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# RECORD OF DECISION FOR SITE 2 BORROW PIT LANDFILL AND SITE 15 DIRT ROADS

MCRD PARRIS ISLAND SC

6/1/2006

TETRA TECH NUS

# Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-94-D-0888

Rev. 2
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# Record of Decision
## for
# Site/SWMU 2 - Borrow Pit Landfill and Site/SWMU 15 - Dirt Roads

## Marine Corps Recruit Depot
## Parris Island, South Carolina
**U.S. EPA Identification Number SC6170022762**

## Contract Task Order 0020

## June 2006


Naval Facilities Engineering Command
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

REVISION 2
JUNE 2006

# RECORD OF DECISION
# SITE/SWMU 2 – BORROW PIT LANDFILL and
# SITE/SWMU 15 – DIRT ROADS
# FOR

## MARINE CORPS RECRUIT DEPOT
## PARRIS ISLAND, SOUTH CAROLINA
## U.S. EPA IDENTIFICATION NUMBER SC6170022762

**COMPREHENSIVE LONG-TERM**
**ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:**
**Southern Division**
**Naval Facilities Engineering Command**
**2155 Eagle Drive**
**North Charleston, South Carolina 29406**

**Submitted by:**
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**CONTRACT NUMBER N62467-94-D-0888**
**CONTRACT TASK ORDER 0020**

**JUNE 2006**

# TABLE OF CONTENTS

**SECTION** **PAGE NO.**

**ACRONYM LIST** ..... **iv**

**1.0 DECLARATION FOR THE RECORD OF DECISION** ..... **1-1**
1.1 SITE NAME AND LOCATION ..... 1-1
1.2 STATEMENT OF BASIS AND PURPOSE ..... 1-1
1.3 DESCRIPTION OF THE SELECTED REMEDY/STATUTORY DETERMINATIONS ..... 1-2
1.4 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY ..... 1-3

**2.0 DECISION SUMMARY** ..... **2-1**
2.1 SITE NAME, LOCATION, AND DESCRIPTION ..... 2-1
2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES ..... 2-1
2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION ..... 2-3
2.4 SCOPE AND ROLE OF THE RESPONSE ACTION AT SITES 2 AND 15 ..... 2-3
2.5 SUMMARY OF SITE CHARACTERISTICS ..... 2-4
2.5.1 Geology ..... 2-4
2.5.2 Hydrogeology ..... 2-5
2.5.3 Human Health Conceptual Site Model/Current and Potential Future Land and Resource Uses ..... 2-6
2.5.4 Ecology ..... 2-7
2.6 NATURE AND EXTENT OF CONTAMINATION ..... 2-9
2.7 SUMMARY OF SITE RISKS ..... 2-11
2.7.1 Human Health Risk Assessment ..... 2-12
2.7.2 Ecological Risk Assessment ..... 2-14
2.7.3 Risk Assessment Summary ..... 2-16
2.8 EXPLANATION OF SIGNIFICANT CHANGES ..... 2-16

**3.0 RESPONSIVENESS SUMMARY** ..... **3-1**
3.1 STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES ..... 3-1

**REFERENCES** ..... **R-1**

**APPENDIX**

**A RESPONSIVENESS SUMMARY**

# TABLES

**NUMBER**

2-1 Summary Statistics - Surface Soil, Site 2 - Borrow Pit Landfill and Site 15 - Dirt Roads
2-2 Summary Statistics - Groundwater, Site 2 - Borrow Pit Landfill
2-3 Summary Statistics - Surface Water, Site 2 - Borrow Pit Landfill
2-4 Summary Statistics - Sediment, Site 2 - Borrow Pit Landfill
2-5 Summary Statistics - Sediment, Site 15 - Dirt Roads
2-6 Chemicals Retained as Human Health COPCs, Site 2 - Borrow Pit Landfill
2-7 Summary of Cancer Risks and Hazard Indices, Site 2 - Borrow Pit Landfill
2-8 Chemicals Retained as ERA Step 2 Ecological COPCs, Site 2 - Borrow Pit Landfill
2-9 Chemicals Retained as ERA Step 2 Ecological COPCs, Site 15 - Dirt Roads

# FIGURES

**NUMBER**

2-1 Depot Location Map
2-2 Site Layout, Site 2 - Borrow Pit Landfill and Site 15 - Dirt Roads
2-3 Site Layout, Site 15 - Dirt Roads at Elliiot's Beach

# ACRONYM LIST

| | |
|---|---|
| B&R Environmental | Brown & Root Environmental |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| cm/sec | centimeters per second |
| COPC | chemical of potential concern |
| ER,N | Environmental Restoration, Navy |
| ERA | ecological risk assessment |
| ESV | Ecological Screening Value |
| HHRA | human health risk assessment |
| HI | Hazard Index |
| HQ | Hazard Quotient |
| IAS | Initial Assessment Study |
| ILCR | incremental lifetime cancer risk |
| LOAEL | lowest observed adverse effect level |
| MCL | Maximum Contaminant Level |
| MCRD | Marine Corps Recruit Depot |
| mg/kg | milligrams per kilogram |
| Navy | United States Navy |
| NCP | National Contingency Plan |
| NEESA | Naval Energy and Environmental Support Activity |
| NOAA | National Oceanographic and Atmospheric Administration |
| NOAEL | no observed adverse effect level |
| PAH | polynuclear aromatic hydrocarbon |
| PCBs | polychlorinated biphenyls |
| RBC | risk-based concentration |
| RCRA | Resource Conservation and Recovery Act |
| RDA | Recommended Daily Allowance |
| RFA | RCRA Facilities Assessment |
| RfD | Reference Dose |
| RFI | RCRA Facilities Investigation |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SCDHEC | South Carolina Department of Health and Environmental Control |

| | |
|---|---|
| SCDNR | South Carolina Department of Natural Resources |
| SVOCs | semivolatile organic compounds |
| SWMU | solid waste management unit |
| TtNUS | Tetra Tech, NUS, Inc. |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| U.S. EPA | United States Environmental Protection Agency |
| VOCs | volatile organic compounds |
| VS | verification step |

# 1.0 DECLARATION FOR THE RECORD OF DECISION

## 1.1 SITE NAME AND LOCATION

Site/Solid Waste Management Unit (SWMU) 2, the Borrow Pit Landfill, is a reported landfill located in the central portion of Horse Island in the northern section of the Marine Corps Recruit Depot (MCRD) Parris Island. Site/SWMU 2 (Site 2) occupies approximately 1.9 acres; its southwestern border is approximately 100 feet from a marsh area. From approximately 1966 to 1968, the site was reportedly used as a disposal site for domestic trash, construction debris, solid paint wastes, cleaning rags, solvent sludge, perchloroethylene still bottoms, metal shavings, polychlorinated-biphenyl (PCB)-contaminated oil, mercury amalgam, and beryllium waste from the MCRD. Currently, the site is covered by mature pine trees.

