site 19B, due to topographic relief. The hydraulic conductivity in the upper part of the aquifer was 7.93×10^{-3} centimeters per second (cm/sec). Groundwater flow direction is from the north-northeast to the south-southwest across the site at a gradient of 2.26×10^{-4} feet per foot (ft/ft). The groundwater seepage velocity estimated under Site 19B was 0.020 feet per day (ft/day) due to the low gradient. The high hydraulic conductivity at the water table suggests that the flow gradient and seepage velocity are easily influenced by local perturbations.

No evidence of subsurface VOC contamination was detected either by visual evidence of soil staining or the organic vapor analyzer (OVA) readings; however, borings were not placed directly in former waste discharge areas.

Groundwater samples were collected from the eight SI monitoring wells for detection of contamination migrating from Sites 19B and 20B. Eleven metals were detected in the eight groundwater samples. These metals include aluminum, calcium, iron, potassium, magnesium, lead, arsenic, antimony, cadmium, mercury, and sodium. Aluminum, calcium, iron, potassium, magnesium, and sodium are major ion-constituents of natural surface waters and groundwaters, even though they are listed on the CERCLA TAL for inorganics. Although iron was detected in amounts in excess of the Alabama secondary drinking water maximum contaminant limit (MCL), none of these metals occur at levels suggesting a site-related release nor do these metals exhibit an upgradient-downgradient pattern. The presence of iron at Site 19B is typical in situations where shallow groundwater lies in regions of silty or clayey sands. Maximum concentrations of the rest of the metals detected at Site 19B are as follows: arsenic, 0.001 milligram per liter (mg/ℓ); antimony, 0.1 mg/ℓ; cadmium, 0.001 mg/ℓ; lead, 0.03 mg/ℓ; and mercury, 0.0059 mg/ℓ. Only concentrations of lead in a downgradient monitoring well and mercury in an upgradient monitoring well are above the Alabama and Federal MCLs. Because of the presence of lead in the fuels handled at Sites 19B and 20B and because of the presence of lead in waste oils and in paints, it is possible that the lead observed in groundwater at downgradient well WHF-20B-4 is related to either Site 19B or Site 20B.

Mercury is used in pressure measuring instruments, batteries, as a pigment, and as a fungicide. The presence of mercury in the upgradient monitoring wells may be a result of operations that occurred at Site 19B or from a source further upgradient in the former "administrative area".

With the exception of two samples in which total phenols were reported, no extractable TCL organic chemicals, pesticides, or polychlorinated biphenyls (PCBs) were detected in groundwater at Site 19B. Total phenols were reported in samples from monitoring wells WHF-19B-1D (0.011 mg/ℓ) and WHF-20B-4 (0.006 mg/ℓ). Because of the lack of specificity of the total phenol test and its potential for positive interference due to non-TCL chemicals, the groundwater total phenol results probably do not relate to contamination due to hazardous materials. The only VOCs detected at Site 19B were toluene, acetone, 2-butanone, and vinyl acetate. However, the presence of acetone and 2-butanone are suspect due to reported method blank contamination. No halogenated solvents were detected during the SI field investigation.

2.2 SITE 20B, ABANDONED UNDERGROUND STORAGE TANKS, FUEL PIT AREA, AND OLF BARIN WATER SUPPLY WELLS. The following subsections discuss the site location, description, and history of the Abandoned Underground Storage Tanks, Fuel Pit Area, and the OLF Barin Supply Wells.

2.2.1 Abandoned Underground Storage Tanks and Fuel Pit Area

Site Location. Site 20B consists of the abandoned aircraft fuel storage and dispensing facility of OLF Barin that includes nine USTs (eight 25,000-gallon tanks and one 15,000-gallon tank), approximately 60 abandoned fuel pits, and 2.15 miles of underground fuel lines. Reportedly, all tanks, pits, and fuel lines are currently in place at the site. Figure 2-1 depicts the layout of the site, and also shows the relationship between Site 20B and Site 19B. Site 20B lies on the north and south side of the Former Hangar Maintenance Area, and comprises an area of approximately 19.8 acres. Of this acreage, approximately 1 acre consists of the fuel-containing USTs and the pumping system, and approximately 18.8 acres consist of the hardstand area where the fuel pits are located (Figure 2-2).

Site Description. The abandoned aircraft fuel storage and dispensing system consisted of an aquafarm-type system that was installed during the 1940's. This system was operated during WWII until 1947, and operated again during the 1950's until 1959 when operations at the site ceased. In an aquafarm system, AVGAS ~~is~~ was stored in USTs and dispensed by displacement with water; water would flow into the bottom of the tanks, and fuel would flow out the top of the tank. When the tanks ~~are~~ were refilled with AVGAS, the water stored in the tanks was discharged to the storm sewer system along Guadalcanal Road.

Site History. During operations at Site 20B throughout WWII, nine USTs were used for storage of AVGAS. The next usage of these tanks occurred during the 1950's for the storage of AVGAS or jet fuel; the tanks were deactivated in 1959. In the mid-1980's, the tanks were subsequently filled with water for fire-fighting purposes. During the PA site visit, an oily sheen and residue were noted within these tanks.

Reportedly, a 2,000-gallon AVGAS spill occurred in 1954 when vandals opened a release valve on one of the 25,000-gallon USTs. Most of the fuel was reported to have migrated to an unlined drainage ditch along the north side of Guadalcanal Road. In December 1991 and January 1992 an UST removal action was conducted at Site 20B. Nine former fuel USTs and 10 waste oil USTs were removed from the site. Soil samples collected at that time were reported to contain petroleum hydrocarbons at concentrations ranging from 200 to 4,200 parts per billion (ppb). Soil removed for the tank excavations was backfilled in the pit following UST removal. Fuel distribution lines were not removed at that time.

Results of Previous Investigations. A hydrogeological assessment including monitoring well installation, sampling, and testing for aquifer properties was conducted at Site 20B during the SI. The chemical groundwater quality data show no evidence of significant fuel releases with the exception of the detection of lead at 0.03 mg/ℓ in samples from well WHF-20B-4 and 0.007 mg/ℓ at WHF-20B-2. A trace of toluene (2 µg/ℓ) was observed in samples from well WHF-20B-1. This, however, may be attributed to laboratory contamination as toluene was detected

Figure 2-2 Locations of Fuel Pits and Lines at Site 20B

in method blanks. The presence of lead in groundwater samples may be attributed to residuals from AVGAS leaks in the 1940's or 1950's in the fuel pit area. The integrity of the currently in-place fuel distribution piping or fuel pits is unknown. Although the water table monitoring wells are placed to detect former major releases from the fuels storage area and the lower ~~portion~~ part of the fuel pits area, dissolved or undissolved fuel-related contamination discharged 33 to 48 years in the past could underlie the central ~~portion~~ part of the Site 19B and Site 20B area and be undetected by the present program. Soil data from the storm drainage ditch tend not to support long distance migration of lead or lead contaminated soil as a result of wasting of aquafarm water.

2.2.2 OLF Barin Water Supply Wells

Site Location. The OLF Barin water supply well is located north of the station headquarters and adjacent to Guadacanal Road. This well is also adjacent to the Former Hangar Maintenance Area and within 400 feet of the abandoned USTs.

Site Description. The area consists of one water supply well and one abandoned and grouted supply well. The water from the active supply well is used for firefighting activities, cleaning, and human consumption by station personnel. The water is obtained from the Pliocene-Miocene aquifer from a depth of approximately 100 feet bls.

Site History. When OLF Barin was recommissioned in 1988, a new water supply well was drilled approximately 200 feet due east of the old water supply well (Figure 2-1). In July 1988, the new water supply well was sampled; results indicated that trans-1,2-dichloroethylene and trichloroethylene were present. Also in July 1988, the old water supply well was sampled; sampling results revealed the presence of tetrachloroethylene and trichloroethylene. Since this sampling occurred, the old ~~waste~~ tic supply well has been abandoned and grouted in-place. The State of Alabama allowed the use of the new supply well for human consumption after the installation of an approved granular activated carbon (GAC) filter system.

In April 1990, the new water supply well was sampled. The only inorganics detected above detection limits were cadmium, chromium, sodium, lead, calcium, magnesium, and potassium. None of the concentrations of the metals detected in this sampling round were above the Alabama MCL for that chemical. No chlorinated hydrocarbons were detected above detection limits.

2.3 SITE 21B, RUBBLE LANDFILL.

Site Location. The Rubble Landfill is located in the northeast section of OLF Barin as shown in Figure 2-3.

Site Description. The landfill is approximately 3.1 acres in area and lies just to the west of Sandy Creek. It borders a drainage pipe and ditch for approximately 350 feet. The vertical distance from the top of the fill to the floodplain of Sandy Creek is approximately 15 feet. The Site 21B rubble landfill reportedly received debris from dismantled buildings that were destroyed in 1959 prior to the decommissioning and release of the north and west area of OLF Barin

Figure 2-3 Location of Site 21B, Rubble Landfill, and Abandoned Wastewater Treatment Plant

to the City of Foley. The landfill appears to be free of surface debris except in the northeast edge that borders the drainage pipe. The remainder of the surface area is covered with vegetation, appears relatively smooth, and slopes slightly towards Sandy Creek. To the east of the drainage pipes, the fill slopes abruptly to the floodplain of Sandy Creek.

Site History. According to the PA (NEESA, 1989; reference 11), the only waste disposed in the rubble landfill was debris from the dismantled buildings. The PA site visit reported that no evidence of drums or other containers that might have contained hazardous waste existed. However, at that time the site was overgrown with Kudzu vine; therefore, visibility was limited. The soils covering the landfill are porous and any leachate or runoff from the site would most likely migrate to Sandy Creek approximately 50 to 100 feet northeast of the site.

The Rubble Landfill appears to be a filled area at the beginning of the drop off in topography from the installation runway area to Sandy Creek. If the reported disposal of rubble is correct, the material filled a location from the natural edge of the slope to a pair of large stormwater drainage culverts. No visual evidence of a large rubble fill area exists and no evidence of leachate seeps are present at the apparent toe of the fill along the culverts.

Results of Previous Investigations. During the SI, surface soil samples were collected to evaluate the nature of contamination in surface soils at Site 21B.

Surface soils at this location do not generally appear to be contaminated by TCL chemicals or TAL elements above natural metals background concentrations. The exception to this is the possible presence of methylene chloride. This chemical was observed in one of the field replicates. Methylene chloride was also detected in sediment samples from Sandy Creek; laboratory contamination is suspected. However, because of the conservative screening nature and objectives of the SI, the presence of methylene chloride cannot be ruled out. No Federal or Alabama standards exist in soil for methylene chloride.

No immediate threat to biota is expected if methylene chloride is present at 448 micrograms per kilogram (µg/kg). Based on comparison of the chronic toxicity human reference dose and mammalian bioassay data and the ambient water quality criteria (AWQC) for aquatic biota of 11,000 ~~micrograms per liter~~ µg/l, no chronic toxic effects to biota would be expected at concentrations not posing a significant potential for human risks.

Site 21B could pose a long-term public health threat if methylene chloride is present at concentrations in excess of 2,100 µg/kg, but does not pose an immediate significant public health risk or environmental threat. Although this site is located in a remote area of OLF Barin and potential exists for public access, the site is not attractive for play activities. However, the surface soil sampling does not adequately characterize the nature of the landfill nor does it address all contaminant migration pathways. Nothing is known relative to the contamination status of the subsurface soils.

Contaminants were detected in Sandy Creek adjacent to the Rubble Landfill. Contaminant migration via contaminated groundwater, if present, could result in discharge of contaminants to the floodplain or directly into Sandy Creek.

2.4 SITE 22B, OLD FIREFIGHTING DEMONSTRATION AREA.

Site Location. The location of Site 22B, the Old Firefighting Demonstration Area, has not been identified based on historical plans or aerial photographs. However, the PA indicates that Site 22B may be located just west of the Machine Gun Butt Area (Figure 2-4).

Site Description. The Old Firefighting Demonstration Area is a level, poorly vegetated area with poor drainage.

Site History. During WWII operations at OLF Barin, approximately 12 to 15 firefighting demonstrations took place at Site 22B. Firefighting exercises involved the dosing of a wrecked aircraft with approximately 400 to 1,000 gallons of combustible liquids. The aircraft was subsequently ignited, and firefighters would douse the flames. Typically, these combustible liquids were contaminated fuels, oils, or spent solvents from operations at the station. However, no records exist describing the total amount of liquid flammables that were actually used during firefighting exercises.

Results of Previous Investigations. Site investigations to date include a surface soil sampling event that occurred during the SI field investigation. A grid was established over the suspected location of Site 22B, and soil samples were collected at 1 and 2 feet bls at each node; all samples were analyzed for lead. Ten soil samples contained detectable concentrations of lead ranging from 15 mg/kg to 364 mg/kg. Based on these sampling results, the approximate location of Site 22B was delineated on Figure 2-4. However, the Machine Gun Butt Area is located approximately 300 feet east of the area of high lead concentrations. Because of this, the elevated concentrations of lead detected in surface soils at Site 22B may have migrated from the Machine Gun Butt Area.

2.5 SITE 23B, DRAINAGE DITCH LEADING TO SANDY CREEK.

Site Location. The drainage ditch system (Figure 2-5) runs east from Guadalcanal Road, ~~turning~~ turns north approximately 500 feet east of the Command Building (Building 2768), travels approximately 2,500 feet north, and intersects another open ditch, which flows approximately 2,000 feet east to Sandy Creek.

The drainage ditch is unlined throughout its length from Guadalcanal Road to the ends of the runway. The ditch exists only as a swale along the north end of the runway. This latter drainage ditch travels around the ends of Runways 15, 18, and 21 and into an asphalt drainage gutter. The gutter diverts flow around the Rubble Landfill and through a concrete drainage pipe to a small stream that discharges into Sandy Creek.

Site History. The drainage ditch system carried runoff from the Former Hangar Maintenance Area, Site 19B, as well as discharged water from the aquafarm fuel system (Site 20B). During the 1940's, aircraft were washed on wash racks in the

Figure 2-4 Location of Site 22B, Old Firefighting Demonstration Area, and Machine Gun Butt Area

Figure 2-5 Location of Site 23B, Drainage Ditch Leading to Sandy Creek, and Uncontrolled Dump Site

; reference 11

Former Hangar Maintenance Area using kerosene as a cleaner. Reportedly (NEESA, 1989), kerosene was reclaimed through the use of an oil-water separator. Discharge of rinse water through the oil-water separators was conveyed toward Sandy Creek via the Site 23B ditch.

Sandy Creek was reported to be unfishable due to kerosene contamination when the aircraft washing operations were underway at OLF Barin. Fishing in Sandy Creek was discontinued in the early 1950's according to the PA (NEESA, 1989; reference 11). A 2,000-gallon fuel spill, which occurred in 1954, migrated toward Sandy Creek via the drainage ditch.

Site 23B, Drainage Ditch leading to Sandy Creek, consists of two separate subareas studied during the SI field program. The first is the Guadalcanal Road storm sewer, its discharge outfall, and the upper reaches of the storm drainage ditch. The second area is Sandy Creek in the reach adjacent to the Rubble Landfill, immediately upstream and downstream of the storm drainage outfall (see Figure 2-5). In addition, during the HRS II site visit, two additional potential sites were identified along Sandy Creek, upstream of the sampling locations and the Rubble Landfill. These latter areas were not sampled during the SI field program.

Results of Previous Investigations. Based on lead and polycyclic aromatic hydrocarbons (PAHs) analytical results, no fuel-related residual contamination was present in the upper ditch. This ditch may have previously received releases from Site 19B. The sewer outfall area would be expected to receive contaminants via surface runoff from Site 19B and Site 20B.

No evidence for residual contamination due to the 1954 fuel spill exists at this location (to a depth of 2 feet bls). Runoff from the Former Hangar Maintenance Area and/or all of the aquafarm system may have released other contaminants to the drainage ditch. Enhanced infiltration may have driven existing lead and/or PAH below the zone sampled or sediment deposition may have buried the contaminated soils subsequent to the activity.

The reach of Sandy Creek adjacent to OLF Barin is likely an area of groundwater discharge based on interpreted groundwater elevation and surface topography. It is likely, therefore, that a contamination migration route of significance is via surface water, either as transport of dissolved materials or sediment transport. Groundwater may discharge to the creek, underflow the creek, or migrate downstream as subsurface flow. Apparent fuel-related aromatic VOCs, cyanide, and chlorinated pesticide residues that may be above background levels were detected in Sandy Creek upstream and/or downstream of the stormwater outfall. In addition, methylene chloride was detected in one soil sample from the Rubble Landfill and in one Sandy Creek sediment sample. This chemical was present in substantial concentrations not directly attributable to method blanks contamination. However, the poor agreement among field replicates and the common occurrence of methylene chloride and 2-butanone as analytical artifacts render these VOC data suspect.