In addition to Site 2, Site/SWMU 15 (Site 15) is included in this Record of Decision (ROD). Site 15 consists of approximately 0.5 mile of dirt roads surrounding Site 2 and approximately 1.5 miles of dirt roads accessing Elliot's Beach. From about 1918 to 1966, the dirt roads of Parris Island were sprayed with a mixture of waste lubricating oil, cutting oil, petroleum-based solvents, hydraulic fluids, and water-based coolants. The majority of the roads were paved in the 1940s, but the roads leading to the Borrow Pit Landfill and Elliot's Beach remained unpaved and continued to be sprayed until 1966. At present, the majority of the roads leading to Elliot's Beach have been paved; approximately 0.25 mile remains unpaved.

The Superfund site identification number for MCRD Parris Island is 0403488. The United States Environmental Protection Agency (U.S. EPA) identification number is SC6170022762.

For ease of reading and clarity, Site/SWMU 2 and Site/SWMU 15 will be referred to as Site 2 and Site 15, respectively, for the remainder of this ROD.

## 1.2 STATEMENT OF BASIS AND PURPOSE

This ROD document proposes no action/no further action at Sites 2 and 15 at the MCRD Parris Island, South Carolina.[1] This decision is made based on the results from previous investigations at these sites, including an Initial Assessment Study (IAS) in 1986, a Verification Step (VS) in 1988, an Interim Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) and a combined Remedial Investigation (RI)/RCRA Facilities Investigation (RFI) in 1998 and 1999. During these investigations, it

[1] "No action" is equivalent to the RCRA term of "no further action" and has been added at the request of the South Carolina Department of Health and Environmental Control.

was determined that no remediation is necessary at Sites 2 and 15 in order to protect human health and the environment.

This ROD documents the selected remedy for Site 2 at the MCRD Parris Island, South Carolina. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource and Conservation Recovery Act (RCRA), as amended, and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The Navy and EPA select the remedy, with concurrence by SCDHEC. The decision was based on information contained within the site's Administrative Record, which is on file at the Beaufort County Public Library's Headquarters Location, 311 Scott Street, Beaufort, South Carolina, 29902. The State of South Carolina concurs with this no action decision. The community did not provide any comments during the public comment period.

## 1.3 DESCRIPTION OF THE SELECTED REMEDY/STATUTORY DETERMINATIONS

The Navy and EPA, with concurrence by the State of South Carolina, have determined that no remedial action is required to ensure protection of human health and the environment at Sites 2 and 15. The measured level of risk to human health or environmental receptors allows for unrestricted use and/or unlimited exposure.

During the time between the publishing of the Proposed Plan and the finalization of this ROD for SWMU 2, the Navy, U.S. EPA and the State of South Carolina completed negotiation of a FFA, which outlines the remediation process for sites at MCRD Parris Island. The FFA effective date is March 31, 2006. Some additional delay in ROD finalization was incurred in resolving how land use controls and other post-remedial action activities are to be treated at federal facilities on the National Priorities List.

## 1.4 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY

Signature Paul E. Lefebvre
Brigadier General
Commanding General
MCRD Parris Island

1 Aug 06
Date

Signature Beverly H. Banister
Acting Division Director
Waste Management Division
U.S. EPA Region 4

9/12/06
Date

By separate letter, the State of South Carolina will concur with this decision.

# 2.0 DECISION SUMMARY

## 2.1 SITE NAME, LOCATION, AND DESCRIPTION

MCRD Parris Island is located along the southern coast of South Carolina, approximately 1 mile south of the City of Port Royal and 3 miles south of the City of Beaufort within Beaufort County. MCRD Parris Island covers approximately 8,047 acres that consist of dry land, salt marshes, saltwater creeks, and ponds, as shown in Figure 2-1. MCRD Parris Island is the reception and recruit training facility for the Marine Corps for enlisted men for all states east of the Mississippi River and for enlisted women nationwide. The Superfund site identification number for MCRD Parris Island is 0403488. The U.S. EPA identification number is SC6170022762.

Site 2, Borrow Pit Landfill, is a landfill that was in operation from 1966 to 1968. It is located in the central portion of Horse Island, in the northern section of MCRD Parris Island, as shown on Figure 2-1. As shown in Figure 2-2, the southwestern border of the landfill is located approximately 100 feet from a marsh area. The former landfill occupies approximately 1.9 acres and is currently covered with mature pine trees. Site 15 is approximately 0.5 mile of dirt roads surrounding the Borrow Pit Landfill (Figure 2-2) and 1.5 miles of dirt roads accessing Elliot's Beach in the southwestern portion of MCRD Parris Island (Figure 2-3).

The United States Navy (Navy) is the lead agency for this ROD, and the U.S. EPA Region 4 and South Carolina Department of Health and Environmental Control (SCHDEC) serve as support agencies. The Navy and EPA select the remedy, with concurrence by SCDHEC. Representatives of the National Oceanic and Atmospheric Administration (NOAA), the South Carolina Department of Natural Resources (SCDNR), and the U.S. Fish and Wildlife Service also serve as natural resource trustees.

## 2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

**Site 2 – Borrow Pit Landfill**

In the 1960s, Site 2 consisted of a pit that was dug to provide fill dirt for the base. When waste disposal at Site 2 was initiated, the unlined pit consisted of a hole approximately 10 feet deep. The 1986 IAS indicated that, from 1966 to 1968, the landfill served as the disposal site for domestic trash, construction debris, solid paint wastes, cleaning rags (contaminated with oil, mineral spirits, and kerosene), spent absorbent, solvent sludge (aliphatic petroleum and chlorinated solvent compounds), perchloroethylene still bottoms, metal shavings, PCB-contaminated oil, mercury amalgam, and beryllium wastes from the MCRD. An estimated 33,000 tons of solid waste refuse and 16 tons of solid paint wastes (e.g., empty paint cans, cleaning rags, used brushes and rollers, and spray booth scrapings) were reportedly disposed

in this landfill during the period of operation. Most of the wastes were located in the central and eastern portions of Site 2 [Naval Energy and Environmental Support Activities (NEESA), 1986]. Reportedly, paint shop personnel also brought liquid paint wastes including thinners (mineral spirits, kerosene, and diesel fuel) and a stripper (methylene chloride) to this landfill and burned them. During the 3-year period, approximately 2,800 gallons of liquid paint wastes may have been burned annually in this landfill (NEESA, 1986). The landfill was the facility's primary landfill after the termination of operations at the Site/SWMU 1 - Incinerator Landfill and the temporary suspension of operations at the Site/SWMU 3 - Causeway Landfill. When Site 2 operations were terminated, the pit was believed to be approximately half filled with wastes and approximately 6 feet deep. Since 1968, no documented significant disposal or intrusive activities have taken place at Site 2. No regulatory actions have been undertaken at Site 2.

**Site 15 – Dirt Roads**

In the past, the MCRD routinely sprayed the Depot's dirt and gravel roads with oils to reduce dust. From about 1918 until 1966, waste lubricating oil, cutting oil, petroleum-based solvents (kerosene, gasoline, mineral spirits), hydraulic fluids, and water-based coolants were transported by roads and grounds personnel from various Depot shops and sprayed for dust suppression. From 1918 to 1940, an estimated 11,000 gallons were sprayed on all Depot roads; the majority was applied during the 1930s. Most of the Depot roads were paved in the 1940s. However, from the early 1940s to 1966, approximately 16,200 gallons of waste oils and hydraulic fluids continued to be applied to the dirt roads accessing Elliot's Beach and the Borrow Pit Landfill. Most of the dirt road accessing Elliot's Beach was recently paved and only 0.25 mile of dirt road remains. No regulatory actions have been undertaken at Site 15.

Environmental investigations of Sites 2 and 15 began in 1986. The following reports describe the results of investigations at these sites to date and are available in the MCRD Parris Island information repository:

- IAS of MCRD Parris Island, South Carolina (NEESA, 1986).
- RI Verification Step (McClelland Consultants, Inc., 1990).
- Interim RFA of United States Marine Corps, Recruit Depot Parris Island, South Carolina (Kearney, A.T., Inc., 1990).
- Relative Risk Evaluation [Brown and Root Environmental (B&R Environmental), 1996].

- RI/RFI Work Plan for Sites/SWMUs 1, 2, 3, and 15 and SWMU 41 (B&R Environmental, 1998a) and Work Plan Addendum [Tetra Tech NUS, Inc. (TtNUS), 1999].

- RI/RFI Report for Sites/SWMUs 2 and 15 - Borrow Pit Landfill and Dirt Roads (TtNUS, 2000a).

## 2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

On August 10, 2000, the Proposed Plan for No Action at Sites 2 and 15 was made available to the public in the Information Repository at the Beaufort County Public Library's Headquarters Location at 311 Scott Street, Beaufort, South Carolina 29902. This Proposed Plan recommended that no further investigation or remediation be performed at Sites 2 and 15.

The public notice of the Proposed Plan was published in the *Beaufort Gazette* on August 11, 17, and 24, 2000. Additionally, a public information session was held on August 24, 2000 to present the results of the RI/RFI, explain the preferred remedy, and solicit comments from the community. At this information session, representatives from Southern Division Naval Facilities Engineering Command, MCRD Parris Island, U.S. EPA Region 4, and SCDHEC were available to discuss aspects of Sites 2 and 15 and the response actions under consideration. No comments were made during the public information session, and none were received during the public comment period. The Community Relations Responsiveness Summary is included in Appendix A of this ROD.

## 2.4 SCOPE AND ROLE OF THE RESPONSE ACTION AT SITES 2 AND 15

Sites 2 and 15 are two of approximately 45 sites being evaluated for potential contamination at the MCRD Parris Island. In 1996, the MCRD Parris Island partnering team was developed to facilitate the development, review, and approval of work plans, reports (RIs and Feasibility Studies), and decision documents (Proposed Plans and RODs). The original members of the team consisted of the Southern Division of the Navy, Marine Corps - MCRD Parris Island, U.S. EPA, and SCDHEC. In 1997, representatives of NOAA, SCDNR, and U.S. Fish and Wildlife Service joined the team as natural resource trustees.

This ROD is designed to convey the final remedial remedy chosen by the MCRD partnering team for Sites 2 and 15. During the RI/RFI, risk to construction/maintenance workers, adolescent and adult recreational users, and child and adult future on-site residents were evaluated. It was determined that, at both sites, contaminant concentrations in all media were within the U.S. EPA's acceptable risk range. Additionally, the associated hazard indices (HIs) did not exceed unity, indicating that non-carcinogenic toxic effects would not be anticipated. There was no contamination to warrant a remedial action to prevent unacceptable risk to ecological receptors, including fishes, aquatic birds, terrestrial birds, and terrestrial

mammals. For this reason, the partnering team has decided that the best course was to take no action/no further action at Sites 2 and 15.

## 2.5 SUMMARY OF SITE CHARACTERISTICS

This section summarizes the regional and site-specific geology, hydrogeology, and ecology in the vicinity of MCRD Parris Island. A more detailed presentation of this information is available in the RI/RFI Report for Sites 2 and 15 (TtNUS, 2000a).

### 2.5.1 Geology

Four geological units are present in the Beaufort-Jasper County area. These units from the oldest (Eocene age) to the youngest (Pleistocene age) are the Santee Limestone, Cooper Marl, Hawthorn Formation, and Pleistocene sands and clays. Soils at MCRD Parris Island have been mapped by the U.S. Soil Conservation Service as both individual soils and groupings of soils (units) (Stuck, 1980). The Depot has been mapped as having 15 individual soil types, but only eight types are present beneath MCRD Parris Island. Three soil units have been mapped for the Depot (the Wando-Seabrook-Seewee, Coosaw-Williman-Ridgeland, and Bohicket-Capers-Handsboro Soil Units).

The Borrow Pit soils located at Site 2 and the adjacent Site 15 dirt road represent areas where soils have been disturbed by man for use as fill material. These soils may include surface soil, subsoil, and, in some instances, substratum.

Soils collected from the Borrow Pit Landfill during the 1998 and 1999 field events consisted of fine to medium sands with a varying silt content, as confirmed by the lithologic descriptions during the sampling events. Rust-colored soils indicating possible fill material were encountered at several Site 2 sample locations at a depth of 1 foot to 6.5 feet below ground surface (bgs). Subsequent test pitting sampling did not find evidence of remaining waste. Sediment samples collected from the tidal inlet area consist of silts overlying sand and shells, coarse sand and shells, and silty sands. The Site 15 dirt road soils consisted of fine sand with varying silt and shell content. Sediment samples collected at Site 15 consisted of fine sands with a varying silt and clay content and sandy silts and clays.

Subsurface materials at Site 2 were classified from the drilling of one soil test boring during the field investigation, the soil logs for the existing wells, test pits, and the hand-auger borings collected within Site 2. Generally, the shallow subsurface geology inland of the tidal inlet consists of silty sand to a depth of approximately 25 feet bgs and sand with varying clay content to a depth of approximately 30 feet bgs. The subsurface geology along Archers Creek consists of predominantly fine to medium sand with a varying clay content to the termination of the boring at 48 feet bgs. A clayey, fine to coarse sand was

encountered from 36 to 40 feet bgs that seems to correspond with the confining unit encountered at a site located approximately 3,000 feet east of Site 2.

### 2.5.2 Hydrogeology

Two primary aquifers are present within the Beaufort-Jasper County area: the surficial Pleistocene aquifer and the Floridan Aquifer. These aquifers are generally separated by the Hawthorn Formation and Cooper Marl, which act as confining units to the underlying Floridan Aquifer.