Cyanide exceeds the Federal AWQC for protection of freshwater aquatic life from chronic toxic effects of cyanide. In addition, the concentrations of DDT, its

metabolites, and dieldrin could cause chronic toxic effects to biota because of the potential for bioaccummulation.

2.6 UNCONTROLLED DUMPSITE.

Site Location. The Uncontrolled Dumpsite (Figure 2-5) comprises an area of approximately 0.5 to 0.75 acre, and is located at the northeastern boundary of OLF Barin. A housing area, consisting of approximately 30 homes and mobile homes, is located from 500 to 1,500 feet north of the dumpsite (along U.S. Highway 98).

Site Description. The Uncontrolled Dumpsite is overgrown with vines and brush, thus restricting visibility. At the northeastern boundary of the site, along the boundary of OLF Barin, the fence has been torn down, thus allowing motor vehicle access. close to water? explain

Site History. Apparently, this site has been used for the dumping of used appliances, paint cans, garbage, tires, auto parts, and used motor oil cans. Three rusted 55-gallon drums were observed during the HRS II site visit. The site is relatively close to Sandy Creek and signs of apparent recreational activities, such as fishing, picnicking, and body contact water sports, were noted during the HRS II site visit. The potential exists for ongoing contamination via exposure to chemicals by the general public at the Uncontrolled Dumpsite. Contamination migration most likely occurs via runoff into Sandy Creek or by infiltration to groundwater.

Results of Previous Investigations. To date, no investigations have been conducted at this site.

2.7 ABANDONED WASTEWATER TREATMENT PLANT.

Site Location. The Abandoned WWTP (Figure 2-5) lies 150 feet north of Site 21B, and 100 feet southeast of the Uncontrolled Dumpsite.

Site Description. The abandoned wastewater treatment plant (AWTP) is located directly north and adjacent to the rubble landfill (Figure 2-5). The AWTP covers an area of approximately 160 feet by 260 feet (1 acre) and is overgrown with vegetation, limiting visibility. Remaining components of the AWTP include primary and final settling tanks, trickling filter, digester tank, chlorination chamber, and a 45-foot by 56-foot sludge drying bed.

Site History. The OLF Barin WWTP was taken out of service in 1959 when the installation was decommissioned. Contaminant residuals, especially metals, may exist in former sludge drying beds. Contamination may have migrated along the sewer lines in the past, and may be mobilized due to infiltration of water.

Results of Previous Investigations. To date, no investigations have been conducted at this site.

2.8 MACHINE GUN BUTT AREA.

Site Location, Description and History. The machine gun butt area is located just east of the suspected location of the old firefighting demonstration area (Figure 2-4). The butt area is composed of soil and is estimated at 50 to 75 feet wide by 100 to 150 feet long and 10 to 15 feet high. The machine gun butt area was used as a target for fire from 0.50-caliber machine guns and other firearms during the 1940's and 1950's.

The machine gun butt area site was identified as a potential contaminant site during SI and HRS II site visits in 1991. During the site visits, spent lead, steel, and copper jacketed bullets, shotgun lead shot, and bullet fragments (ranging from 0.22 to 0.50 caliber) were observed littering the ground on the north side of the machine gun butt area. However, during a site visit in September 1991 it was discovered that most of the bullets and spent shells had been scooped up with the dirt from the machine gun butt area to be used as fill for the repair of a washed out patrol road at the east end of OLF Barin.

No previous investigations have been conducted at the machine gun butt area site.

2.9 APPLICATION OF HAZARD RANKING SYSTEM II (HRS II) AT OLF BARIN.

Section 2.1 through 2.8 identified and described the current conditions and site histories for the eight sites at OLF Barin. These sites have been identified in the PA and characterized during the SI. Data available for application of HRS II were obtained from the SI field investigation. These documents (i.e., the PA and the SI) were previously approved by the regulatory agencies, and are incorporated by reference, rather than appended, to the HRS II Report.

Additional site and surrounding area reconnaissance was performed to upgrade the SI. The purpose of the reconnaissance was to support demographic and regional environmental setting requirements for HRS II. These data are documented in Chapter 4.0 relative to their use in scoring. The rest of this subsection describes the manner of the application of HRS II to OLF Barin, and describes the qualification of data completeness relative to HRS II.

2.9.1 Grouping of Potential Source of Contamination.

OLF Barin is typical of Department of Defense (DOD) facilities in that contamination sources are located at sites distributed over a wide area. Because of this, sites or groups of sites frequently have unique sets of hydrogeologic and environmental factors that affect contaminant migration, unique sets of contaminants, and unique sets of receptors or targets. Such groups may be different from other groups of sites at the facility. Because of this, HRS II scoring of multi-site federal facilities requires consideration of these factors to ensure an appropriate HRS II score.

At OLF Barin, three groups of sites are apparent based on site location, contaminant migration pathways, and receptors. These groups are shown on Figure 2-6. Additionally, these three groups are located in different areas of the

Figure 2-6 Site Groupings for HRS II Scoring

installation and are from 2,000 to 5,000 feet apart. The site groupings are as follows:

Group 1. Site 19B, Former Hangar Maintenance Area
Site 20B, Abandoned USTs and Fuel Pits Area and Installation Production Wells
Site 23B, Drainage Ditch to Sandy Creek and Sandy Creek downstream of the Stormwater Outfall

Group 2. Site 21B, Rubble Landfill
Site 26B, Abandoned Wastewater Treatment Plant and Sandy Creek upstream of the Storm Water Outfall
Site 27B, Uncontrolled Dumpsite

Group 3. Site 22B, Old Firefighting Demonstration Area
Site 25B, Machine Gun Butt Area

HRS II scoring is recommended for each grouping. The OLF Barin score should be selected as the maximum of the three scores. The sites were grouped and based on rationales ~~as follows~~ the following.

Group 1. The source areas for this group are Sites 19B and 20B, the Abandoned UST and Fuel Pit Area, and the Former Hangar Maintenance Area. These are located together in the western ~~portion~~ part of the installation and contaminant migration pathways (groundwater and stormwater runoff) are similar. Receptors for Group 1 sites contamination are similar in distance and number. The installation water supply wells are also potentially receiving impact from these sources. Migration as runoff from the sites is either to the south by overland flow or along the Site 23 Drainage Ditch leading to Sandy Creek. In evaluating the ditch and Sandy Creek as a migration route and/or receptor area, consideration must be given to the downstream sampling locations in Sandy Creek.

Group 2. This group consists of sites adjacent to the west bank of Sandy Creek, from its entry onto OLF Barin downstream past the Rubble Landfill. These sites include the uncontrolled dumpsite and the abandoned WWTP. Because of the location of this group of sites adjacent to a break in the OLF Barin boundary fence, and because of evidence of intrusion by the public, the human population targets and attractiveness and accessibility of this area are significantly different from groups 1 and 3. Group 2 also requires careful consideration in developing factor scores for waste types, quantities, etc., because no detailed exploration has been made of the Abandoned WWTP or the Uncontrolled Dumpsite. Also, adding to the complexity in scoring this site is the consideration of Sandy Creek. Because the source(s) of sediment contamination in the creek are not clearly defined, Group 2 should be scored both by considering Sandy Creek as a receptor and as a source.

Group 3. Group 3 is a logical grouping based on location, mutual types of contaminants, possible physical linkage, migration route, onsite receptor types, and distance to offsite receptors.

2.9.2 Completeness and Adequacy of the Available OLF Barin Data Sections 2.1 through 2.8 have presented a source narrative summarizing the available chemical data and historical information relative to each site at OLF Barin. As indicated, documentation of these data is included in the SI report.

Current guidance, the most relevant of which is as follows, supports HRS II scoring data needs or clarifies and discusses issues relative to ambiguities discovered in implementing scoring under USEPA direction.

Guidance to Performing Preliminary Assessments under CERCLA, OSWER Publication 9345.0-01A (September 1991).

Expanded Site Inspection, Transitional Guidance for Fiscal Year 1988, OSWER Directive 9345.1-02 (October 1987).

Hazard Ranking System Data Collection Guide to Meet the Requirements of the Revised Hazard Ranking System (HRS 2), USEPA Region IV (April 1991).

General Reference on Site Inspections to Meet the Requirements of the Revised Hazard Ranking System (HRS 2) (December 1990).

Preliminary Resolution of Update 11 Guidance Issues, Janet Grubbs, Site Assessment Branch, Memorandum (May 31, 1991).

Demographic and environmental setting data collected in 1991 are adequate and structured appropriately to meet receptor information requirements for HRS II. These data and the previous reports also are adequate to support assessment of each of the pathways. However, due to the pre-guidance focus of the SI activities on identifying contaminant migration, adequate data to characterize the 'waste quantities' in terms of hazardous substances or hazardous waste streams are not available. Estimates have been made for waste quantities based on the best available estimate of area or volume. In addition, only limited soil or waste sampling has been conducted and full CERCLA TCL and TAL results were generally not obtained. These factors limit the completeness of the HRS II ranking. Soil or source samples are available at three of the eight sites. Groundwater monitoring data from the site investigation indicate observed releases to groundwater have occurred at Sites 19B and 20B. The installation water supply well is contaminated by VOCs at concentrations in excess of Alabama and Federal MCLs. Wellhead treatment by activated carbon is employed at the wellhead to remove the VOCs from potable water prior to consumption. Effectiveness of treatment is monitored by OLF Barin on a monthly basis. No observational data exist for releases to air. Three surface water and sediment samples were collected during the site investigation.

In spite of the data limitations, an HRS II score has been developed as shown in Chapter 3.0 and documented in Chapter 4.0 for each of the three site groups.

2.10 WASTE QUANTITIES. Table 2-3 presents the Hazardous Waste Quantity, volume, and area used for calculating Waste Quantity Factor Values for HRS II Scoring. Due to the absence of documentation, the quantity of hazardous waste associated with each site was not determined. As a default, the area or volume of all sites

Table 2-3
Site-Specific Hazardous Waste Quantity Evaluation

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Number	Site Name	HRS II Tier	Area/Volume
19B	Former Hangar Maintenance Area including the Installation Water Supply Areas	D	511,000 ft^2
20B	Abandoned USTs and Fuel Pit Area	D	861,000 ft^2
21B	Rubble Landfill including Sandy Creek	D	134,850 ft^2
22B	Old Firefighting Demonstration Area	D	280,000 ft^2
23B	Drainage Ditch to Sandy Creek	D	NA
25B	Machine Gun Butt Area	D	8,700 ft^2
26B	Abandoned WWTP	C	550 yd^3
27B	Uncontrolled Dumpsite	D	32,700 ft^2

Notes: ft^2 = square feet.
NA = not applicable.
WWTP = Wastewater Treatment Plant.
yd^3 = cubic yards.

USTs

USTs = underground storage tanks

was approximated. All sites were classified as either Tier C (volume), or Tier D (area). Based on area for Tier D, factor values may be calculated for HRS II scoring guidance based on either Table 2-5 of the HRS II guidance, or Table 5-2 of the HRS II scoring guidance for soil exposures.

2.11 HAZARDOUS SUBSTANCES PRESENT. In Sections 2.1 through 2.8, the eight potential disposal sites at OLF Barin were identified and described. Each site represents a potential or observed release of hazardous substances. Groundwater and soil data are summarized in Table 2-4 for the eight sites, and surface water or sediment sampling data are summarized in Table 2-5.

The OLF Barin potable groundwater supply has been shown to be contaminated by VOCs. The chemicals and observed concentrations are summarized in Table 2-6. As an interim remedial action, wellhead GAC filtration treatment systems have been installed and treated water is tested on a monthly basis to ensure that VOCs are removed.

In order to develop waste characteristic scores for the HRS II and to evaluate and score the severity of impact of observed releases to targets, specific chemical, physical, and toxicological attributes of the hazardous chemicals are required. Table 2-7 is a tabulation of the chemical, physical, and toxicological properties and attributes necessary to score toxicity, mobility, and bioaccumulation factors for the observed chemicals at OLF Barin taken from the USEPA Chemical Matrix Data Base. Tables 2-8 and 2-9 contain information including Federal AWQC, MCLs, screening and "benchmark" concentrations based on human verified reference doses (RfDs), cancer slope factors, and USEPA Cancer Assessment Group weight of evidence. These data are extracted from the ~~internal~~ USEPA guidance Chemical Matrix Data Base. These data will be used in the HRS II scoring process in the absence of numerical MCLs for any of the environmental media or migration pathways. Table 2-10 is a summary of available Federal and State of Alabama (Alabama Administrative Code, Chapter 335-7-2 and 335-7-3) numerical standards for substances in the USEPA TCL and TAL.

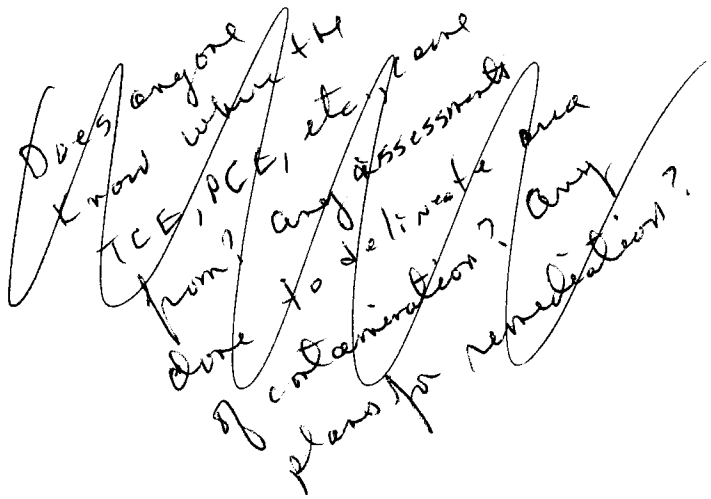

Table 2-4
Summary of Observed Releases of Hazardous Substances to Soil and Groundwater

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Number	Site Name	Materials Disposed	Soil Chemical	Frequency of Detection[1]	Maximum Conc. (mg/kg)	Groundwater Chemical	Frequency of Detection[1]	Maximum Conc. (µg/ℓ)
19B	Former Hangar Maintenance Area including the Installation Water Supply Areas	Solvents, oils, and fuels	Not detected	NA	NA	Mercury Trichloroethylene Tetrachloroethylene trans-1,2-Dichloroethylene	3/9 [2]2/2 [2]2/2 [2]1/2	5.9 8 6 13.2
20B	Abandoned USTs and Fuel Pit Area	Fuels and AVGAS	Not sampled	NA	NA	Lead	4/9	30
21B[3]	Rubble Landfill including Sandy Creek	Debris from dismantled buildings.	Methylene chloride.	1/4	448	Not sampled	NA	NA
22B	Old Firefighting Demonstration Area	Fuels, oils and spent solvents	Lead	10/54	364	Not sampled	NA	NA
23B	Drainage Ditch to Sandy Creek	Fuel	Not sampled	NA	NA	Not sampled	NA	NA
-26B	Abandoned WWTP	NA	Not sampled	NA	NA	Not sampled	NA	NA
-27B	Uncontrolled Dumpsite	Used appliances, paint cans, garbage, tires, auto parts, and used motor oil cans.	Not sampled	NA	NA	Not sampled	NA	NA
-25B	Machine Gun Butt Area	Spent bullets, copper jacketed bullets, shotgun lead shot, and bullet fragments.	Not sampled	NA	NA	Not sampled	NA	NA

Notes:
[1] (1/2) = number of samples with detectable levels of contaminant per total number of samples analyzed.
[2] Detection of trichloroethene (TCE), tetrachloroethene (PCE), and trans-1,2-dichloroethylene (trans-1,2-DCE) are based on analyses of the new water supply well, untreated water.
[3] Reported soil contamination is located near Site 21B.

Conc. = Concentration
mg/kg = milligrams per kilogram.
µg/ℓ = micrograms per liter.
NA = not applicable.
USTs = underground storage tanks.
AVGAS = aviation gasoline.
WWTP = wastewater treatment plant.

in text you used ethylene, be consistant (we usually use ethene).