In the MCRD Parris Island area, the shallow unconfined aquifer generally consists of permeable, fine to medium Pleistocene age sands. Surface relief is relatively low. The area is drained by fresh and brackish water streams inland and by tidal streams along the coast. The water table in the MCRD Parris Island area usually ranges from 0 to 10 feet bgs and is most commonly found at a depth of 3 feet bgs. Water-table fluctuations are a function of tidal influence, recharge, evaporation, and transpiration and have been observed to be as great as 6.5 feet at some locations (Glowacz, et al., 1980). The direction of groundwater flow in the upper portion of the shallow surficial aquifer is generally toward the nearest surface water body, such as a pond, river, tidal creek, or the ocean.

In the Beaufort-Jasper County area, the Floridan Aquifer system occurs near the land surface, and overlying confining beds vary from essentially 0 to more than 150 feet in thickness. Groundwater in the Floridan Aquifer occurs in solutionally enlarged openings or cavities in the limestone. In general, groundwater occurs in a series of broadly defined water-bearing (permeable) zones that serve as aquifers and are separated by less permeable rocks. Two hydrogeologic zones within the Floridan Aquifer lie beneath the MCRD Parris Island area: a 200-foot-thick upper hydrogeologic unit that contains an upper permeable zone and an 800-foot-thick lower hydrogeologic unit that has a somewhat lower permeability compared to the upper unit.

Based on water-level measurements, the shallow water table at Site 2 occurs at depths ranging from 3.5 to 14.5 feet bgs. The saturated thickness of the surficial aquifer ranges from 21.5 to 32.5 feet. Within the borrow pit, groundwater was encountered in the hand-auger borings and test pits at depths from 2.5 to 8 feet bgs. Within the vicinity of the topographically upgradient monitoring wells, groundwater was encountered at depths from 12.1 to 14.5 feet bgs.

Recharge of the shallow aquifer beneath the site is likely to occur primarily through infiltration of precipitation inland of the tidal inlet. Groundwater flow is generally toward the west-northwest, although groundwater near the marsh appears to flow toward the adjacent tidal inlet. Based on the groundwater elevation data collected during this field event, the vertical gradient within the surficial aquifer is downward. Site 2 is located within the 100-year flood plain.

Slug tests were performed at Site 2. The geometric average hydraulic conductivity for the shallow surficial aquifer wells was calculated to be 1.13 feet per day [3.99 x $10^{-4}$ centimeter per second (cm/sec)]. The deep surficial well conductivity was determined to be 3.08 feet per day (1.08 x $10^{-3}$ cm/sec). The values for the shallow and deep wells are within the typical range of hydraulic conductivity for clayey, silty sands, silts, and sandy silts

### 2.5.3 Human Health Conceptual Site Model/Current and Potential Future Land and Resource Uses

As described previously, Site 2 is a former unlined landfill located on Horse Island in the northern section of MCRD Parris Island. The landfill is now a depression mainly covered in mature pine trees. Site 15 is used as a traffic route. Neither site is used for residential purposes nor is it anticipated to be used for such in the future.

Sites 2 and 15 groundwater is not used as a potable water supply nor is it expected to be used as such in the future, based on the high total dissolved solids content of the groundwater. Currently no off-site residents are located hydraulically downgradient in the immediate vicinity of the sites that might use groundwater as a potable water supply. The surface water adjacent to Sites 2 and 15 is not currently used as a potable water supply, but it is used for recreation (boat launch and fishing).

The potential sources of contamination are the former wastes disposed within the landfill at Site 2 and the waste oils that were sprayed on the road to suppress dust at Site 15. Contaminants may be released by mechanisms such as leaching of contaminants from soil/former waste material via infiltrating water and subsequent migration to the water table, wind erosion of surface soil (fugitive dust), and volatilization of chemicals from soil (volatile emissions). Contaminants may also have been released from Site 15 via erosion of surface soil during rain storms. At Site 2, off-site migration of surface water is limited, due to the lower elevation of the landfill compared to the surroundings.

As a general rule, once released from the source, contaminants may be transported in media such as soil, groundwater, surface water, sediment, or air. Potential receptors may be exposed either directly or indirectly to contaminants in these media by a variety of exposure mechanisms. Inhalation of air, direct contact with soil, groundwater, surface water, and sediment, and ingestion of fish were exposure routes evaluated in the RI/RFI.

Potential receptors were identified by analyzing the interaction of current and potential future land use practices and the identified sources of contamination. The receptors evaluated in the RI/RFI consisted of

construction workers, maintenance workers, on-site recreational users, and hypothetical future on-site residents.

### 2.5.4 Ecology

**Site 2**

Site 2 is roughly rectangular in shape and covers an area of approximately 2 acres (Figure 2-2). The site perimeter is bounded to the north, east, and south by a dirt road leading to a boat ramp. The remainder of the site perimeter consists of a 3- to 5-feet high berm along the southwestern boundary of the site. A narrow strip of marsh habitat adjacent to an inlet of Archer's Creek is located southwest of the berm.

Habitat at Site 2 consists of a pine forest. The dominant overstory species are slash pine (*Pinus elliottii*) and loblolly pine (*Pinus taeda*). Other trees include sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*), and red bay (*Persea borbonia)*. The midstory and much of the understory consist almost exclusively of wax myrtle (*Myrica cerifera*). Scattered shrubs and vines include poison ivy (*Rhus radicans*), muscadine grape (*Vitis rotundifolia*), and greenbrier (*Smilax rotundifolia*).

The narrow strip of marsh to the west and southwest of the site is dominated by needlerush (*Juncus roemerianus*). Cordgrass (*Spartina alterniflora*), sea oxeye (*Borrichia frutescens*), and glasswort (*Salicornia virginica*) are present in portions of the marsh.

The site is small in areal extent, yet a variety of wildlife species occur there. White-tailed deer (*Odocoileus virginianus*), raccoons *(Procyon lotor*), and gray squirrels (*Sciurus carolinensis*) are known to forage on the site. Other mammals expected to occur at Site 2 include the opossum (*Didelphis virginiana*), short-tailed shrew (*Blarina carolinensis*), cotton rat (*Sigmodon hispidus*), and cotton mouse (*Peromyscus gossypinus*). Mammalian carnivores expected to occur, at least occasionally, on the site include the red fox (*Vulpes vulpes*) and striped skunk (*Mephitus mephitus*). A variety of birds, reptiles, and amphibians utilize the site.

Mink (*Mustela vison*), river otters (*Lutra canadensis*), marsh rabbits (*Sylvilagus palustris*), and rice rats (*Oryzomys palustris*) probably forage along the edge of the marsh southwest of the site. The tidal inlet provides habitat for a variety of fauna, particularly fish and crustaceans. Several species of animals probably prey upon these fish, mollusks, and crustaceans. These include mammals such as the raccoon, mink, and river otter and wading birds such as the tricolored heron (*Egretta tricolor*), great blue heron (*Ardea herodias*), green heron (*Butorides striatus),* and snowy egret (*Egretta thula*). An active osprey (*Pandion haliaetus*) nest is located on a nesting platform at the edge of the inlet immediately southwest of the site.

Fish such as red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), southern flounder (*Paralichthys lethostigma*), whiting (*Menticirrhus americanus*), and striped mullet (*Mugil cephalus)* are known to occur in Archer's Creek and presumably occur in the tidal inlet near the site. Smaller fish such as mud minnows (*Umbra pygmaea*) and mummichogs (*Fundulus heteroclitus*), as well as benthic and nektonic invertebrates such as oysters, shrimp, and crabs, also are expected to occur in the inlet.

Endangered and threatened species that could potentially occur at or near the site consist of the bald eagle (*Haliaeetus leucocephalus*), wood stork (*Mycteria americana*), and American alligator (*Alligator mississippiensis*). An active bald eagle nest is located approximately 1 mile southeast of the site, and bald eagles (state and federally listed as threatened) could potentially forage on fish in Archer's Creek. Wood storks (state and federally listed as endangered) forage in various locations throughout the Depot, and they could potentially forage in the tidal inlet near the site. An alligator was observed near the site during sampling activities. Although common in some parts of its range, the alligator is federally listed as threatened due to its similarity in appearance to the endangered American crocodile (*Crocodylus acutus*).

Although other endangered and threatened species occur in Beaufort County, the site provides poor habitats for these species. For example, the manatee (*Trichechus manatus*), shortnose sturgeon (*Acipenser brevirostrum*), and various sea turtles have been seen, at least occasionally, in the Broad River, Beaufort River, and Port Royal Sound. Similarly, the Atlantic bottlenosed dolphin (*Tursiops truncatus*) is a year-round resident of these areas. Although not threatened or endangered, dolphins are afforded protection under the Federal Marine Mammal Act. However, these species usually are not associated with shallow marshes and small tidal inlets like those near Site 2. With the exception of the bald eagle, wood stork, and alligator, the likelihood of endangered and threatened species in the vicinity of the site is remote.

**Site 15**

Site 15 consists of approximately 0.5 mile of dirt road accessing the Site 2 Borrow Pit Landfill and approximately 1.5 miles of road near Elliot's Beach (Figures 2-2 and 2-3). Most of the Elliot's Beach road has been paved, and the only unpaved portion is within the picnic area at Elliot's Beach.

Habitat in the vicinity of the Borrow Pit road consists of pine forest on the downslope side of the road and temperate evergreen forest on the upslope side. The area on the upslope side of the road is dominated by laurel oak (*Quercus laurifolia*), and the downslope pine forest was discussed previously in the Site 2 ecological section. Other trees include black cherry, red bay, and loblolly pine. Common understory shrubs and vines include saw palmetto (*Serenoa repens*), yaupon holly (*Ilex vomitoria*), muscadine grape, and greenbriar.

A variety of habitats exist in the vicinity of the Elliot's Beach road. Approximately 20 acres of mowed grass with scattered live oaks (*Quercus virginiana*) occur in the picnic area. Mowed grass extends seaward to the edge of a 5-foot bluff along the shoreline, where concrete slabs have been recently placed as riprap. The shoreline at the picnic area is rock and gravel, with no emergent vegetation. A boat ramp is located approximately 3,000 feet southeast of the picnic area, at the mouth of Whale Creek. An extensive saltwater marsh, dominated by cordgrass, is located upstream along Whale Creek.

Wooded areas near Elliot's Beach consist of temperate evergreen forest. This transitions into pine forest when proceeding inland. The temperate evergreen forest includes tree species such as live oak, laurel oak, cabbage palmetto (*Sabal palmetto*), red bay, and sweet bay (*Magnolia virginiana*). Common understory species include wax myrtle, yaupon holly, muscadine grape, and greenbrier. The pine forest includes these species but is dominated by slash pine and loblolly pine. The understory of the pine forest near Elliot's Beach is thickly vegetated with sweet gum (*Liquidambar styraciflua*), saw palmetto, oaks (*Quercus* spp), and numerous vines.

Terrestrial and aquatic animal species known and expected to occur in the vicinity of Site 15 are those described previously in the Site 2 ecological discussion.

The most likely endangered and threatened species that could potentially occur at or near Site 15 consist of the bald eagle, woodstork, and American alligator. Wood storks could potentially forage in the extensive marsh upstream of the boat ramp near Elliot's Beach. Bald eagles and alligators could potentially forage in the marsh or in the Broad River.

Other endangered and threatened species known to occur in Beaufort County that could potentially occur near Site 15 consist of aquatic species such as the manatee (*Trichechus manatus*), shortnose sturgeon (*Acipenser brevirostrum*), and various sea turtles. These species are occasionally seen in the Broad River, Beaufort River, and Port Royal Sound. There are no sandy beach habitats favored as nesting sites by sea turtles near Site 15. Thus, the likelihood of sea turtles near the site (except for occasional transients) is remote. The possibility that manatees and shortnose sturgeon may occasionally occur in the Broad River near Elliot's Beach cannot be ruled out.

## 2.6 NATURE AND EXTENT OF CONTAMINATION

This section summarizes the nature and extent of contamination observed at Sites 2 and 15 during the 1998 and 1999 RI/RFI. A more detailed presentation of this information is available in the RI/RFI Report for Sites 2 and 15 (TtNUS, 2000a).

The nature, extent, and concentration of hazardous substance contamination at Sites 2 and 15 were evaluated during the RI/RFI conducted from May to September 1998 and in October 1999. Concentrations of analytes detected by laboratory analyses are reported in micrograms per kilogram (µg/kg) or milligrams per kilogram (mg/kg) for soil samples and micrograms per liter (µg/L) for water samples. For instance, a concentration of 8,600 mg/kg for iron means that 8,600 milligrams of iron are present in each kilogram of soil. A kilogram is a metric unit measure of weight equal to about 2.2 pounds. One thousand micrograms equal 1 milligram, 1,000 milligrams equal 1 gram, and 1,000 grams equal 1 kilogram. A liter is a unit measure of volume roughly equal to a quart.

Samples were collected from Sites 2 and 15 in the spring and summer of 1998. Additional subsurface soil samples were collected in October 1999 as part of test pitting operations. During the 1998 field investigation sampling at Site 2, eight surface soil samples, four filtered and non-filtered groundwater samples, four filtered and non-filtered surface water samples, and five sediment samples were collected and analyzed. The field investigation at Site 15 during the same time included seven surface soil samples and three sediment samples. In 1999, three subsurface soil samples were collected at Site 2. Summary statistics for 1998 surface soil, groundwater, surface water, and sediment analytical results and 1998 and 1999 subsurface soil results are presented in Tables 2-1 though 2-5.