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Table 2-5
Summary of Observed Releases of Hazardous Substances to Surface Water and Sediment

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Number	Site Name	Materials Disposed	Surface Water Chemical	Frequency of Detection[1]	Maximum Conc. (µg/ℓ)	Sediment Chemical	Frequency of Detection[1]	Maximum Conc. (mg/kg)
19B	Former Hangar Maintenance Area including the Installation Water Supply Areas	Solvents, oils, and fuels	Not detected	NA	NA	Not sampled	NA	NA
20B	Abandoned USTs and Fuel Pit Area	Fuels and AVGAS	Not sampled	NA	NA	Not sampled	NA	NA
21B	Rubble Landfill including Sandy Creek	Debris from dismantled buildings.	Cyanide	1/3	6	Methylene chloride Toluene DDT DDE DDD Dieldrin Xylenes Ethyl benzene	2/3 3/3 2/3 2/3 2/3 2/3 3/3 3/3	113 229 14 5 2 10 286 57
22B	Old Firefighting Demonstration Area	Fuels, oils, and spent solvents.	Not sampled	NA	NA	Not sampled	NA	NA
23B	Drainage Ditch to Sandy Creek	Fuel	Not sampled	NA	NA	Not sampled	NA	NA
– 26B	Abandoned WWTP	NA	Not sampled	NA	NA	Not sampled	NA	NA
– 27B	Uncontrolled Dumpsite	Used appliances, paint cans, garbage, tires, auto parts, and used motor oil cans.	Not sampled	NA	NA	Not sampled	NA	NA
– 28B	Machine Gun Butt Area	Spent bullets, copper jacketed bullets, shotgun lead shot, and bullet fragments.	Not sampled	NA	NA	Not sampled	NA	NA

[1] (1/2) = number of samples with detectable levels of contaminant per total number of samples analyzed.

Conc. = Concentration

Notes: µg/ℓ = micrograms per liter.
mg/kg = milligrams per kilogram.
NA = not applicable.
USTs = underground storage tanks.
AVGAS = aviation gasoline.
DDT = dichlorophenyl trichloroethane.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethylene.
WWTP = wastewater treatment plant.

Table 2-6
Summary of Groundwater Quality in OLF Barin Potable Water Supply

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Parameters	Well and Sample Data			
	Raw Water			Treated Water Supply
	New Well	New Well	Old Well	
	07/29/88	09/07/88	09/07/88	04/30/90
Physical Characteristics				
Specific conductance (µmhos/cm)	32.0	48.0	40.0	34.0
pH (standard units)	5.7	5.2	3.3	5.6
Organic Chemicals				
trans-1,2-Dichloroethylene (µg/ℓ)	13.2	<5.0	<5.0	<0.5
Tetrachloroethylene (µg/ℓ)	6.0	6.0	7.0	<0.5
Trichloroethylene (µg/ℓ)	4.0	8.0	7.0	<0.5
Inorganic Analytes				
Alkalinity (mg/ℓ as $CaCO_3$)	5.0	NA	NA	10.0
Chloride (mg/ℓ)	4.0	NA	NA	8.0
Total hardness (mg/ℓ as $CaCO_3$)	3.0	NA	NA	5.0
Calcium (mg/ℓ)	<0.01	NA	NA	NA
Magnesium (mg/ℓ)	0.88	NA	NA	NA
Lead (mg/ℓ)	0.004	NA	NA	0.004
Total dissolved solids (mg/ℓ)	5.7	NA	NA	3.0

Source: Personal communication, Department of Public Works, NAS Whiting Field, 1990.

Notes: No extractable organic chemicals, pesticides, or herbicides were detected.

µmhos/cm = micromhos per centimeter.
µg/ℓ = micrograms per liter.
mg/ℓ = milligrams per liter.
$CaCO_3$ = calcium carbonate.
NA = Not analyzed.

Table 2-7
Summary of Assigned HRS II Factor Values for Hazardous Chemicals Detected at OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Chemical	CAS Number	Toxicity	Groundwater Mobility		Persistence		Bioaccumulation				Ecotoxicity		Air Gas		Gas	Particulate
			H_2O Solubility	Distribution Coefficient	River	Lake	Food Chain Freshwater	Food Chain Saltwater	Environmental Freshwater	Environmental Saltwater	Freshwater	Saltwater	Migration	Mobility		
Cyanide	00057-12-5	100	--	--	0.4	0.7	0.5	0.5	0.5	0.5	1,000	1,000	0	0	F	T
DDD	00072-54-8	100	0.09	2,490	1.0	1.0	50,000	50,000	50,000	50,000	10,000	10,000	6	0.002	T	T
DDE	00072-55-9	1,000	0.12	1,610	1.0	1.0	50,000	50,000	50,000	50,000	10,000	10,000	6	0.002	T	T
DDT	00056-29-3	1,000	0.025	23,100	1.0	1.0	50,000	50,000	50,000	50,000	10,000	10,000	6	0.002	T	T
Dieldrin	00060-57-1	10,000	0.195	1,270	1.0	1.0	50,000	5,000	50,000	5,000	10,000	10,000	6	0.002	T	T
Ethyl benzene	00100-41-4	10	109	30	0.4	0.4	50	50	50	50	100	100	17	1.0	T	F
Lead	07434-92-1	10	0.148	900	1	1	50	5×10^3	5×10^3	5×10^3	10^3	10^3	0	0	F	T
Mercury	07439-97-6	10^4	7.7×10^{-8}	10	1	1	5×10^4	5×10^4	5×10^4	5×10^4	10^4	10^4	11	0.2	T	T
Methylene chloride	00075-09-2	10	13,030	1.7029	0.4	1.0	5	5	5	5	1	1	17	1.0	T	F
Tetrachloroethylene	00127-18-4	100	200	36	0.4	1.0	50	50	50	50	100	100	17	1.0	T	F
Toluene	00108-88-3	10	526	14.4	0.4	0.4	50	50	50	50	10	100	17	1.0	T	F
trans-1,2-DCE	00156-60-5	100	6,300	3.32	0.4	1.0	50	50	50	50	0	0	17	1.0	T	F
Trichloroethylene	00079-01-6	10	1,899	25.18	0.4	1.0	50	50	50	50	10	10	17	1.0	T	F
Xylenes (maximum value)	0.0180-38-3	10	178	39.5	0.4	1.0	500	500	500	500	100	100	17	1.0	T	F

Source: USEPA Chemical Matrix Data Base, April 5, 1991

Notes:
CAS = chemical abstract service.
H_2O = water.
DDD = dichlorophenyl dichloroethane.
F = false.
T = true.
DDE = dichlorophenyl dichloroethylene.
DDT = dichlorophenyl trichloroethane.
trans-1,2-DCE = trans-1,2-dichloroethylene.

Table 2-8
Benchmark Screening Concentrations for Hazardous Chemicals in Air, Soil, and Groundwater at OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Substance Name	CAS Number	Air Pathway			Groundwater Pathway			Soil Pathway	
		NAAQS/NESHAPS ($\mu g/m^3$)	Reference Dose Screen Conc. (mg/m^3)	Cancer Risk Screen Conc. (mg/m^3)	MCL/MCLG (mg/ℓ)	Reference Dose Screen Conc. (mg/ℓ)	Cancer Risk Conc. (mg/ℓ)	Reference Dose Screen Conc. (mg/kg)	Cancer Risk Conc.
Cyanide	00057-12-5	--	--	--	--	7.0E-01	--	1.2E+04	--
DDD	00072-54-8	--	--	--	--	--	1.5E-04	--	2.4E+00
DDE	00072-55-9	--	--	--	--	--	1.0E-04	--	1.7E+00
DDT	00050-29-3	--	--	1.0E-05	--	1.8E-02	1.0E-04	2.9+02	1.7E+00
Dieldrin	00060-57-1	--	--	2.2E-07	--	1.8E-03	2.2E-06	2.9E+01	3.6E-02
Ethyl benzene	00100-41-4	--	1.0E+00	--	--	3.5E+00	--	5.8E+04	--
Lead	07434-92-1	1.5E+00	--	--	5.0E-02	--	--	--	--
Mercury	07439-97-6	--	3.0E-04	--	2.0E-03	1.1E-02	--	1.7E+02	--
Methylene chloride	00075-09-2	--	3.0E+00	2.2E-03	--	2.1E+00	4.7E-03	3.5E+04	7.8E+01
Tetrachloroethylene	000127-18-4	--	--	1.9E-03	[1]5.0E-03	3.5E-01	6.9E-04	5.8E+03	1.1E+01
Toluene	00108-88-3	--	2.0E+00	--	--	7.0E+00	--	1.2E+05	--
trans-1,2-DCE	00156-605	--	--	--	[1]1.0E-01	7.0E-01	--	1.2E+04	--
Trichloroethylene	00079-01-6	--	--	2.1E-04	5.0E-03	--	3.2E-03	--	5.3E+01
Xylenes	00108-38-3	--	7.0E-01	--	--	7.0E+01	--	1.2E+06	--

Source: USEPA Chemical Matrix Data Base, April 5, 1991

: reference 21

[1] Standard goes into effect July 1992.

Notes: CAS = chemical abstract service.
NAAQS/NESHAPS = National Ambient Air Quality Standards/National Emission Standards for Hazardous Air Pollutants.
$\mu g/m^3$ = micrograms per cubic meter.
Conc. = concentration.
mg/m^3 = milligrams per cubic meter.
MCL/MCLG = maximum contaminant limit/maximum contaminant limit goal.
mg/ℓ = milligrams per liter.
mg/kg = milligrams per kilogram.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethylene.
DDT = dichlorophenyl trichloroethane.
trans-1,2-DCE = trans-1,2-dichloroethylene.

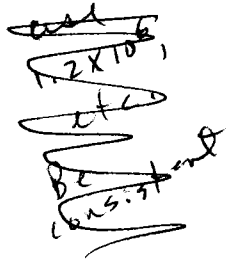

Table 2-9
Benchmark Screening Concentrations for Hazardous Chemicals in Surface Water at OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Substance Name	CAS Number	Drinking Water			Food Chain			Environmental	
								AWQC/AALAC	
		MCL/MCLG (mg/ℓ)	Reference Dose Screen Conc. (mg/ℓ)	Cancer Risk Screen Conc. (mg/ℓ)	FDAAL (ppm)	Reference Dose Screen Conc. (mg/kg)	Cancer Risk Screen Conc. (mg/kg)	Freshwater (µg/ℓ)	Saltwater (µg/ℓ)
Cyanide	00057-12-5	--	7.0E-01	--	--	2.6E+01	--	5.2E+00	1.0E+00
DDD	00072-54-8	--	--	1.5E-04	5.0E+00	--	5.4E-03	--	--
DDE	00072-55-9	--	--	1.0E-04	5.0E+00	--	3.8E-03	--	--
DDT	00050-29-3	--	1.8E-02	1.0E-04	5.0E+00	--	3.8E-03	--	--
Dieldrin	00060-57-1	--	1.8E-03	2.2E-06	3.0E-01	6.5E-02	8.1E-05	1.9E-03	1.9E-03
Ethyl benzene	00100-41-4	--	3.5E+00	--	--	1.3E+02	--	--	--
Lead	07434-92-1	5.0E-02	--	--	--	--	--	3.2E+00	5.6E+00
Mercury	07439-97-6	2.0E-03	1.1E-02	--	1.0E+00	3.9E-01	--	1.2E-01	2.5E-02
Methylene chloride	00075-09-2	--	2.1E+00	4.7E-03	--	7.8E-01	1.7E-01	--	--
Tetrachloroethylene	000127-18-4	[1]5.0E-03	3.5E-01	6.9E-04	--	1.3E-01	2.5E-02	--	--
Toluene	00108-88-3	--	7.0E+00	--	--	2.6E+02	--	--	--
trans-1,2-DCE	00156-605	[1]1.0E-01	7.0E-01	--	--	2.6E+01	--	--	--
Trichloroethylene	00079-01-6	5.0E-03	--	3.2E-03	--	--	1.2E-01	--	--
Xylenes	00108-38-3	--	7.0E-01	--	--	2.6E+03	--	--	--

Source: USEPA Chemical Matrix Data Base, August 5, 1991

[1] Standard goes into effect July 1992.

Notes:
AWQC/AALAC = ambient water quality criteria/ambient aquatic life advisory concentration
CAS = chemical abstract service.
MCL/MCLG = maximum contaminant limit/maximum contaminant limit goal
mg/ℓ = milligrams per liter.
Conc. = concentration.
FDAAL = Food and Drug Administration Action Levels.
ppm = parts per million.
mg/kg = milligrams per kilogram.
µg/ℓ = micrograms per liter.
DDD = dichlorophenyl dichloroethane.
DDE = dichlorophenyl dichloroethylene.
DDT = dichlorophenyl trichloroethane.
trans-1,2-DCE = trans-1,2-dichloroethylene.

Table 2-10
Federal and State Water Quality Standards and Criteria, U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Volatile organic compounds						
Chloromethane				0(0.19)		
Bromomethane				0(0.19)		
Vinyl chloride	2	0		0(2.0)		2
Chloroethane			IND	IND		
Methylene chloride			[5]11,000	0(0.19)		
Acetone						
Carbon disulfide						
1,1-Dichloroethene	7	7	[5]11,600	0(0.003)		7
1,1-Dichloroethane						
cis-1,2-Dichloroethene	[6]70	70	IND	IND		
trans-1,2-Dichloroethene	[6]100	100				
Chloroform	[7]100		[8]1,240	0(0.19)		
1,2-Dichloroethane	5	0	[8]20,000	0(0.94)		5
2-Butanone						
1,1,1-Trichloroethane	200	200	18,000	18,400		200
Carbon tetrachloride	5	0	[5]35,200	0(0.4)		5
Vinyl acetate						
Bromodichloromethane	[7]100		[5]11,000			
1,2-Dichloropropane	5	0	[8]5,700	IND		
trans-1,3-Dichloropropene			[8]244	87		
Trichloroethene	5	0	[8]21,900	0(2.78)		5
Dibromochloromethane	100		[5]11,000	0(0.19)		
1,1,2-Trichloroethane			[8]9,400	0(0.6)		
Benzene	5	0	[5]5,300	0(0.66)		5
cis-1,3-Dichloropropene			[8]244	87		
2-Chloroethylvinyl ether						
Bromoform	[7]100		[5]11,000			
4-Methyl-2-pentanone						
2-Hexanone						
Tetrachloroethene	[7]5	0	[8]840	0(0.80)		
1,1,2,2-Tetrachloroethane			[8]2,400	0(0.17)		
Toluene	[6]1,000	1,000	[5]17,500	[8]18,400		

See notes at end of table.

Table 2-10 (Continued)
Federal and State Water Quality Standards and Criteria, U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Volatile organic compounds--continued						
p-Dichlorobenzene						75
Ethyl benzene	[6]700	700	[5]32,000	1,400		
Chlorobenzene	[6]100	100	[8]50	488		
Styrene	[6]100	100				
Xylenes (total)	[6]10,000	10,000				
Inorganic compounds						
Aluminum			[9]87	146	50 to 200	
Antimony			[8]30	146		
Arsenic	50	50	[9]190	0.0022		50
Asbestos	[10]7 x 10^6(f/ℓ)	[10]7 x 10^6(f/ℓ)				
Barium	[6]2,000	[6]2,000		1,000		1,000
Beryllium			[8]5.3	0(0.0037)		
Cadmium	[6]5	5	[11]1.1	10		10
Calcium						
Chloride						[12]250,000
Chromium (total)	[6]100	100				50
Chromium VI	50	12	11	50		
Chromium III			[11]210	170,000		
Cobalt						
Copper		1,300	[11]12	[11]1,000	1,000	[12]1,000
Cyanide, total						
Fluoride	4,000	4,000			2,000	4,000
Iron			1,000	300	3,000	[12]300
Lead	[6]15	0	[11]3.2	50		20
Magnesium						
Manganese				50	50	[12]50
Mercury	[6]2	2	[9]0.012	0.144		2
Nitrate (as N)	10,000					10,000
Nitrite (as N)	[6]1,000					
Total nitrate + nitrite	[6]10,000					
Nickel			[11]160	13.4		
Potassium						
Selenium	[6]50	50	[9]5	10		10

See notes at end of table.

Table 2-10 (Continued)
Federal and State Water Quality Standards and Criteria,
U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Inorganic compounds--continued						
Silver	50		[9]0.12	50	100	50
Sodium						
Thallium			[8]40	13		
Vanadium						
Zinc			[11]110	[13]5,000	5,000	[12]5,000
Semivolatile organic compounds						
3-Nitroaniline				0.0028		
Acenaphthene			[8]520	70		
2,4-Dinitrophenol				70		
4-Nitrophenol						
Dibenzofuran						
2,4-Dinitrotoluene			[8]230	0(0.11)		
Diethylphthalate				350,000		
4-Chlorophenyl-phenylether						
Fluorene				0.0028		
4-Nitroaniline						
4,6-Dinitro-2-methylphenol						
N-Nitrosodiphenylamine				0(4.9)		
4-Bromophenyl-phenylether						
Hexachlorobenzene			[8]3.68	0.00072		
Pentachlorophenol	1	0	[9]13	1,010		
Phenanthrene			[8]6.3	0.0031		
Anthracene			[13]6.3	0.0031		
Di-n-butylphthalate				34,000		
Fluoranthene			[5]3,980	42		
Pyrene				0.0028		
Butylbenzylphthalate						
3,3'-Dichlorobenzidine				0.0103		
Benzo(a)anthracene				0.0028		
Chrysene				0.0028		
bis(2-Ethylhexyl)phthalate			[8]3			
Di-n-octylphthalate						
Benzo(b)fluoranthene				0(0.0028)		

See notes at end of table.