Wastes were reportedly disposed of at Site 2. In addition, a review of aerial photographs indicates that the site was disturbed at the reported time of disposal. However, hand borings and test pits were conducted as part of RI/RFI activities to determine whether waste materials are present at the site. The only evidence of waste at Site 2 was the presence of visually stained soils near the water table. The stained soils may be of natural origin. Furthermore, surface and subsurface soil and sediment at Site 2 were found not to contain chemicals in excess of those found in background media and the most stringent of residential human health risk-based criteria or ecological screening values.

Surface soils and sediments at Site 15 were found to contain two isolated detections of chemicals in excess of the background media and the most stringent residential human health risk-based concentrations (RBCs) or ecological screening values. Bis(2-ethylhexyl) phthalate was detected in one sediment sample at a concentration of 1.5 times the U.S. EPA Region 4 Ecological Screening Value (ESV). Similarly, PCBs were detected in one sediment sample (from a previous sample event) at a concentration of 1.2 times the U.S. EPA Region 4 ecological screening level. Several inorganic compounds were detected at concentrations greater than background levels, but were detected less than RBCs and ESVs.

Several metals, one volatile organic compound (VOC), and one semi-volatile organic compound (SVOC) were detected in Site 2 groundwater at concentrations in excess of the most stringent residential human health RBCs or ecological screening values. These results are summarized as follows.

- Chloroform and arsenic were the only chemicals detected in site groundwater at concentrations that could result in potential risk to human health. Chloroform was detected in one of five wells and arsenic in three of five wells. This evaluation assumes that site groundwater would be used as a potable water supply. However, the maximum concentration of arsenic and chloroform detected were actually less than the U.S. EPA maximum contaminant levels (MCLs), indicating that risks from these chemicals are within acceptable U.S. EPA ranges.

- Aluminum, iron, copper, zinc, and bis(2-ethylhexyl) phthalate were the only chemicals detected in the site groundwater at concentrations exceeding established ecological criteria. This evaluation assumes that the groundwater seeps into the adjacent surface water, mixing does not occur in the surface water, and that the most sensitive receptor is continuously exposed to the seep. However, with the exception of bis (2-ethylhexyl) phthalate, none of these chemicals were detected in the adjacent surface water at concentrations greater than ecological screening levels. Since bis(2-ethylhexyl) phthalate is a common laboratory artifact and it was detected in background surface water samples at higher concentrations than detected at this site, it may not be a site contaminant.

Two metals and one SVOC were detected in Site 2 surface water at concentrations in excess of the most stringent residential human health RBCs or ecological screening values. These results are summarized as follows.

- Bis(2-ethylhexyl) phthalate (two of four samples) and arsenic (one of four samples) were detected in the surface water at concentrations that represent a potential threat to human health assuming potable use of the saline water and regular consumption of fish living at the site. Actual threats would be less since salt water is not used for drinking water.

- Silver was detected in two of four surface water samples and was the only chemical detected at concentrations in excess of the most stringent surface water ecological screening values. However, the maximum detected concentration of silver was less than the associated ambient water quality criteria. Therefore, ecological effects attributable to exposure to silver would not be anticipated.

## 2.7 SUMMARY OF SITE RISKS

The Sites 2 and 15 RI/RFI analytical data were evaluated to determine baseline risks to human health and the environment. The baseline risk assessment estimates what risks the sites would pose if no

action were taken. It provides the basis for taking action and identifies the chemicals and the exposure pathways that need to be addressed by the remedial action. Sections 2.7.1 and 2.7.2 summarize the results of the baseline risk assessment for this site.

### 2.7.1 Human Health Risk Assessment

A baseline human health risk assessment (HHRA) was performed to characterize and quantify potential health risks at both sites, in the absence of remedial action. The HHRA for Sites 2 and 15 was conducted using guidance from the U.S. EPA (U.S. EPA, 1989 and 1992), including regional supplemental guidance (U.S. EPA Region 4, 1995a). Methodologies presented in the Master Workplan for MCRD, Parris Island, South Carolina (B&R Environmental, 1998b) were also used to develop the baseline risk assessment for these sites. During this evaluation, a list of chemicals of potential concern (COPCs) was developed for each environmental medium (e.g., surface soil, sediment, etc.) sampled at the sites. Table 2-6 presents the chemicals selected as human health COPCs. COPCs are chemicals that need further evaluation to determine if, in fact, the concentrations found at the site pose a potential risk to human health and the environment.

The human health risk assessment considered exposure of construction workers to site media. The estimated incremental lifetime cancer risk (ILCR) to construction workers across all media at the Borrow Pit Landfill was 1.8E-06. This value exceeded one in one million (1.0E-06), which is the lower bound of U.S. EPA's acceptable risk range, but was less than one in 10,000 (1.0E-04), which is the upper bound of this range. The noncarcinogenic risk estimates [Hazard Indices (HIs)] for the construction worker (0.09 to 0.45) were less than 1.0, which is the U.S. EPA's risk threshold, indicating that toxic effects would not be expected.

The maintenance worker was evaluated for exposure to surface soil and sediment only. Groundwater and surface water were not evaluated as exposure medium because groundwater is not used as a potable water supply and maintenance workers do not come in contact with surface water. Because no COPCs were identified for surface soil and sediment at Sites 2 and 15 under a residential use scenario, carcinogenic and noncarcinogenic risks for the maintenance worker are expected to be within acceptable levels.

An analysis of exposure to surface waters by adolescent and adult recreational users resulted in ILCRs of 4.4E-06 and 2.6E-06, respectively. Both values are within the U.S. EPA’s acceptable risk range. The noncarcinogenic HIs for both receptors (0.11 and 0.18) were less than the acceptable risk threshold of 1.0.

The HHRA determined that ingestion of shellfish from the marsh located approximately 100 feet from Site 2 by adults would represent an estimated ILCR of 1.4E-06, which is also within U.S. EPA’s acceptable risk

range. The noncarcinogenic HI value was calculated to be 0.07, indicating that toxic effects would not be expected.

The estimated ILCR for a hypothetical future lifelong (child and adult) resident exposed to surface water was 1.4E-05, which is within U.S. EPA's acceptable risk range. The noncarcinogenic HI for a future hypothetical child resident was 0.18, and the HI for a future hypothetical adult resident was 0.11, both being less than the acceptable risk threshold of 1.0.

The estimated ILCR for a hypothetical future lifelong (child and adult) resident exposed to groundwater was 3.4E-05, which is within U.S. EPA's acceptable risk range. The noncarcinogenic HIs for future hypothetical residents were 2.8 for a child and 1.2 for an adult, both of which exceed the acceptable threshold of 1.0. Although the HI for the individual target organs for an adult were all less than the acceptable level of 1.0, iron was the main contributor to the HI for a child and for the adult. The reference dose (RfD) for iron is based on the Recommended Dietary Allowance (RDA) for adult nutrition. Children require more iron in their diets than adults do; consequently, use of an RfD based on the adult RDA for iron to evaluate exposures to children results in an overestimation of the risks for children. The HI is less than 1.0 when calculated using a RfD based on child nutritional requirements; therefore, all cancer risks and HIs are within acceptable levels.

A summary of human health ILCRs and HIs for Site 2 human receptors is presented in Table 2-7. No COPCs were detected in the soil or sediment of Site 15; therefore, quantitative risks were not calculated for Site 15 human receptors.

The baseline HHRA reflects certain uncertainties regarding the true risks associated with Site 2. Conservative assumptions were used throughout the entire risk assessment; consequently, the final estimated risks may well be overestimated. The major uncertainty involved the estimation of exposure point concentrations and the retention of bis(2-ethylhexyl)phthalate as a COPC. Based upon the level of sampling conducted, the distribution of the chemical could not be fully determined and the maximum detected concentration was used as the exposure point concentration. As a result, the estimations of risk, where the maximum concentrations were used as the exposure point concentration, are most likely to be overstated because it is unlikely that potential receptors would be exposed to the maximum concentration over the entire exposure period.

Bis(2-ethylhexyl)phthalate was retained as a COPC in surface water at Site 2, although the available data suggests that the presence of bis(2-ethylhexyl)phthalate in surface water may not be site related but be due

to contamination from sampling.[2] Consequently, the retention of bis(2-ethylhexyl)phthalate as a COPC may have also resulted in an overestimation of site risks.

### 2.7.2 Ecological Risk Assessment

An ecological risk assessment (ERA) was performed to characterize the potential risks from site-related contaminants to ecological receptors. The ERA was performed using the general approach recommended in U.S. EPA guidance for performing ERAs (U.S. EPA, 1997, U.S. EPA, 1998), which served as the basis for the ERA methodology. Furthermore, the ERA was conducted in accordance with Navy policy [Department of the Navy (DON), 1999] and other available guidance documents (U.S. EPA, 1995b; Wentsel et al., 1996) and publications (Ingersoll et al., 1997; Suter, 1993; Calabrese and Baldwin, 1993). The ERA investigated potential impacts to fish, benthic invertebrates, soil invertebrates, terrestrial and aquatic plants, terrestrial wildlife, and semi-aquatic wildlife.

Initially, ecological COPCs were determined by comparing the maximum concentrations of detected chemicals in surface water, groundwater, sediment, and surface soil to U.S. EPA Region 4 ecological screening levels. When the hazard quotient (HQ) (ratio of the maximum concentration to its respective screening level) exceeded 1.0, adverse impacts were considered possible and the chemical was retained as an ecological COPC. An HQ of greater than 1.0 is an indication that ecological receptors are potentially at risk. Additional evaluation or data may be necessary to confirm with greater certainty whether ecological receptors are actually at risk, especially since most guidelines are conservatively derived.

The initial ecological risk screening determined that the maximum concentrations of VOCs and several metals across all media at Site 2 exceed U.S. EPA Region 4 screening values and were identified as COPCs, indicating a potential ecological risk. In addition, SVOCs were retained as COPCs in surface and groundwaters and one pesticide was retained as a COPC in surface water at Site 2. At Site 15, one PCB was retained as a COPC in surface soil and one SVOC and several metals were considered COPCs in sediment.

Modeling of contaminant exposure via the food chain was performed to investigate potential risks to representative receptors. All COPCs identified in surface water, sediment, and surface soil were used in the food-chain modeling. Contaminant intake from the ingestion of food and water and incidental ingestion of soil or sediment were estimated and the resulting intake values were divided by published no-

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[2] According to the U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (U.S. EPA, 1999), phthalates are listed as common laboratory contaminants. Phthalates were also observed in several blank samples.

observed-adverse-effects levels (NOAELs) and lowest-observed-adverse-effects levels (LOAELs) to obtain food-chain HQs. The food-chain modeling evaluated 11 representative receptors. The following table summarizes the maximum HQs calculated during the initial COPC screening process and food-chain modeling.

| Receptor | Exposure Route | Hazard Quotients – Site 2 | | Hazard Quotients – Site 15 | |
|---|---|---|---|---|---|
| Terrestrial and aquatic plants, soil invertebrates, benthic receptors (COPC initial screening) | Direct contact with sediment, prey, surface water, and soil; ingestion of sediment, prey, surface water, soil, and food; uptake by plants | U.S. EPA Region 4 Screening Values[1], HQs for Soil (maximum = 85.8), sediment (0.34), surface water (4.04) and groundwater (11.61) | | U.S. EPA Region 4 Screening Values[1], HQs for Soil (maximum = 1.2) and sediment (1.54) | |
| Terrestrial Food-Chain Receptors – Maximum Concentrations | Direct contact with sediment, surface water and soil; ingestion of sediment, prey, surface water, soil, and food | Food-Chain Modeling, Maximum HQs[1] based on: | | Food-Chain Modeling, Maximum HQs[1] based on: | |
| | | NOAELs | LOAELs | NOAELs | LOAELs |
| - Shrew | | 2.77[1] | 0.277[1] | 1.00 | 0.1 |
| - Robin | | 2.41 | 0.241 | 0.256 | 0.026 |
| - Hawk | | 1.12 | 0.112 | 0.168 | 0.017 |
| - Mouse | | 12.8 | 0.128 | 0.0135 | 0.0014 |
| - Fox | | 7.32 | 0.732 | 0.425 | 0.043 |
| - Woodcock | | 4.57 | 0.457 | 0.545 | 0.055 |
| Aquatic Food-Chain Receptors – Maximum Concentrations | Direct contact with sediment and surface water; ingestion of sediment, prey and surface water | Food-Chain Modeling, Maximum HQs[1] based on: | | Food-Chain Modeling, Maximum HQs[1] based on: | |
| | | NOAELs | LOAELs | NOAELs | LOAELs |
| - Raccoon | | 23.1[1] | 2.31[1] | 63.1[1] | 6.31[1] |
| - Heron | | 9.7 | 0.97 | 26.4[1] | 2.64[1] |
| - Mummichog | | NA | NA | NA | NA |
| - Red Drum | | NA | NA | NA | NA |
| - Osprey | | 11.3 | 1.13 | 30.9[1] | 3.09[1] |

1 Maximum HQ result does not include aluminum.
NA – NOAELs or LOAELs not available.

Based on maximum concentrations, several maximum food chain NOAEL HQs exceeded 1.0. The exceedances were limited to inorganic compounds. One organic compound, Aroclor-1254, resulted in an HQ equal to 1.0 for the shrew. This estimate is based on the premise that the shrew would be in contact with the maximum concentration of this compound every day of its life. The food-chain modeling results found that, under more realistic conditions that consider mean chemical concentrations, no organic chemicals had NOAEL HQs equal to or greater than 1.0.