Table 2-10 (Continued)
Federal and State Water Quality Standards and Criteria, U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Semivolatile organic compounds--continued						
Benzo(k)fluoranthene				0(0.0028)		
Benzo(a)pyrene				0(0.0028)		
Indeno(1,2,3-cd)pyrene				0(0.0028)		
Dibenzo(a,h)anthracene				0(0.0028)		
Benzo(g,h,i)perylene				0(0.0028)		
Phenol			[8]2,560	3,500		
bis(2-Chloroethyl)ether				0(30 ng/ℓ)		
2-Chlorophenol			[5]4,380	[13]0.1		
1,3-Dichlorobenzene	[6]600	600	[8]50	400		
1,2-Dichlorobenzene	[6]600	600	[8]50	400		
1,4-Dichlorobenzene	[6]75	75	[8]50	400		
Benzyl alcohol						
2-Methylphenol						
bis(2-Chloroisopropyl)ether				34.7		
4-Methylphenol						
N-Nitroso-di-n-propylamine						
Hexachloroethane			[8]540	0(1.9)		
Nitrobenzene			[5]27,000	19,800		
Isophorone			[5]117,000	5,200		
2-Nitrophenol						
2,4-Dimethylphenol			[5]2,120	400[f]		
Benzoic acid						
bis(2-Chloroethoxy)methane						
2,4-Dichlorobenzene			[8]763	3,090		
Naphthalene			[8]620	IND		
4-Chloroaniline						
Hexacholorobutadiene			[8]9.3	0(0.45)		
4-Chloro-3-methylphenol			[5]30	3,000		
2-Methylnaphthalene				0.0028		
Hexachlorocyclopentadiene			[8]5.2	206		
2,4,6-Trichlorophenol			[8]970	0(1.2)		
2,4,5-Trichlorophenol			[8]63	2,600		

See notes at end of table.

Table 2-10 (Continued)
Federal and State Water Quality Standards and Criteria,
U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Semivolatile organic compounds--continued						
2-Chloronaphthalene			[5]1,600	IND		
2-Nitroaniline						
Dimethylphthalate				313,000		
Acenaphthylene				0.0028		
2,6-Dinitrotoluene						
Pesticides and PCB compounds						
Alachlor	[6]2	0				
Atrazine	[6]3	3				
Carbofuran	[6]40	40				
Dibromochloropropane	[6]0.2	0				
2,4-D	[6]70	70		100		100
Ethylene dibromide	[6]0.05	0				
2,4,5-TP	[6]50	50		10		
alpha-BHC			[5]100	0.073		
beta-BHC			[5]100	0.0233		
delta-BHC	0.2	0	IND	IND		
gamma-BHC (lindane)	[6]0.2	0.2		0.0174		4
Heptachlor	[6]0.4	0	[9]0.0038	0.00028		
Aldrin			[14]3.0	0.000074		
Heptachlor epoxide	[6]0.2	0	0.0038			
Endosulfan I			[14]0.056			
Dieldrin			[14]0.0019	0.000071		
4,4'-DDE			[5]1,050			
Endrin	0.2		[14]0.0023	1		2
Endosulfan II			0.056			
4,4'-DDD						
Endrin aldehyde		[14]0.001				
Endosulfan sulfate						
4,4'-DDT			[9]0.001	0.000024		
Methoxychlor	40	40		100		100
Endrin ketone						
Chlordane	[6]2	0	[14]0.0043	0(0.00046)		
Silvex						10

See notes at end of table.

Table 2-10 (Continued)
Federal and State Water Quality Standards and Criteria, U.S. Environmental Protection Agency Target Compound List

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Federal Primary Drinking Water MCL[1] (µg/ℓ)	Federal Primary Drinking Water MCLG[1] (µg/ℓ)	Federal AWQC Aquatic Organisms[2] (µg/ℓ)	Federal AWQC Human Health[3] (µg/ℓ)	Federal Secondary Drinking Water MCL[4] (µg/ℓ)	Alabama MCL (µg/ℓ)
Pesticides/PCB compounds--continued						
Toxaphene	[6]3	0	[8]0.0002	0(0.00071)		5
Aroclor-1016				0(>0.0126)		
Aroclor-1221				0(>0.0126)		
Aroclor-1232				0(>0.0126)		
Aroclor-1242				0(>0.0126)		
Aroclor-1248				0(>0.0126)		
Aroclor-1254				0(>0.0126)		
Aroclor-1260				0(>0.0126)		
PCBs (total)	[6]0.5	0	[9]0.014	(0.000079)		

[1] From 40 Code of Federal Regulations (CFR) 161, revised by 56 Federal Register 3578, January 30, 1991.
[2] Ambient water quality criteria (AWQC) for the protection of aquatic life, lowest available number is presented (USEPA, May 1986).
[3] AWQC for the protection of human health, from effects through ingestion of contaminated aquatic organisms (USEPA, May 1986).
[4] Secondary MCLs from 40 CFR 143, revised by 56 Federal Register 3595, January 30, 1991. Secondary MCLs are not federally enforceable; they are guidelines to control aesthetic qualities of drinking water.
[5] Acute lowest observed effect level (LOEL).
[6] Effective July 30, 1992.
[7] Maximum contaminant limit (MCL) for total trihalomethanes (sum of concentrations of bromodichloromethane, dibromochloromethane, tribromomethane [bromoform], and trichloromethane) = 100 micrograms per liter (µg/ℓ).
[8] Chronic LOEL.
[9] Chronic criteria.
[10] Units for asbestos MCLs are million fibers per liter for fibers longer than 10 micrometer.
[11] Hardness based criteria (based on 100 milligrams per liter [mg/ℓ] as [CaCO3]).
[12] Secondary Alabama maximum contaminant levels (MCLs).
[13] Organoleptic, criteria based on odor and taste, not health. No health-based criteria available.
[14] Acute criteria.

Notes: MCLs = maximum contaminant levels.
µg/ℓ = microgram per liter.
MCLG = maximum contaminant level goal.
AWQC = Ambient Water Quality Criteria.
IND = insufficient data.
PCB = polychlorinated biphenyls.
f/ℓ = fibers per liter.
ng/ℓ = nanogram per liter.

3.0 HAZARD RANKING SYSTEM II SCORE AND SCORING SHEETS

HRS II scoring was performed for each of the three site groups identified in Chapter 2.0 using the data presented in Chapters 1.0, 2.0, and 4.0. For each site group, hazardous substances available to each pathway were identified based on the PA and SI reports. Scores were developed for groundwater, surface water overland flow and flood, and groundwater to surface water migration, and air pathways as well as for soil exposure. Table 3-1 presents a summary score for each pathway for the three site groups. The scoring sheet documentation is also presented in this chapter. Copies of the Wetland Inventories, Coastal Ecological Inventory, USGS Quadrangle Maps, and pertinent soil type maps from the Santa Rosa County Soil Survey (USDA, 1980) are presented in Chapter 5.0.

Table 3-2 shows the root-mean-square HRS II Score for each site group. The overall score of 56.38 represents a score developed from the highest pathway score for all groups and represents the score for OLF Barin as a whole.

The Group II score of 50.01 (i.e., the score for Site 21B, uncontrolled dumpsite and the abandoned WWTP) is significantly higher than 28.5, the score that designates the threshold for listing on the NPL. The HRS II score for Group II is driven by the surface water pathway score. The major factor that drives the surface water pathway score, and therefore drives the total HRS II score, is the evidence of an observed release to surface water. Cyanide was detected in surface water samples collected from Sandy Creek, and methylene chloride, toluene, xylene, ethyl benzene, dichlorophenyl trichloroethane (DDT), dichlorophenyl dichloroethylene (DDE), dichlorophenyl dichloroethane (DDD), and dieldrin were detected in sediment samples collected from Sandy Creek.

The Group I groundwater pathway score is driven by the presence of lead, mercury, and trichloroethylene in samples from the monitoring wells associated with the Former Hangar Maintenance Area and in samples from the installation water supply wells. No observed releases to groundwater have been documented for Groups II or III.

The soils exposure scores were not significant because no observed releases were documented. The soils pathway scores for each group were based on the likelihood to release chemicals to the environment. Tables 3-3 through 3-14 contain the HRS II scoring sheets for each group and for each pathway.

Table 3-1
HRS II Pathway Scores for OLF Barin Site Groups

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Group	Pathway(s)				
	Groundwater (gw)	Surface Water		Soil Exposure (s)	Air (a)
		Overland Flow/Flood (sw)	Groundwater to Surface Water (swg)		
Group I (Sites 19B, 20B, and 23B)	51.8	2.99	6.51	0	1.45
Group II (Site 21B, Uncontrolled Dumpsite, and Abandoned WWTP)	1.67	100	--	0.0004	0.127
Group III (Machine Gun Butt Area and Site 22B)	5.35	13.44	--	5.33	0.014

Table 3-2
HRS II Scores for OLF Barin Site Groups

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Group	HRS II Score (S)
Group I	26.11
Group II	50.01
Group III	7.71
Overall (highest pathway score for all groups)	56.38

Table 3-3
Groundwater Migration Pathway Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer			
1. Observed release	550	550	
2. Potential to release			
2a. Containment	10		
2b. Net precipitation	10		
2c. Depth to aquifer	5		
2d. Travel time	35		
2e. Potential to release (lines 2a × [2b+2c+2d])	500		
3. Likelihood of release (higher of lines 1 and 2e)	550		550
Waste Characteristics			
4. Toxicity and mobility	(1)	100	
5. Hazardous waste quantity	(1)	100	
6. Waste characteristics	100		10
Targets			
7. Nearest well	50	50	
8. Population			
8a. Level I concentrations	(2)	630	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	72	
8d. Population (lines 8a+8b+8c)	(2)	702	
9. Resources	5	5	
10. Wellhead protection area	20	20	
11. Targets (lines 7+8d+9+10)	(2)		777
Groundwater Migration Score for an Aquifer			
12. Aquifer score[3] ([lines 3×6×11]/82,500)	100		51.8
Groundwater Migration Pathway Score			
13. Pathway score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[3]	100		51.8

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

use small letterings for footnotes (to be consistent) on all these tables.

Table 3-4
Groundwater to Surface Water Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT			
Likelihood of Release to an Aquifer			
1. Observed release	550	0	
2. Potential to release			
2a. Containment	10	10	
2b. Net precipitation	10	6	
2c. Depth to aquifer	5	5	
2d. Travel time	35	35	
2e. Potential to release (lines 2a × [2b+2c+2d])	500	460	
3. Likelihood of release (higher of lines 1 and 2e)	550		460
Waste Characteristics			
4. Toxicity, mobility, and persistence	(1)	1,000	
5. Hazardous waste quantity	(1)	100	
6. Waste characteristics	100		32
Targets			
7. Nearest intake	50	0	
8. Population			
8a. Level I concentrations	(2)	0	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	0	
8d. Population (lines 8a+8b+8c)		0	
9. Resources	5	5	
10. Targets (lines 7+8d+9)	(2)		5
Drinking Water Threat Score			
11. Drinking water threat score ([lines 3×6×10]/82,500, subject to a maximum of 100)	100		0.89

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-4 (Continued)
Groundwater to Surface Water Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
HUMAN FOOD CHAIN THREAT			
Likelihood of Release			
12. Likelihood of release (same value as line 3)	550		460
Waste Characteristics			
13. Toxicity, mobility, ~~and~~ persistence, and Bioaccumulation	(1)	5×10^7	
14. Hazardous waste quantity	(1)	100	
15. Waste characteristics	1,000		560
Targets			
16. Food chain individual	50	0.8	
17. Population			
17a. Level I concentrations	(2)	0	
17b. Level II concentrations	(2)	0	
17c. Potential human food chain contamination	(2)	5.6×10^{-4}	
17d. Population (lines 17a+17b+17c)	(2)	5.56×10^{-4}	
18. Targets (lines 16+17d)	(2)		0.8006
Human Food Chain Threat Score			
19. Human food chain threat score ([lines 12 x 15 x 18]/82,500, subject to a maximum of 100)	100		2.5
ENVIRONMENTAL THREAT			
Likelihood of Release			
20. Likelihood of release (same value as line 3)	550		460

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-4 (Continued)
Groundwater to Surface Water Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
ENVIRONMENTAL THREAT (Concluded)			
Waste Characteristics			
21. Ecosystem toxicity, mobility, ~~and~~ persistence, and Bioaccumulation	([1])	5×10^7	
22. Hazardous waste quantity	([1])	100	560
23. Waste characteristics	1,000		
Targets			
24. Sensitive environments			
24a. Level I concentrations	([2])	0	
24b. Level II concentrations	([2])	0	
24c. Potential contamination	([2])	1	
24d. Sensitive environments (lines 24a+24b+24c)	([2])	1	
25. Targets (value from line 24d)	([2])		1
Environmental Threat Score			
26. Environmental threat score ([lines 20 x 23 x 25]/82,500, subject to a maximum of 60)	60		3.12
GROUNDWATER TO SURFACE WATER MIGRATION COMPONENT SCORE FOR A WATERSHED			
27. Watershed score[3] (lines 11+19+26, subject to a maximum of 100)	100		6.51
GROUNDWATER TO SURFACE WATER MIGRATION COMPONENT SCORE			
28. Component score[3] (S_{gs}) (highest score from line 27 for all watersheds evaluated, subject to a maximum of 100)	100		6.51

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-5
Surface Water Overland/Flood Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT			
Likelihood of Release			
1. Observed release	550	0	
2. Potential to release by overland flow			
2a. Containment	10	10	
2b. Runoff	25	1	
2c. Distance to surface water	25	6	
2d. Potential to release by overland flow (lines 2a × [2b+2c])	500	70	
3. Potential to release by flood			
3a. Containment (flood)	10	10	
3b. Flood frequency	50	0	
3c. Potential to release by flood (lines 3a × 3b)	500	0	
4. Potential to release (lines 2d+3c, subject to a maximum of 500)	500	70	
5. Likelihood of release (higher of lines 1 and 4)	550		70
Waste Characteristics			
6. Toxicity and persistence	(1)	10,000	
7. Hazardous waste quantity	(1)	100	
8. Waste characteristics	100		32
Targets			
9. Nearest intake	50	0	
10. Population			
10a. Level I concentrations	(2)	0	
10b. Level II concentrations	(2)	0	
10c. Potential contamination	(2)	0	
10d. Population (lines 10a+10b+10c)	(2)	0	
11. Resources	5	5	

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-5 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT (concluded)			
Targets (concluded)			
12. Targets (lines 9+10d+11)	([2])		5
Drinking Water Threat Score			
13. Drinking water threat score ([lines 5 x 8 x 12]/82,500, subject to a maximum of 100)	100		1 (0.136)
HUMAN FOOD CHAIN THREAT			
Likelihood of Release			
14. Likelihood of release (same as value in line 5)	550		70
Waste Characteristics			
15. Toxicity, persistence, and bioaccummulation	([1])	5×10^7	
16. Hazardous waste quantity	([1])	100	
17. Waste characteristics	1,000		560
Targets			
18. Food chain individual	50	2	
19. Population			
19a. Level I concentrations	([2])	0	
19b. Level II concentrations	([2])	0	
19c. Potential human food chain contamination	([2])	0.006	
19d. Population (lines 19a+19b+19c)	([2])	0.006	
20. Targets (lines 18+19d)	([2])		2.006
Human Food Chain Threat Score			
21. Human food chain threat score ([lines 14 x 17 x 20]/82,500, subject to a maximum of 100)	100		0.95

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-5 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
ENVIRONMENTAL THREAT			
Likelihood of Release			
22. Likelihood of release (same value as line 5)	550		70
Waste Characteristics			
23. Ecosystem toxicity, persistence, bioaccumulation	(1)	5×10^7	
24. Hazardous waste quantity	(1)	100	
25. Waste characteristics	1,000		560
Targets			
26. Sensitive environments			
26a Level I concentrations	(2)	0	
26b. Level II concentrations	(2)	0	
26c. Potential contamination	(2)	4	
26d. Sensitive environments (lines 26a+26b+26c)	(2)	4	
27. Targets (value from line 26d)	(2)		4
Environmental Threat Score			
28. Environmental threat score ([lines 22 x 25 x 27]/82,500, subject to a maximum of 60)	60		1.9
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED			
29. Watershed score[3] (lines 13+21+28, subject to a maximum of 60)	100		2.99
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30. Component score[3] (S_{of}) (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100		2.99

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-6
Soil Exposure Pathway Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned
RESIDENT POPULATION THREAT		
Likelihood of Exposure		
1. Likelihood of exposure	550	0
Waste Characteristics		
2. Toxicity	([1])	
3. Hazardous waste quantity	([1])	
4. Waste characteristics	100	
Targets		
5. Resident individual	50	
6. Resident population		
6a Level I concentrations	([2])	
6b. Level II concentrations	([2])	
6c. Resident population (lines 6a+6b)	([2])	
7. Workers	15	
8. Resources	5	
9. Terrestrial sensitive environments	([3])	
10. Targets (lines 5+6c+7+8+9)	([3])	
Resident Population Threat Score		
11. Resident population threat (lines 1 x 4 x 10)	([2])	0
NEARBY POPULATION THREAT		
Likelihood of Exposure		
12. Attractiveness and accessibility	100	
13. Area of contamination	100	
14. Likelihood of exposure	500	0
Waste Characteristics		
15. Toxicity	([4])	
16. Hazardous waste quantity	([1])	
17. Waste characteristics	100	

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Maximum value applies to waste characteristics category.

Table 3-6 (Continued)
Soil Exposure Pathway Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value		Value Assigned
NEARBY POPULATION THREAT (Concluded)			
Targets			
18. Nearby individual	1		
19. Population within 1 mile	(2)		
20. Targets (lines 18+19)	(2)		
Nearby Population Threat Score			
21. Nearby population threat (lines 14 x 17 x 20)	(2)		
SOIL EXPOSURE PATHWAY SCORE			
22. Soil exposure pathway score[4] (S_s), (lines [11 ÷ 21] + 82,500, subject to a maximum of 100	100		0

[2]Maximum value not applicable.
[4]Do not round to nearest integer.

Table 3-7
Air Migration Exposure Pathway Scoresheet
For Group I Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release			
1. Observed release	550	0	
2. Potential to release			
2a. Gas potential to release	500	360	
2b. Particulate potential to release	500	250	
2c. Potential to release (higher of lines 2a and 2b)	500	360	
3. Likelihood of release (higher of lines 1 and 2c)	550		360
Waste Characteristics			
4. Toxicity and mobility	(1)	100	
5. Hazardous waste quantity	(1)	100	
6. Waste characteristics	100		10
Targets			
7. Nearest individual	50	20	
8. Population			
8a. Level I concentrations	(2)	0	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	8	
8d. Population (lines 8a+8b+8c)	(2)	8	
9. Resources	5	5	
10. Sensitive environments			
10a. Actual contamination	(3)	0	
10b. Potential contamination	(3)	0.328	
10c. Sensitive environments (lines 10a+10b)	(3)	0.328	
11. Targets (lines 7+8d+9+10c)	(2)		33.33
Air Migration Pathway Score			
12. Pathway score[4] (S_a) ([lines 3 x 6 x 11]/82,500)	100		1.45

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Do not round to nearest integer.

Table 3-8
Groundwater Migration Pathway Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer			
1. Observed release	550	0	
2. Potential to release			
2a. Containment	10	10	
2b. Net precipitation	10	6	
2c. Depth to aquifer	5	5	
2d. Travel time	35	35	
2e. Potential to release (lines 2a × [2b+2c+2d])	500	460	
3. Likelihood of release (higher of lines 1 and 2e)	550		460
Waste Characteristics			
4. Toxicity and mobility	(1)	100	
5. Hazardous waste quantity	(1)	1	
6. Waste characteristics	100		3
Targets			
7. Nearest well	50	20	
8. Population			
8a. Level I concentrations	(2)	0	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	70	
8d. Population (lines 8a+8b+8c)	(2)	70	
9. Resources	5	5	
10. Wellhead protection area	20	5	
11. Targets (lines 7+8d+9+10)	(2)		100
Groundwater Migration Score for an Aquifer			
12. Aquifer score[3] ([lines 3 × 6 × 11]/82,500)	100		1.67
Groundwater Migration Pathway Score			
13. Pathway score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[3]	100		1.67

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-9
Surface Water Overland Flow and Flood Migration Component Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT			
Likelihood of Release			
1. Observed release	550	550	
2. Potential to release by overland flow			
2a. Containment	10		
2b. Runoff	25		
2c. Distance to surface water	25		
2d. Potential to release by overland flow (lines 2a × [2b+2c])	500		
3. Potential to release by flood			
3a. Containment (flood)	10		
3b. Flood frequency	50		
3c. Potential to release by flood (lines 3a × 3b)	500		
4. Potential to release (lines 2d+3c, subject to a maximum of 500)	500		
5. Likelihood of release (higher of lines 1 and 4)	550		550
Waste Characteristics			
6. Toxicity and persistence	(1)	700	
7. Hazardous waste quantity	(1)	10	
8. Waste characteristics	100		6
Targets			
9. Nearest intake	50	0	
10. Population			
10a. Level I concentrations	(2)	0	
10b. Level II concentrations	(2)	0	
10c. Potential contamination	(2)	0	
10d. Population (lines 10a+10b+10c)	(2)	0	
11. Resources	5	5	

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-9 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT (concluded)			
Targets (concluded)			
12. Targets (lines 9+10d+11)	(1)		5
Drinking Water Threat Score			
13. Drinking water threat score ([lines 5 × 8 × 12]/82,500, subject to a maximum of 100)	100		0.20
HUMAN FOOD CHAIN THREAT			
Likelihood of Release			
14. Likelihood of release (same as value in line 5)	550		550
Waste Characteristics			
15. Toxicity, persistence, and bioaccummulation	(1)	5×10^8	
16. Hazardous waste quantity	(1)	10	
17. Waste characteristics	1,000		320
Targets			
18. Food chain individual	50	20	
19. Population			
19a. Level I concentrations	(2)	0	
19b. Level II concentrations	(2)	0.03	
19c. Potential human food chain contamination	(2)	6×10^{-4}	
19d. Population (lines 19a+19b+19c)	(2)	0.03	
20. Targets (lines 18+19d)	(2)		20.03
Human Food Chain Threat Score			
21. Human food chain threat score ([lines 14 × 17 × 20]/82,500, subject to a maximum of 100)	100		42.73

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-9 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
ENVIRONMENTAL THREAT			
Likelihood of Release			
22. Likelihood of release (same value as line 5)	550		550
Waste Characteristics			
23. Ecosystem toxicity, persistence, and bioaccumulation	(1)	2.0×10^8	
24. Hazardous waste quantity	(1)	10	
25. Waste characteristics	1,000		180
Targets			
26. Sensitive environments			
26a Level I concentrations	(2)	1,000	
26b. Level II concentrations	(2)	0	
26c. Potential contamination	(2)	0.386	
26d. Sensitive environments (lines 26a+26b+26c)	(2)	1000.386	
27. Targets (value from line 26d)	(2)		1000.386
Environmental Threat Score			
28. Environmental threat score ([lines 22 x 25 x 27]/82,500, subject to a maximum of 60)	60		60
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED			
29. Watershed score[3] (lines 13+21+28, subject to a maximum of 60)	100		100
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30. Component score (S_{of})[3] (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100		100

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-10
Soil Exposure Pathway Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
RESIDENT POPULATION THREAT			
Likelihood of Exposure			
1. Likelihood of exposure	550		0
Waste Characteristics			
2. Toxicity	([1])		
3. Hazardous waste quantity	([1])		
4. Waste characteristics	100		
Targets			
5. Resident individual	50		
6. Resident population			
6a Level I concentrations	([2])		
6b. Level II concentrations	([2])		
6c. Resident population (lines 6a+6b)	([2])		
7. Workers	15		
8. Resources	5		
9. Terrestrial sensitive environments	([3])		
10. Targets (lines 5+6c+7+8+9)	([2])		
Resident Population Threat Score			
11. Resident population threat (lines 1 x 4 x 10)	([2])		0
NEARBY POPULATION THREAT			
Likelihood of Exposure			
12. Attractiveness and accessibility	100	25	
13. Area of contamination	100	20	
14. Likelihood of exposure	500		5
Waste Characteristics			
15. Toxicity	([4])	10,000	
16. Hazardous waste quantity	([4])	0.294	
17. Waste characteristics	100		6

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Maximum value applies to waste characteristics category.

Table 3-10 (Continued)
Soil Exposure Pathway Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
NEARBY POPULATION THREAT (Concluded)			
Targets			
18. Nearby individual	1	1	
19. Population within 1 mile	(2)	0.115	
20. Targets (lines 18+19)	(2)		1.115
Nearby Population Threat Score			
21. Nearby population threat (lines 14 x 17 x 20)	(2)		33
SOIL EXPOSURE PATHWAY SCORE			
22. Soil exposure pathway score[4] (S_s), (lines [11 ÷ 21] ÷ 82,500, subject to a maximum of 100 ⓥ	100		0.0004

[2]Maximum value not applicable.
[4]Do not round to nearest integer.

Table 3-11
Air Migration Pathway Scoresheet
For Group II Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release			
1. Observed release	550	0	
2. Potential to release			
2a. Gas potential to release	500	175	
2b. Particulate potential to release	500	0	
2c. Potential to release (higher of lines 2a and 2b)	500	175	
3. Likelihood of release (higher of lines 1 and 2c)	550		175
Waste Characteristics			
4. Toxicity and mobility	(1)	100	
5. Hazardous waste quantity	(1)	1	
6. Waste characteristics	100		3
Targets			
7. Nearest individual	50	7	
8. Population			
8a. Level I concentrations	(2)	0	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	3	
8d. Population (lines 8a+8b+8c)	(2)	3	
9. Resources	5	5	
10. Sensitive environments			
10a. Actual contamination	(3)	0	
10b. Potential contamination	(3)	5	
10c. Sensitive environments (lines 10a+10b)	(3)	5	
11. Targets (lines 7+8d+9+10c)	(2)		20
Air Migration Pathway Score			
12. Pathway score (S_a) ([lines 3 x 6 x 11]/82,500)[4]	100		0.127

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Do not round to nearest integer.

Table 3-12
Groundwater Migration Pathway Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer			
1. Observed release	550	0	
2. Potential to release			
2a. Containment	10	10	
2b. Net precipitation	10	6	
2c. Depth to aquifer	5	5	
2d. Travel time	35	35	
2e. Potential to release (lines 2a × [2b+2c+2d])	500	460	
3. Likelihood of release (higher of lines 1 and 2e)	550		460
Waste Characteristics			
4. Toxicity and mobility	(1)	1,000	
5. Hazardous waste quantity	(1)	1	
6. Waste characteristics	100		10
Targets			
7. Nearest well	50	18	
8. Population			
8a. Level I concentrations	(2)	0	
8b. Level II concentrations	(2)	0	
8c. Potential contamination	(2)	68	
8d. Population (lines 8a+8b+8c)	(2)	68	
9. Resources	5	5	
10. Wellhead protection area	20	5	
11. Targets (lines 7+8d+9+10)	(2)		96
Groundwater Migration Score for an Aquifer			
12. Aquifer score ([lines 3×6×11]/82,500)[3]	100		5.35
Groundwater Migration Pathway Score			
13. Pathway score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[3]	100		5.35

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-13
Surface Water Overland/Flood Migration Component Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT			
Likelihood of Release			
1. Observed release	550	0	
2. Potential to release by overland flow			
2a. Containment	10	10	
2b. Runoff	25	1	
2c. Distance to surface water	25	6	
2d. Potential to release by overland flow (lines 2a × [2b+2c])	500	70	
3. Potential to release by flood			
3a. Containment (flood)	10	10	
3b. Flood frequency	50	0	
3c. Potential to release by flood (lines 3a × 3b)	500	0	
4. Potential to release (lines 2d+3c, subject to a maximum of 500)	500	70	
5. Likelihood of release (higher of lines 1 and 4)	550		70
Waste Characteristics			
6. Toxicity and persistence	([1])	10,000	
7. Hazardous waste quantity	([1])	1	
8. Waste characteristics	100		10
Targets			
9. Nearest intake	50	0	
10. Population			
10a. Level I concentrations	([2])	0	
10b. Level II concentrations	([2])	0	
10c. Potential contamination	([2])	0	
10d. Population (lines 10a+10b+10c)	([2])	0	
11. Resources	5	5	

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-13 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
DRINKING WATER THREAT (concluded)			
Targets (concluded)			
12. Targets (lines 9+10d+11)	(2)		5
Drinking Water Threat Score			
13. Drinking water threat score ([lines 5 × 8 × 12]/82,500, subject to a maximum of 100)	100		0.042
HUMAN FOOD CHAIN THREAT			
Likelihood of Release			
14. Likelihood of release (same as value in line 5)	550		70
Waste Characteristics			
15. Toxicity, persistence, bioaccummulation	(1)	5×10^7	
16. Hazardous waste quantity	(1)	1	
17. Waste characteristics	1,000		56
Targets			
18. Food chain individual	50	2	
19. Population			
19a. Level I concentrations	(2)	0	
19b. Level II concentrations	(2)	0	
19c. Potential human food chain contamination	(2)	6.46×10^{-4}	
19d. Population (lines 19a+19b+19c)	(2)	6.46×10^{-4}	
20. Targets (lines 18+19d)	(2)		2.006
Human Food Chain Threat Score			
21. Human food chain threat score ([lines 14 × 17 × 20]/82,500, subject to a maximum of 100)	100		0.10

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.

Table 3-13 (Continued)
Surface Water Overland/Flood Migration Component Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
ENVIRONMENTAL THREAT			
Likelihood of Release			
22. Likelihood of release (same value as line 5)	550		70
Waste Characteristics			
23. Ecosystem toxicity, persistence, bioaccumulation	(1)	5×10^7	
24. Hazardous waste quantity	(1)	1	
25. Waste characteristics	1,000		560
Targets			
26. Sensitive environments			
26a Level I concentrations	(2)	0	
26b. Level II concentrations	(2)	0	
26c. Potential contamination	(2)	28	
26d. Sensitive environments (lines 26a+26b+26c)	(2)	28	
27. Targets (value from line 26d)	(2)		28
Environmental Threat Score			
28. Environmental threat score ([lines 22 × 25 × 27]/82,500, subject to a maximum of 60)	60		1.33
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED			
29. Watershed score[3] (lines 13+21+28, subject to a maximum of 60)	100		13.44
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30. Component score (S_{of})[3] (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100		13.44

[1]Maximum value applies to waste characteristics category.
[2]Maximum value not applicable.
[3]Do not round to nearest integer.

Table 3-14
Soil Exposure Pathway Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
RESIDENT POPULATION THREAT			
Likelihood of Exposure			
1. Likelihood of exposure	550		550
Waste Characteristics			
2. Toxicity	(1)	10,000	
3. Hazardous waste quantity	(1)	1	
4. Waste characteristics	100		10
Targets			
5. Resident individual	50	0	
6. Resident population			
6a Level I concentrations	(2)	0	
6b. Level II concentrations	(2)	0	
6c. Resident population (lines 6a+6b)	(2)	0	
7. Workers	15	5	
8. Resources	5	0	
9. Terrestrial sensitive environments	(3)	75	
10. Targets (lines 5+6c+7+8+9)	(3)		80
Resident Population Threat Score			
11. Resident population threat (lines 1 x 4 x 10)	(2)		440,000
NEARBY POPULATION THREAT			
Likelihood of Exposure			
12. Attractiveness and accessibility	100	5	
13. Area of contamination	100	60	
14. Likelihood of exposure	500		5
Waste Characteristics			
15. Toxicity	(4)	10,000	
16. Hazardous waste quantity	(1)	1	
17. Waste characteristics	100		10

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Maximum value applies to waste characteristics category.

Table 3-14 (Continued)
Soil Exposure Pathway Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
NEARBY POPULATION THREAT (Concluded)			
Targets			
18. Nearby individual	1	0	
19. Population within 1 mile	(2)	1	
20. Targets (lines 18+19)	(2)		1
Nearby Population Threat Score			
21. Nearby population threat (lines 14 x 17 x 20)	(2)		50
SOIL EXPOSURE PATHWAY SCORE			
22. Soil exposure pathway score[4] (S_s), (lines [11+21]+82,500, subject to a maximum of 100	100		5.33

[2]Maximum value not applicable.
[4]Do not round to nearest integer.

Table 3-15
Air Migration Pathway Scoresheet
For Group III Sites

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Factor Categories and Factors	Maximum Value	Value Assigned	
Likelihood of Release			
1. Observed release	550	0	
2. Potential to release			
2a. Gas potential to release	500	0	
2b. Particulate potential to release	500	280	
2c. Potential to release (higher of lines 2a and 2b)	500	280	
3. Likelihood of release (higher of lines 1 and 2c)	550		280
Waste Characteristics			
4. Toxicity and mobility	([1])	8	
5. Hazardous waste quantity	([1])	1	
6. Waste characteristics	100		1
Targets			
7. Nearest individual	50	2	
8. Population			
8a. Level I concentrations	([2])	0	
8b. Level II concentrations	([2])	0	
8c. Potential contamination	([2])	2	
8d. Population (lines 8a+8b+8c)	([2])	2	
9. Resources	5	0	
10. Sensitive environments			
10a. Actual contamination	([3])	0	
10b. Potential contamination	([3])	0.01	
10c. Sensitive environments (lines 10a+10b)	([3])	0.01	
11. Targets (lines 7+8d+9+10c)	([2])		4.01
Air Migration Pathway Score			
12. Pathway Score[4] (S_a) ([lines 3×6×11]/82,500)	100		0.014

[1]Maximum value applies to waste characteristics category.

[2]Maximum value not applicable.

[3]No specific maximum value applies to factor; however, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

[4]Do not round to nearest integer.

4.0 DOCUMENTATION SUPPORT PACKAGE

This chapter provides the documentation support for the HRS II scores provided in Chapter 3.0.

4.1 TARGETS DOCUMENTATION. "Targets" are defined in HRS II as human populations or sensitive environments that are within a 4-mile radius or within 15 river miles downstream of a potential release or are subjected to observed releases as measured by monitoring data. Figures 4-1 and 4-2 show these target distance limits, respectively. USGS topographical maps and U.S. Fish and Wildlife Service Wetland inventory maps are presented in Chapter 5.0 to document these limits. This section provides a general description of the populations surrounding OLF Barin. These data will be used to score the target factor values for each migration pathway and for the soils exposure pathway for each of the three site groups.

4.1.1 Groundwater Receptors Receptors evaluated for the groundwater pathway include human populations within a 4-mile radius of each group of sites. Human populations are tabulated in Section 1.2.3. No surface water is used as a source of drinking water or as an agricultural supply within a 4-mile radius of OLF Barin, or within 15 river miles downstream. Personnel on the OLF Barin facility receive their potable water from the installation water supply well located on base. This well draws water from the Pliocene-Miocene aquifer from a depth of approximately 100 feet bls. Off base, the public receives their potable water supply from wells completed in the Miocene aquifer. Table 4-1 depicts the population within a 4-mile radius of each Group of sites, thus representing the magnitude of the targets that may be affected by base activities.

Table 4-1
Human Population Distribution Within 4 Miles of Each Site Group at OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site Group	0 to ¼ mile	¼ to ½ mile	½ to 1 mile	1 to 2 miles	2 to 3 miles	3 to 4 miles
Group I	30	89	200	1,370	2,308	2,440
Group II	88	10	16	1,370	2,308	2,440
Group III	0	33	17	1,370	2,308	2,440

Sources: U.S. Geological Survey (USGS) 1980 topographic maps.
1988 U.S. Department of Agriculture aerial photographs.

4.1.2 Surface Water Receptors

Drinking Water. No surface water intakes exist on the watersheds of Wolf or Sandy Creeks. According to Alabama Water Quality Criteria Use Classification Regulations (Alabama Water Improvement Commission Regulations, Polices, and Procedures, Title 11, 1982), the waters of Sandy Creek and the estuarine systems

Figure 4-1 Four-Mile Radius Map from OLF Barin Field

Figure 4-2 Fifteen River Miles Map from OLF Barin

are all classified "S", suitable for human body contact recreation. These waters are also classified as "F&W" and/or "SH", suitable for propagation of fish and wildlife and suitable for taking of shellfish, respectively. The waters of Wolf Creek, downstream of the Foley, Alabama, sewage treatment discharge, and upstream of Wolf Bay, is classified as "F&W", only.

map 2

Potential Food Chain and Environmental Targets. The forested ecological communities within the 4-mile radius surrounding OLF Barin include remnants of longleaf pine-turkey oak upland forest, pine plantations, coastal strand, pine flatlands, bottom land hardwoods, and swamp hardwoods. The wetland and aquatic ecological communities within the drainage basin of Sandy Creek, and up to 15 miles downstream into Perdido Bay, include freshwater marsh and swamps, floodplain forest, cypress stands, salt marsh, intertidal mud flats, medium salinity estuary, high salinity estuary, and the coastal offshore Gulf of Mexico waters. Major wetland systems are shown in Figure 4-3. Seagrass flats are present in the Old River estuary adjacent to the barrier strand along Perdido Key near Alabama Point. As shown in the 1988 aerial photography (U.S. Department of Agriculture, Soil Conservation Service, reference 17), much of the upland area within 4 miles has been greatly changed due to agriculture and silviculture. Chapter 1.0 discussed the approximate distribution of land uses. Cropland agriculture systems are the predominant terrestrial system. Human influenced systems, represented by old field and shrub successional stages and successional forest, appear to dominate areas not maintained as pasture, cropland, or managed residential yards and gardens.

Wetland and aquatic ecosystems in the area surrounding OLF Barin appear much less affected by human activity. The flora and fauna of these systems are well described by O'Neil and Mettee (1982, reference 12). Figure 4-3 presents the location of wetlands within 4 miles of OLF Barin and downstream into Wolf Bay. This figure was developed from the U.S. Fish and Wildlife Service Wetland Inventory. All of the wetlands surrounding OLF Barin are within the Coastal Zone Federal Management Area (U.S. Fish and Wildlife Service, 1982; reference 24). map 6 Dominant wetlands in the reaches of Sandy Creek and Wolf Creek adjacent to and downstream from OLF Barin are palustrine forested swamps or forested/shrub mixed swamps with broad-leafed deciduous, broad-leafed evergreen, and narrow-leafed evergreen dominants and codominants. Downstream, within 15 miles of OLF Barin, these systems are replaced in the tidal and estuarine reaches by estuarine intertidal emergent vegetation or salt marsh, intertidal swamp forest, subtidal open water estuarine system, intertidal mud flat, and dredged areas. Table 4-2 tabulates the wetland lengths for the downstream reaches of estuarine systems for 15 river miles.

According to the PA (NEESA, 1989; reference 11), no State or Federal endangered plant species are known to occur on OLF Barin. A SOUTHNAVFACENGCOM endangered plant species survey is currently ongoing. More recent surveys of threatened or endangered animal species that may reside in the area of OLF Barin have been conducted by SOUTHNAVFACENGCOM. SOUTHNAVFACENGCOM (Burst, 1990; reference 6) has compiled a list of rare, threatened, or endangered species that could occur on or near OLF Barin, as part of a survey of the biota of NAS Whiting Field, Florida, and each of its subinstallations. Table 4-3 lists each of the species, its likelihood of occurrence, and its status at OLF Barin.

Figure 4-3 Major Wetland Types Adjacent to and Downstream from OLF Barin

Table 4-2
Wetland Lengths Adjacent to Potential Surface Water Contamination Downstream of OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Stream Reach	Linear Feet of Adjoining Wetland	Miles of Wetland
Wolf Creek	21,120	4
Sandy Creek	21,120	4
Wolf Bay	31,680	6
Perdido Key	105,600	20
Oyster Bay	5,280	1
Intracoastal Waterway	26,400	5
Bayou St. Johns	52,800	10
Perdido Pass	15,840	3

Table 4-3
Rare, Threatened, or Endangered Species Occurrence at OLF Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Organism		Legal Status		Occurrence at OLF Barin
Common Name	Scientific	Alabama	Federal	
Animals				
Eastern indigo snake	*Drymarchon corais couperi*	T	T	PR
Dusky gopher frog	*Rana areloata*	T	C-2	PR
Black pine snake	*Pituophis melanoleucus loding*	T	C-2	PR
Southern hog-nose snake	*Herterodon simus*	T	N	LR
Gopher tortoise	*Gopherus polyphemus*	N	C-2	PR
Flatwoods salamander	*Ambystoma cingulatum*	SC	C-2	PR
American alligator	*Alligator mississippiensis*	SC	E	PR
Woodstork	*Myceteria americana*	E	E	PV
Bald eagle	*Haliaeetus leucocephalus*	E	E	PV
Mississippi sandhill crane	*Grus canidensis pulla*	E	E	UR
Red-cockaded woodpecker	*Picoides borealis*	E	E	PV
Bachman's sparrow	*Aimophila aestivalis*	N	C-2	
Bachman's warbler	*Vermirora bachmanii*	E	E	UR
Southeastern myotis	*Myotix austroriparus*	SC	E-2	PR
Rafinesque's big-eared bat	*Plecotus rafinesquii*	SC	C-2	PR
Alligator snapping turtle	*Macroclemys temmincki*	SC	C-2	NH
Southeastern American kestrel	*Falco sparverius paulus*	N	C-2	LR
Migrant loggerhead shrike	*Lanius ludovicianus migrans*	N	C-2	LWR
Arctic peregrine falcon	*Falco perogrinus tundrius*	T	T	WV
Plants				
Orange azalea	*Rhododendron austrinum*	N	C-5	PR
Incised groove bur	*Agrimonia incison*	N	C-2	PR
Southern three-awn grass	*Aristidia simplicifolia*	N	C-2	PR
Eliott's croton	*Croton elliottii*	N	C-2	PR
Serviceberry holly	*Ilex amelanchier*	N	C-2	PR
Carolina false lily	*Lilaeopsis carolinensis*	N	C-2	PR
Piedmont water milfoil	*Myreophyllium laxum*	N	C-2	PR
Naked-stemmed prairie grass	*Panicum nudicarli*	N	C-2	PR
Hacry fevertree	*Pinckneya pubes*	N	C-2	PR
Chapmrans butterwort	*Pinguicula planifolia*	N	C-2	PR
Chaff seed	*Schwalbec americana*	N	C-2	PR
Cooley's meadowrue	*Thalictrum cooleyi*	N	C-1	PR
Drummond's yellow-eyed grass	*Xyris drummondii*	N	C-2	PR
Harpers yellow-eyed grass	*Xyris scabrifolia*	N	C-2	PR
Panhandle lily	*Lilium iridollae*	N	C-2	PR
Florida jointtail	*Coelorachis tuberulosa*	No data		
Florida pondweed	*Potamiooeton floridana*	No data		

Source: Burst, 1990; reference 6.

Legal Status
E = endangered.
N = not protected or not applicable.
T = threatened.
SC = species of special concern.
C-1 = Federal candidate for listing; substantial evidence for need to list.
C-2 = Federal candidate for listing; not enough evidence for listing at this time.
C-5 = former Federal candidate for listing; more common than previously thought.

Occurrence at OLF Barin
C = confirmed, L = likely, P = possible, R = resident,
W = winter, V = visitor, U = unlikely, NH = no habitat,

OLF Barin is a suitable habitat for a number of species. The alligator and alligator snapping turtle might be expected to inhabit the palustrine and riverine wetlands in the immediate area of the installation. ~~While~~ although likely present in freshwater marshes near OLF Barin, the woodstork is unlikely to be present on the installation or in the wooded swamps of Sandy and Wolf Creek. In addition, the red-cockaded woodpecker also would not likely be present on OLF Barin because of its restricted habitat to large mature stands of longleaf pine. The brown pelican, *Pelecanus occidentalis*, although not listed by Burst (1990, reference 6), would be expected in the medium salinity and high salinity estuarine and salt marsh systems.

The HRS II final rule lists a set of sensitive environments recognized as specific targets or receptors of contaminants migrating from potential hazardous waste sites. Those found at OLF Barin are listed in Table 4-4, along with their respective distance overland or downstream tabulated.

Wolf Creek, Sandy Creek, Wolf Bay, Perdido Key, Oyster Bay, and Bayou St. Johns constitute a sports fishery that is estimated to result in catches ranging from 0 to 10,000 pounds of fish per year. Specific data on sports fishing are not available for these fisheries. However, during the HRS II site visit, it was apparent that frequent fishing has occurred along the banks of Sandy Creek near the Uncontrolled Dumpsite.

The HRS II scoring classifies human food chain population values in terms of pounds per year of aquatic organisms. Table 4-5 summarizes the pounds of fish for food production for each of the fisheries identified previously.

4.1.3 **Base Worker Use of Contaminated Sites, Accessibility and Attractiveness for Soil Exposure** The eight identified disposal sites for the most part are remote from areas normally occupied by OLF Barin worker populations. No work places or residents exist on any of the eight sites. In the HRS II scoring procedures, resident individuals or workers are defined as being within 200 feet of an area of observed or potential contamination. Only the following sites are located such that base personnel are situated within 200 feet.

> Sites 19B and 20B ~~&~~ and ~~L~~ less than 200 feet from Building 2768. Less than 100 workers use this building on a routine basis as a workplace.

All other sites only receive incidental and/or occasional visits by maintenance workers.

Table 4-6 of the HRS II final rule presents a set of ~~8~~ eight criteria for attractiveness and accessibility for sites. The majority of sites at OLF Barin are relatively inaccessible. Table 4-6 also shows the sites grouped by HRS II accessibility ~~/~~ and attractiveness criteria.

4.1.4 **Air Targets** The total population residing and working at OLF Barin is 63 people. No personnel permanently reside within the base boundaries of OLF Barin. Table 1-2 provides the population distribution on the base. Population numbers located within distance classes required by the HRS II scoring procedures are presented in Table 4-1.

Table 4-4
Relationship of Sensitive Environments[1] to Outlying Landing Field (OLF) Barin

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Designation	Sensitive Environment
Habitat known to be used by Federal and Alabama designated threatened or endangered species.	On OLF Barin to a distance of 4 miles and in the aquatic systems for 15 river miles downstream including the estuarine areas of Wolf Bay, Perdido Bay, and the Gulf of Mexico nearshore waters.
Coastal barrier	Bayou St. Johns, Perdido Key, Alabama Point, and Perdido Pass, 10 to 15 miles from OLF Barin.
Spawning areas critical for the maintenance of fish and shellfish species within river, lake, or coastal tidal waters.	Sea grass flats in Bayou St. Johns, approximately 10 miles from OLF Barin. Salt marshes in lower Wolf Bay, 5 river miles from OLF Barin.
State designated areas for protection or maintenance of fish and aquatic life.	All waters of Sandy Creek and Wolf Creek are designated "F&W" (Fish and Wildlife Propagation) use classification by Alabama Department of Environmental Management (DEM). With the exception of Wolf Creek, all waters of Sandy Creek and the estuarine system are designated as suitable for Body Contact Recreation (S) by Alabama DEM. All tidal and estuarine waters, except Mifflin Creek and Hammock Creek, are also designated SH and F&W, designating their classification as suitable for shellfish harvesting (within 5 river miles of OLF Barin) by Alabama DEM.

[1] As defined in Table 4-23 of the HRS II Rankings (U.S. Environmental Protection Agency, 1990).

; reference 20

Table 4-5
Pounds of Fish for Food Production Per Year

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Wolf Creek	<100
Sandy Creek	<100
Wolf Bay	100 to 1,000
Perdido Key	104 to 105
Oyster Bay	100 to 1,000
Bayou St. Johns	1,000 to 10,000

Table 4-6
Attractiveness and Accessibility For Potentially Contaminated Soil Exposure

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Criterion	Group I	Group II	Group III
Designated recreational area	None	None	None
Regularly used for public recreation (for example, fishing, hiking, and softball).	None	Uncontrolled Dumpsite	None
Accessible and unique recreational area (for example, vacant lots in urban area).	None	None	None
Moderately accessible (may have some access improvements, for example gravel road), with some installation recreation use.	None	None	None
Slightly accessible (for example, extremely rural area with no road improvement), with some installation recreation use.	19B, 20B	None	None
Accessible, with no installation recreation use	19B, 20B, 23B	21B, Sandy Creek, Uncontrolled Dumpsite, Abandoned WWTP	22B, Machine Gun Butt Area
Surrounded by maintained fence or combination of maintained fence and natural barriers.	19B, 20B, 23B	None	None
Physically inaccessible to public, with no evidence of public recreation use.	None	None	None

Notes: WWTP = wastewater treatment plant.

Except for Site 19B, no residences or occupied buildings lie within the boundary of any identified site at OLF Barin. Buildings 2768 and 3029 are currently occupied by OLF Barin personnel whose responsibilities are to provide 24-hour emergency services for NAS Whiting Field flight operations involving OLF Barin. Distances to the nearest land use are presented in Table 4-7.

Table 4-7
Distances to the Nearest Land Use

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Use	Group I (miles)	Group II (miles)	Group III (miles)
Offbase industry	0.95	1.40	1.20
Residential	0.50	1.10	0.20
Schools	2.60	1.90	2.70
Parks	2.70	2.0	2.80
Recreational	0.70	0.01	1.00
Agricultural	0.90	0.65	0.90

4.2 SOURCE DOCUMENTATION. In order to develop an HRS II score for any of the migration pathways or soil exposure, the nature and amount of hazardous substances and the engineered containment of the substances, if any, must be described. This information must be known in order to determine factor values for hazardous waste quantities, waste characteristics, toxicity and mobility, and containment structure. Information on the nature and amount of hazardous substances also aids in deciding whether an observed release exists for each potential source of contamination. This section documents the classification and factor development for each of the site groups at OLF Barin based on the data and information presented in Chapter 2.0. These data were used in Chapter 3.0, Hazard Ranking II Scoring, to develop scores by site group.

4.2.1 Waste Quantities and Containment The waste quantities and containment factors were assessed for each of the eight sites at OLF Barin in accordance with Section 2.4.2 and Section 3.1.2.1, respectively, from the HRS II final rule. Table 4-8 presents the type and quantity of waste in each source. This table also depicts the method that was used to develop the quantity factor score, and identifies the waste quantity score. Records do not exist to document quantities of hazardous constituents disposed; therefore, no Tier A waste quantities were identified. Likewise, disposal volume extent is not available because no sampling of waste cells was performed. Tanks related to Site 20B do not have records to document the frequency of use or removal of hazardous substances or product; therefore, no Tier C (volume based) scores can be calculated. The nominal site areas were estimated from the Preliminary Assessment (PA), Site Inspection (SI), or site visual inspection and were used to develop area-based

Table 4-8
Waste Quantity Factor Values

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site and Grouping	Quantity Tier (from Section 2.4.2 HRS II scoring)	Area or Volume	Adjustment	Adjusted Quantity	Quantity Score
Group I					
19B	D	511,00 ft^2	÷ 3,400	150.29	
20B	D	861,000 ft^2	÷ 3,400	253.23	
23B					
Total				403.52	100
				Level I Groundwater contamination	Assign 100
Group II					
21B	D	134,850 ft^2	÷ 3,400	39.66	
Uncontrolled Dumpsite	D	32,700 ft^2	÷ 13	2,515.00	
Abandoned WWTP	C	550 yd^3		220.00	
Total				2,774.66	100
Group III					
Machine Gun Butt Area	D	8,700 ft^2	÷ 3,400	2.56	
22B	D	280,000 ft^2	÷ 3,400	82.35	
Total				84.91	1

Note: WWTP = wastewater treatment plant.
ft^2 = Square feet
yd^3 = Cubic yards

factor scores (Tier D). None of the sites are equipped with engineering controls that meet the criteria in Tables 3-1 and 3-2 of the HRS II final rule.

4.2.2 Potential Release to Groundwater Observed releases of hazardous chemicals to groundwater have been documented in groundwater for Group I sites: the Former Hangar Maintenance Area and the Abandoned USTs and Fuel Pits Area. No observed releases to groundwater have been documented for Group II or Group III sites. Observed HRS II system contamination exists in monitoring wells as follows:

Site 19B: mercury, trichloroethylene, tetrachloroethylene, and trans-1,2-dichloroethylene

Site 20B: Lead and mercury

As shown in Table 2-4, trans-1,2-dichloroethylene, tetrachloroethylene, and trichloroethylene were detected in groundwater. Trichloroethylene was detected at concentrations of 4.0 and 8.0 $\mu g/\ell$, trans-1,2-dichlorethylene was detected in two out of two samples at 6 $\mu g/\ell$; all of the aforementioned concentrations represent Level I contamination. As indicated in Chapter 2.2.2, however, wellhead treatment is employed to prevent exposure of the installation personnel to the VOC contaminant levels.

4.2.3 Potential to Release to Surface Water and Air No air sampling has been implemented at OLF Barin; therefore, no observed releases to air have been documented. Potential release of hazardous chemicals to air exists primarily at Sites 20B, 21B, and the Uncontrolled Dumpsite. The Fuel Pits area at Site 20B has the potential to release contaminants including trichloroethylene, tetrachloroethylene, and trans-1,2-dichloroethylene to the atmosphere. Contaminated soil at the Uncontrolled Dumpsite or the landfill has the potential to release contaminants to the atmosphere.

Three surface water samples were collected from two locations within Sandy Creek (i.e., Group II) during the SI field investigation. No detectable organics (VOCs, semivolatile organic compounds [SVOCs], pesticides, PCBs, or total phenols) were detected in surface water at either sampling location. Cyanide was detected in the upstream sample from Sandy Creek at 6.0 $\mu g/\ell$.

4.2.4 Soils Exposure No observed release to soil has been documented at the eight sites at OLF Barin; however, exposure to sediment contamination observed in Sandy Creek (i.e., methylene chloride, toluene, xylenes, ethylbenzene, DDT, DDE, DDD, and dieldrin) was considered in the soils exposure pathway score for the Group II sites. Although exposure to aquatic sediments is not directly considered in the HRS II scoring, there is evidence that human exposure to the stream sediments may result from recreational activities including fishing and swimming. Lead was detected in surface soil samples collected from the Old Firefighting Demonstration Area and Machine Gun Butt Area, and were evaluated in the soils exposure pathway for the likelihood of exposure.

4.3 GROUNDWATER DOCUMENTATION.

4.3.1 Hydrogeology OLF Barin lies within the recharge area of the Pliocene-Miocene aquifer that supplies most, if not all, of the potable groundwater in the general region. This aquifer is within the lower Citronelle Formation and the upper Miocene Series. This unit produces water in Baldwin, Washington, Clarke, and Mobile Counties of Alabama (Hinkle, 1984; reference 8). The Citronelle and Miocene undifferentiated sediments together comprise an aquifer that is highly transmissive and is capable of producing water in sufficient quantities for large public systems. Most wells completed in the above-mentioned aquifers range from 40 to 1,100 feet deep and can yield up to 700 gpm. Aquifer testing has shown that specific capacities of more than 10 gallons per minute per foot (gpm/ft) in wells drilled in the area are not uncommon (Hinkle, 1984; reference 8). Water supply wells within the vicinity of OLF Barin are described in Section 3.8. The Pliocene-Miocene aquifer is also connected hydraulically to the Alluvial Coastal Plain aquifer. Although the formations comprising these aquifers differ somewhat in their origin, age, and lithology, both the systems are unconfined and exist under water table piezometric conditions throughout the southern part of Baldwin County. Figure 4-4, adapted from Mooty (1984, reference 10) and Riccio *et al* (1973, reference 13), shows the regional hydrogeological systems and potentiometric surface (i.e., water table) in southern Baldwin County. This shows that OLF Barin lies in the Pliocene-Miocene system with the exception of the eastern and northeastern corners where the Alluvial-Coastal system is expressed along Sandy Creek.

4.3.2 Aquifer Characteristics The results of hydraulic conductivity analyses of all monitoring wells at OLF Barin as estimated from *in-situ* rising head "slug" permeability tests during the SI are presented in Table 4-9. The geometric mean hydraulic conductivity of all eight monitoring wells was 3.89×10^{-3} cm/sec. Even though the shallow and deep wells are both part of the same aquifer, considerable variability in the calculated hydraulic conductivities exists as shown. The conductivity of the deeper zone (90 to 100 feet bls) was approximately 6 times lower than the conductivity at the water table. At the water table wells (WHF-20B-1 through WHF-20B-5), the geometric mean hydraulic conductivity was 7.93×0^{-3} cm/sec. This variability may be a result of the different lithologies present over the screened interval of the monitoring wells. Because the soils encountered below the site are not homogeneous and exhibit a wide range of grain sizes and degrees of sorting, greater deviations from the mean hydraulic conductivity can be expected.

4.3.3 Groundwater Flow Direction In order to more adequately evaluate groundwater migration pathways for HRS II scoring at OLF Barin, an area-wide groundwater elevation contour map was interpreted from the site-specific data, topography, stream flow direction, and elevation for the areas adjacent to OLF Barin. Figure 4-5 shows the interpreted contours in 10-foot intervals. The site-specific 2-foot groundwater contour intervals interpreted from the SI data are shown in Figure 4-6 as well as the surveyed groundwater elevations. The water levels off-station were interpreted based on the following assumptions. First, the regional contour groundwater shows a 50-foot NGVD contour parallel to a line between Foley and Elberta (see Figure 4-4). It is assumed, based on the

Figure 4-4 Regional Hydrogeology

Table 4-9
Hydraulic Conductivity Estimates

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Well No.	Hydraulic Conductivity Rising Head (cm/sec)	Geometric Mean Hydraulic Conductivity (cm/sec)
WHF-19B-1D	3.34×10^{-3}	**Deep Wells**
WHF-19B-2D	3.34×10^{-4}	
WHF-19B-3D	1.50×10^{-3}	1.19×10^{-3}
WHF-20B-1	1.84×10^{-3}	**Water table wells**
WHF-20B-2	7.08×10^{-3}	
WHF-20B-3	1.53×10^{-2}	7.93×10^{-3}
WHF-20B-4	7.90×10^{-3}	
WHF-20B-5	1.99×10^{-2}	

Notes: Overall geometric mean = 3.89×10^{-3} centimeter per second (cm/sec).
cm/sec = centimeters per second.

Figure 4-5 Interpreted Area-Wide Water Table Contours at OLF Barin

Figure 4-6 Site-Specific Groundwater Contour Map

permeable lithology of the upper Citronelle aquifer and the adjoining Alluvial-Coastal aquifer in the Sandy Creek Valley, that the system would be unconfined and follow general topographic contours. It was also assumed that base flow of Wolf Creek and Sandy Creek consists of groundwater and the streams are not perched. The water table would intersect the stream beds and consequently groundwater discharge would occur along both streams. Therefore, the contour lines on the 7.5-minute USGS topographic map represent approximate 2 meter (6.6 feet) elevation intervals for groundwater elevation where the creeks cross a contour line.

Based on these assumptions, it has been interpreted that groundwater flow is southeastward and eastward from immediately northwest of OLF Barin toward the respective creeks and that under the installation the water table is fairly flat, decreasing from approximately 39 feet NGVD north of the former hangar maintenance and fuel areas to 30 feet NGVD at the southern boundary. Groundwater from the western half of OLF Barin discharges to Wolf Creek. Groundwater from the northern and eastern parts of OLF Barin discharges to Sandy Creek.

Geologic and Hydrogeologic Data. The generalized geologic cross section at OLF Barin is presented in Figure 4-7. Locations of geologic cross sections are shown in Figure 4-8. The typical stratigraphic sequence found in Southern Baldwin County is shown in Figure 4-9.

Within the confines of OLF Barin, groundwater lies approximately 10 to 20 feet bls. Depth to groundwater and groundwater elevations in the monitoring wells installed and sampled during June 1990 are summarized in Table 4-10. The depth to aquifer and the presence or absence of clay layers for each Group used for HRS II scoring purposes is summarized in Table 4-11. The groundwater contour map of the groundwater table in the western half of the site is presented in Figure 4-6. Groundwater in the western part of the installation flows south-southeasterly at a very low gradient.

Under non-pumping conditions, the water table exists under a fairly low gradient in the former fuel storage and hangar maintenance areas. The gradient across this part of the site is estimated as 2.26×10^{-4} ft/ft based on averaged water levels in wells WHF-20B-1 and WHF-20B-2 compared to wells WHF-20B-3, WHF-20B-4, and WHF-20B-5. Overall across the site (WHF-20B-1 and WHF-20B-2 to WHF-19B-3D) the gradient was 3.20×10^{-3} ft/ft.

4.3.4 Water Supply The OLF Barin facility receives its water from a water supply well located north of the station headquarters along Guadalcanal Road. The water is obtained from the Pliocene-Miocene Aquifer from a depth of approximately 100 feet bls. No drilling or well construction logs are available for this well. The location of these wells is depicted on Figure 4-6. Prior to the use of this well, the station water supply was from an old water supply well located due west of the new water supply well. Water from the old well analyzed in September of 1988 and contained tetrachloroethylene and trichloroethylene. The old water supply well was subsequently abandoned and grouted. Currently, water from the new well is treated with granular activated carbon prior to human consumption in order to remove VOCs.

Figure 4-7 North-South and East-West Cross Sections at OLF Barin

Figure 4-8 Plan View of Geologic Cross Sections

Figure 4-9 Typical Stratigraphic Sequence in Southern Baldwin County

Table 4-10
Groundwater Elevation Summary
June 12, 1990

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Monitoring Well Number	Total Depth (feet bls)	Screen Interval (feet bls)	Riser Elevation (feet above NGVD)	Depth to Water (feet)	Water Table Elevation (feet above NGVD)
WHF-19B-1D	100	90-100	48.65	10.20	38.45
WHF-19B-2D	100	90-100	43.78	13.15	30.63
WHF-19B-3D	100	90-100	50.28	22.30	27.98
WHF-20B-1	22	12-22	57.60	17.88	39.72
WHF-20B-2	22	12-22	56.99	17.37	39.62
WHF-20B-3	18	8-18	49.00	9.70	39.30
WHF-20B-4	18	8-18	49.31	9.77	39.54
WHF-20B-5	18	8-18	51.29	11.90	39.39

Notes: bls = below land surface.
NGVD = National Geodetic Vertical Datum of 1929.

Table 4-11
Depth to Aquifer (June 1990)

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site	Depth to Aquifer[1] (feet bls)	Clay Layers (feet bls)
Group I		
19B	10 to 15	None
20B	10 to 15	
23B	<10	
Group II		
21B	[2]8 to 15	None
~~27B Uncontrolled Dumpsite~~	[2]8 to 15	
~~26B Abandoned WWTP~~	[2]8 to 15	
Group III		
~~15~~ 22B	13 to 20	None
16 ~~25~~ B	13 to 20	

[1] Based on measured water levels in monitoring wells at each site.
[2] Extrapolated from nearest monitoring well.
Notes: bls = below land surface.
~~WWTP = wastewater treatment plant.~~

Public water supply wells near OLF Barin and Foley draw water from depths of 90 to 157 feet bls. Foley is listed as having three high capacity wells ranging in depth from 138 to 157 feet bls. The capacity of these wells is listed as 400, 550, and 550 gallons per minute, respectively. The location of these wells is depicted in Section 1.2.2 on Figure 1-2. Records indicate that these wells are drilled into the Miocene Aquifer, although the screened interval most likely overlaps the Miocene/Citronelle contact.

The Town of Elberta, Alabama, is served by a single well with a capacity of 45,000 gallons per day (Scott, 1991; reference 15). The location of this well is also shown on Figure 1-2.

4.4 SURFACE WATER DOCUMENTATION. The purpose of this section is to characterize OLF Barin surface water drainage to the extent necessary to support scoring the "Potential to Release and Targets" and target distances categories for the Surface Water Migration Pathway. This section presents the drainage patterns and surface water bodies within the 15-mile target distance limit downstream from OLF Barin. Also included are the surface water resources, wetlands, and sensitive environments within the target distance limit. The only site where documentation exists of a release to surface water is at Site 21B where Sandy Creek is considered with the Rubble Landfill. At this site, cyanide was detected in one surface water sample. In addition, an observed release was assumed because sediment samples contained concentrations of toluene, xylene, ethyl benzene, DDT, DDE, DDD, and dieldrin. No drinking water or agricultural water supply intakes exist downstream (i.e., within 4 miles or 15 river miles) of OLF Barin.

OLF Barin is located in USGS Hydrologic Unit 03140107, an Eastern Coastal Unit adjacent to the Perdido River Drainage Basin (O'Neil and Mettee, 1982; reference 12). The Perdido River flows south from Alabama and forms the border between Baldwin County, Alabama, and Escambia County, Florida. Figure 4-10 is a map of the southern part of Baldwin County. As shown, the Perdido River System becomes a long southwesterly trending estuarine system that opens to the Gulf of Mexico among a series of barrier islands. As shown in Figure 4-10, the southeastern part of Baldwin County, which makes up the Eastern Coastal Unit, drains to the Perdido Bay estuarine system via a series of creeks and bayous. The western part of Baldwin County drains westerly into Mobile Bay. Wolf Creek and Sandy Creek have drainage areas estimated as 10.91 and 13.54 square miles, respectively, upstream of OLF Barin. No USGS streamflow gauging stations exist on either Wolf Creek or Sandy Creek.

O'Neil and Mettee (1982; reference 12), in their assessment of coastal hydrology of the Mobile Bay area, estimated unit runoff in the Perdido River Basin and the Fish River at an average annual flow of approximately 2.0 cubic feet per second per square mile ($ft^3/s/mi^2$) based on the following gauging locations:

- Perdido River at Barrineau Park, Florida (1942-1967), 1.96 $ft^3/s/mi^2$;
- Styx River at Loxby, Alabama (1952-1962), 1.94 $ft^3/s/mi^2$; and
- Fish River near Silverhill, Alabama (1954-1962), 2.16 $ft^3/s/mi^2$

Figure 4-10 also shows the areas 15 river miles downstream from OLF Barin that are identified as target areas for surface water contaminant migration route

Figure 4-10 Overall Surface Hydrologic Features of Southern Baldwin County, Alabama

assessment using the HRS II. Points 15 miles downstream include all of the tidal part of Wolf Bay, the Intracoastal Waterway to Mobile Bay, and Perdido Bay from the U.S. Highway 98 bridge to the Gulf of Mexico waters immediately offshore of Alabama Point at Perdido Pass. The installation is drained by Wolf Creek to the west and Sandy Creek to the east (Figure 4-11). Both streams flow to the south-southeast into Wolf Bay. No other naturally occurring bodies of surface water that can receive flow from the station appear to be located within the immediate vicinity of OLF Barin. Several man-made ditches are located throughout the former aircraft maintenance and runway areas that convey drainage to the east into Sandy Creek. Runoff from part of the southern half of the runways flows overland into Wolf Creek. Overland flow distances from the former operational areas of OLF Barin to the streams are relatively great. Runoff from the former fuel storage system, the north side of the former hangar areas, and administrative area was collected in drainage ditches that flowed for approximately 5,500 feet before discharging to Sandy Creek. Runoff from the former aircraft parking areas and the southern part of the former hangar areas flows for 4,000 to 4,500 feet overland before discharging into Wolf Creek. Runoff from the area of the Machine Gun Butt Area and Old Firefighting Demonstration Area travels 4,000 feet overland before discharging to Wolf Creek. The Abandoned WWTP and Rubble Landfill are located within 200 feet of Sandy Creek. An unrestricted dumping area (Uncontrolled Dumpsite) located just north of the WWTP is just above and possibly on the banks of Sandy Creek.

Because of the relatively small drainage basins of Wolf and Sandy Creeks above OLF Barin, and the steep slopes from the installation to the thalweg of the streams, only a small part of the northeastern part of OLF Barin is within the 500-year or 100-year floodplain. The 100- and 500-year floodplains are delineated in Figure 4-11. The abandoned WWTP and the toe of the Rubble Landfill are near the edge of the 100-year floodplain. The Uncontrolled Dumpsite lies partially within the 100-year floodplain.

According to Alabama Water Quality Criteria Use Classification Regulations (Alabama Water Improvement Commission Regulations, Policies, and Procedures, Title II, 1982), the waters of Sandy Creek and the estuarine systems are all classified "S", suitable for human body contact recreation as well as "F&W" and/or "SH." "F&W" and "SH" classes are suitable for propagation of fish and wildlife and suitable for taking of shellfish, respectively.

Wolf Creek downstream of the Foley, Alabama, sewage treatment discharge and upstream of Wolf Bay is classified "F&W" only.

The Uncontrolled Dumpsite was visited during the HRS II site visit in October 1990. Frequent fishing, as well as wading, swimming, and picnicking was evident on the banks of Sandy Creek.

Distance to nearest surface water for each of the eight sites is tabulated in Table 4-12. These were measured from the U.S. Geological Survey 7.5-minute quadrangle map.

From the U.S. Department of Commerce Rainfall Intensity Map, 210-VI-TR-55, June 1986, the 2-year 24-hour rainfall total is 6 inches.

Figure 4-11 Delineation of Flood Prone Areas Adjacent to OLF Barin

Table 4-12
Distance to Surface Water

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Site	Overland Distance Segment (feet)	Total Distance to Surface Water (feet)	Surface Water Body
Group I			
19B	4,000	4,000	Sandy Creek
20B	4,000	4,000	Sandy Creek
23B	3,800	3,800	Sandy Creek
Group II			
21B	200	200	Sandy Creek
Uncontrolled Dumpsite	200	200	Sandy Creek
Abandoned WWTP	200	200	Sandy Creek
Group III			
22B	3,000	3,000	Wolf Creek
Machine Gun Butt Area	3,000	3,000	Wolf Creek

Notes: WWTP = wastewater treatment plant.

4.5 SOIL DOCUMENTATION. Based on the soil group descriptions contained in Table 4-4 of the HRS II final rule, the predominant soils at NAS Whiting Field are classified as Group C, moderately fine-textured soils with low infiltration rates (e.g., silty loams, silts, and sandy clay loams).

Figure 4-12 is a soils map showing the dominant soils types on and adjacent to OLF Barin. This was taken from the U.S. Department of Agriculture Soils Conservation Service General Soils Map, Baldwin County, Alabama (U.S. Department of Agriculture, 1963; reference ~~18~~ map 1).

4.6 AIR DOCUMENTATION. To date, no air samples from any of the eight identified sites at OLF Barin have been collected during any environmental investigation. Based on the records of activities and potential releases, migration by air is estimated to be a negligible to minor pathway for contaminants.

OLF Barin is located in a region of humid, near-subtropical climate with an average annual temperature of 68 degrees Fahrenheit according to Moore (1987; reference 9). The region can be characterized as having a long spring and fall, extremely hot summers, and short, mild winters. Average yearly precipitation is approximately 64.6 inches (Moore, 1987; reference 9). The wettest month is July, and the driest month is October. Heavy rains can occur in the mid-summer to early fall months when tropical storms enter the Gulf of Mexico.

The nearest source of long-term National Oceanic and Atmospheric Administration (NOAA) meteorological data to OLF Barin is Mobile, Alabama, located at the head of Mobile Bay. Review of the Alabama-wide data presented by Moore (1987; reference 9) indicates that southern Baldwin County and OLF Barin share similar conditions of average annual temperature, precipitation, and runoff with the Mobile area.

Table 4-13 summarizes monthly means and extremes for wind velocity, rainfall, and temperatures. Calculated monthly evapotranspiration and monthly net precipitation for Mobile, Alabama, are tabulated in Table 4-14. These data are required for evaluating the importance of the groundwater and air (particulate) contamination migration pathways. Monthly evapotranspiration was calculated using the equation below, presented in Section 3.1.2.2 of the HRS II final rule (USEPA, 1990; reference ~~22~~ 20).

Calculate monthly potential evapotranspiration (E_i) as follows:

$$E_i = 0.6\ f_i\ (10\ T_i/I)^2 \qquad (1)$$

where

E_i = monthly potential evapotranspiration (inches) for month i,
f_i = monthly latitude adjusting value for month i,
T_i = mean monthly temperature (°C) for month i (tabulated temperatures in Table 3-4 are in degrees Fahrenheit; these are converted to degrees Centigrade for calculation), and
$I = \Sigma\ (T_i/5)^{1.514}$.

spell out degrees Celcius

Figure 4-12 Generalized Soils Map of Southern Baldwin County

Table 4-13
Temperature Normals, Means, and Extremes for Mobile, Alabama

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Year
Temperature (°F)													
Normals													
- Daily maximum	60.6	63.9	70.3	78.3	84.9	90.2	91.2	90.7	87.0	79.4	69.3	63.1	77.4
- Daily minimum	40.9	43.2	49.8	57.7	64.8	70.8	73.2	72.9	69.3	57.5	47.9	42.9	57.6
- Monthly	50.8	53.5	60.0	68.0	74.8	80.5	82.2	81.8	78.2	68.5	58.6	53.0	67.5
Extremes													
- Record highest	84	82	90	92	100	102	104	102	99	93	87	81	104
- Record lowest	3	11	21	36	43	49	60	59	42	32	8	8	3
Precipitation (inches):													
Water equivalent													
- Normal	4.59	4.91	6.48	5.35	5.46	5.07	7.74	6.75	6.56	2.62	3.67	5.44	64.64
- Maximum monthly	10.40	11.89	15.58	17.69	15.08	13.07	19.29	15.19	13.61	13.20	13.65	11.38	19.29
- Year	1978	1983	1949	1955	1986	1967	1949	1984	1957	1985	1948	1953	Jul. 1949
- Minimum monthly	0.98	1.31	0.59	0.48	0.45	1.19	1.72	2.35	0.58	T	0.25	1.29	T
- Year	1968	1948	1967	1954	1962	1966	1983	1972	1963	1978	1960	1900	Oct. 1978
- Maximum in 24 hours	8.34	5.37	6.52	13.36	8.00	7.38	5.34	6.62	8.55	5.65	7.02	5.50	13.36
- Year	1965	1981	1951	1955	1981	1967	1975	1969	1979	1985	1965	1968	Apr. 1955
Wind:													
Mean speed (mph)	10.5	10.7	11.0	10.4	8.9	7.7	7.0	6.8	8.0	8.2	9.3	10.1	9.0

Source: Ruffner and Bair, 1986. ← reference 14

Notes: Period of record: 44 years for temperature and precipitation, 37 years for wind speed.
°F = degrees Fahrenheit.
T = trace.
mph = miles per hour.

Table 4-14
Calculated Monthly Net Precipitation and Potential Evapotranspiration for Mobile, Alabama

HRS II Scoring Documentation Report
OLF Barin, Foley, Alabama

Month	Average Rainfall (inches)[1]	Latitude Adjusting Factors[2]	Average Evapotranspiration (inches)[3]	Net Precipitation (inches)
January	4.59	0.90	0.59	4.00
February	4.91	0.87	0.77	4.14
March	6.48	1.03	1.64	4.84
April	5.35	1.08	2.95	2.40
May	5.46	1.18	4.71	0.75
June	5.07	1.17	6.10	-1.03
July	7.74	1.20	6.77	0.97
August	6.75	1.14	6.33	0.42
September	6.56	1.03	4.86	1.70
October	2.62	0.98	2.76	-0.14
November	3.67	0.89	1.26	2.41
December	5.54	0.88	0.75	4.79

[1] From Table 4-13.
[2] Taken from Table 3-3 of U.S. Environmental Protection Agency (USEPA), 1990.
[3] Calculated from USEPA, 1990.

reference 20

reference 20

Latitude adjusting values (fi) for each month were selected as follows.

Mobile, Alabama, and OLF Barin are at latitude 30° 41′ North and 30° 23′ North, respectively. Monthly adjustment factors for this latitude zone selected from USEPA (1990, reference ~~22~~ 20) are shown in Table 4-14.

Based on these calculations and Table 4-14, the annual net precipitation at OLF Barin is estimated as 26.4 inches per year. This figure represents the summary of monthly net precipitation. For months in which evapotranspiration exceeds rainfall, 0 inches net precipitation is used in the summation to be consistent with the factor as developed in the HRS II. Table 4-14 shows that two-thirds of the annual net precipitation, and therefore the recharge to the aquifer, occurs in winter (December through March).

5.0 REFERENCES, DOCUMENTATION, AND ~~HAZARD RANKING SYSTEM II WORKSHEETS~~

Included in this chapter is documentation and listing of data and sources used to develop the source narrative scoring documentation, and to calculate the HRS II pathway scores for OLF Barin. Section 5.1 contains references to published final reports and plans that are part of the OLF Barin Administrative Record and other generally available published data used in the scoring. Section 5.2 identifies copies of full scale maps used in developing data such as USGS Topographical Maps, U.S. Fish and Wildlife Service Wetland Inventories, Flood-Prone Area Maps, and other data. ~~Section 5.3 is a compilation of the industrial scoring worksheets for each pathway for each group of sites at OLF Barin.~~

5.1 REFERENCES.

1) ABB-ES, September 1991, Final Site Inspection Report, Outlying Landing Field (OLF) Barin, Foley, Alabama.

2) Alabama Department of Environmental Management, 1989(a), Alabama Groundwater Source Rules; Chapter 335-7-5 Alabama Administrative Code.

3) Alabama Department of Environmental Management, 1989(b), Alabama Primary Drinking Water Standards; Chapter 335-7-2, Alabama Administrative Code.

4) Alabama Department of Environmental Management, 1989(c), Alabama Secondary Drinking Water Standards; Chapter 335-7-3, Alabama Administrative Code.

5) Baldwin County Land Atlas and Plat Book, 1988, Baldwin County Soil and Water Conservation District.

6) Burst, T. 1990, Personal Communication; Endangered, Rare, and Threatened Species at NAS Whiting Field and Subinstallations; SOUTHNAVFACENGCOM.

7) City of Foley, Alabama, Public Works Department, 1991: Personal Communication.

8) Hickle, F., 1984, Groundwater Resources of the Lower Tombigbee-Mobile River Corridor: Geological Survey of Alabama Circular 115.

9) Moore, J.D., 1987, Water in Alabama 1986; Geological Survey or Alabama Circular 122D, 93 p.

10) Mooty, W.S., 1988, Geohydrology and Susceptibility of Major Aquifers to Surface Contamination in Alabama; Area 13; U.S. Geological Survey Water-Resources Investigations Report 88-4080.

11) Naval Energy and Environmental Support Activity (NEESA), 1989, Preliminary Assessment Report, Outlying Landing Field Barin, Foley, Alabama: NEESA 13-193PA.

12) O'Neil, P.E., and Mettee, M.F., 1982, Alabama Coastal Region Ecological Characterization; 2. A Synthesis of Environmental Data; Geological Survey of Alabama, Information Series 61, 346 p.

13) Riccio, J.F., Hardin, J.D., and Lamb, G.M., 1973, Development of a Hydrologic Concept for the Greater Mobile Metropolitan-Urban Environment; Geological Survey of Alabama Bulletin 106, 171 p.

14) Ruffner, J.A., and Bair, F.E., 1986, The Weather Almanac, Fifth Edition; Gale Research Co., Detroit, Michigan.

15) Scott, E., 1991, Personal Communication, Town of Elberta, Alabama, Water Department.

16) South Baldwin County Chamber of Commerce, 1990, Baldwin County USA; Southern Publishing Company, Pensacola, Florida.

17) South Baldwin Chamber of Commerce, 1990a, Economic Update for South Baldwin Chamber of Commerce as of June 30, 1990; South Baldwin Chamber of Commerce Research Department, Foley, Alabama.

18) U.S. Department of Agriculture, Soil Conservation Service, 1963, General Soils Map for Baldwin County, Alabama.

19) U.S. Department of Agriculture, 1988, Soil Conservation Service, Aerial photographs.

18 ~~20~~) U.S. Department of Commerce, 1955, Rainfall Intensity-Duration-Frequency Curves for Selected Stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico; Technical Paper No. 25.

19 ~~21~~) U.S. Department of Commerce, 1988, U.S. Bureau of the Census, County and City Data Book, 1988; U.S. Government Printing Office, Washington, D.C.

20 ~~22~~) U.S. Environmental Protection Agency (USEPA), 1990. 40 Code of Federal Regulations Part 300 Appendix A, Hazard Ranking System; Final Rule; *Federal Register* 55 No. 241 51532-51667.

US Env.

21 ~~23~~) USEPA, 1991, Chemical Matrix Database.

24) U.S. Fish and Wildlife Service, 1982, Gulf Coast Ecological Inventory, 1:250,000 scale, Pensacola, Florida-Alabama.

5.2 FULL SCALE MAP DATA DOCUMENTS. Full scale maps used for developing data presented in the text of the report are contained in 11 map pockets at the back of this document. ~~This~~ These contain full-scale reproductions of the maps and soils data used for developing HRS II scoring data for NAS Whiting Field and its environs. These maps are as follows.

1) U.S. Department of Agriculture, Soil Conservation Service, 1963, General Soils Map for Baldwin County, Alabama; Sheet 142, legend, index, and map key.

3 ~~2~~) U.S. Fish and Wildlife Service, 1979, National Wetland Inventory Maps, Elberta, ~~Gulf Shores and Orange Beach~~, Alabama; 7.5 Minute Quadrangle.

6 ~~3~~) U.S. Fish and Wildlife Service, 1982, Gulf Coast Ecological Inventory, 1:250,000 Scale, Pensacola, Florida-Alabama;

7 ~~4~~) U.S. Geological Survey (USGS), 1980, 7.5 Minute Series (topographic) Map, Foley, Alabama;

8 ~~5~~) U.S. Geological Survey (USGS), 1980, 7.5 Minute Series (topographic) Map, Elberta, Alabama;

9 ~~6~~) U.S. Geological Survey (USGS), 1980, 7.5 Minute Series (topographic) Map, Orange Beach, Alabama-Florida;

10 ~~7~~) U.S. Geological Survey (USGS), 1980, 7.5 Minute Series (topographic) Map, Gulf Shores, Alabama;

2 U.S. Department of agriculture, 1986, Soil Conservation Service, aerial photograph;

4 U.S. Fish and Wild life Service, 1979, National Wetland Inventory Map Gulf Shores, Alabama: 7.5 Minute Quadrangle.

5 U S Fish and Wildlife Service, 1979, National Wetland Inventory Map Orange Beach, Alabama: 7.5 Minute Quadrangle.

Send changes previously