The remaining food chain NOAEL HQs that exceeded 1.0 were due to aluminum, iron, and vanadium. However, the food chain HQs were calculated by assuming that concentrations of inorganics in food items of terrestrial and aquatic receptors were equal to surface soil and sediment concentrations. This is a conservative assumption since accumulation and transfer through the food chain generally does not occur for aluminum, iron, and vanadium. In view of this conservative assumption, the HQs greater than 1.0 for aluminum, iron, and vanadium do not appear to be excessive. In addition, all concentrations of

aluminum, iron and vanadium at Sites 2 and 15 were at concentrations less than background concentrations as shown below:

| Analyte | Soil (mg/kg) | | Sediment (mg/kg) | | |
|---|---|---|---|---|---|
| | Background | Site 2 Max. Conc. | Background | Site 2 Max. Conc. | Site 15 Max. Conc. |
| Aluminum | 7,270 | 4,290 | 24,200 | 5,560 | 15,500 |
| Iron | 3,920 | 1,930 | 21,500 | 5,390 | 14,700 |
| Vanadium | 9.5 | 4.1 | 50 | 12.8 | 37.4 |

The results of COPC screening and food chain modeling indicate that COPCs do not pose significant potential risks to terrestrial and aquatic receptors.

### 2.7.3 Risk Assessment Summary

The HHRA determined that all ILCRs resulting from exposure to Site 2 and 15 media are below or within the U.S. EPA's acceptable risk range of 1.0E-06 and 1.0E-04. Additionally, all HIs are less than the acceptable risk threshold of 1.0. Furthermore, the results of COPC screening and food chain modeling indicate that COPCs do not pose significant potential risks to terrestrial and aquatic receptors.

Based on the absence of excess risk to human health and the environment from contaminants in the media investigated, a no action/no further action remedy has been selected as the appropriate response action for Sites 2 and 15.

The measured level of risk to human health or environmental receptors allows for unrestricted use and/or unlimited exposure.

## 2.8 EXPLANATION OF SIGNIFICANT CHANGES

As the lead agency, the Navy prepared and issued the Proposed Plan for Site 2 and 15 on August 10, 2000 (TtNUS, 2000b). This Proposed Plan described the rationale for a no action final response at Sites 2 and 15. No significant changes were made to the Proposed Plan. The Navy and EPA, with concurrence by the State of South Carolina, have determined that no remedial action is required to ensure protection of human health and the environment at Sites 2 and 15. This response action may be re-evaluated in the future if conditions at Sites 2 and 15 indicate that an unacceptable risk to public health or the environment may exist at this site.

**TABLE 2-1**

**SUMMARY STATISTICS - SURFACE SOIL**
**SITE 2 - BORROW PIT LANDFILL AND SITE 15 - DIRT ROADS**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Parameter | Frequency of Detection | Range of Positive Detects | Range of Nondetects | Location of Maximum Positive Detect | Average of Positive Detects | Average All | Background Level | Maximum Exceed Backgrd. |
|---|---|---|---|---|---|---|---|---|
| | | | | **SITE 2** | | | | |
| **Volatiles (mg/kg)** | | | | | | | | |
| Acetone | 2/7 | 0.018 - 0.17 | 0.02 - 0.16 | PAI-02-SS-08-01 | 0.094 | 0.045429 | NA | NA |
| Chloroform | 6/8 | 0.002 - 0.018 | 0.007 - 0.008 | PAI-02-SS-04-01 | 0.007 | 0.006188 | NA | NA |
| Toluene | 1/8 | 0.003 | 0.006 - 0.008 | PAI-02-SS-01-01 | 0.003 | 0.00325 | NA | NA |
| **Semivolatiles (mg/kg)** | | | | | | | | |
| Anthracene | 1/8 | 0.0013 | 0.0017 - 0.022 | PAI-02-SS-02-01 | 0.0013 | 0.002325 | NA | NA |
| Benzo(b)fluoranthene | 4/8 | 0.0009 - 0.0023 | 0.0017 - 0.022 | PAI-02-SS-07-01 | 0.0015 | 0.00257 | NA | NA |
| Chrysene | 1/8 | 0.0029 | 0.0043 - 0.055 | PAI-02-SS-07-01 | 0.0029 | 0.005781 | NA | NA |
| Fluoranthene | 2/8 | 0.0047 - 0.0077 | 0.0043 - 0.055 | PAI-02-SS-01-01 | 0.0062 | 0.006663 | NA | NA |
| Indeno(1,2,3-cd)pyrene | 1/8 | 0.0047 | 0.0043 - 0.055 | PAI-02-SS-08-01 | 0.0047 | 0.005719 | NA | NA |
| Phenanthrene | 6/8 | 0.0032 - 0.041 | 0.0036 - 0.0073 | PAI-02-SS-06-01 | 0.014 | 0.011419 | NA | NA |
| **Inorganics (mg/kg)** | | | | | | | | |
| Aluminum | 8/8 | 1710 - 4290 | NA | PAI-02-SS-04-01 | 2548 | 2548.75 | 7270 | No |
| Antimony | 1/8 | 0.17 | 0.15 - 1.3 | PAI-02-SS-01-01 | 0.17 | 0.16625 | ND | Yes |
| Arsenic | 4/8 | 0.18 - 1 | 0.18 - 0.23 | PAI-02-SS-07-01 | 0.56 | 0.33375 | 1.4 | No |
| Barium | 8/8 | 4.4 - 12 | NA | PAI-02-SS-02-01 | 8 | 8.025 | 23.6 | No |
| Calcium | 7/8 | 53.1 - 477 | 47.3 | PAI-02-SS-06-01 | 168 | 150.34375 | 766 | No |
| Chromium | 8/8 | 3.5 - 7.5 | NA | PAI-02-SS-07-01 | 5.07 | 5.075 | 6.23 | Yes |
| Cobalt | 5/8 | 0.03 - 0.19 | 0.04 | PAI-02-SS-04-01 | 0.084 | 0.06 | 0.36 | No |
| Copper | 2/8 | 1.1 - 1.7 | 0.36 - 0.75 | PAI-02-SS-05-01 | 1.4 | 0.568125 | 1.5 | Yes |
| Iron | 8/8 | 382 - 1930 | NA | PAI-02-SS-04-01 | 693 | 693.25 | 3920 | No |
| Lead | 5/8 | 1.7 - 5.7 | 2.6 - 5.2 | PAI-02-SS-04-01 | 3.68 | 3.075 | 12 | No |
| Magnesium | 5/8 | 53.1 - 174 | 63.7 - 236 | PAI-02-SS-04-01 | 89 | 82.69375 | 515 | No |
| Manganese | 6/8 | 2.6 - 58.1 | 1.8 - 3.6 | PAI-02-SS-04-01 | 14 | 11.275 | 128 | No |
| Mercury | 5/8 | 0.03 - 0.05 | 0.02 - 0.03 | PAI-02-SS-06-01 | 0.042 | 0.03125 | 0.11 | No |
| Nickel | 1/8 | 1.2 | 0.05 - 0.41 | PAI-02-SS-04-01 | 1.2 | 0.22875 | 1.8 | No |
| Potassium | 2/8 | 87.8 - 102 | 47.8 - 87.5 | PAI-02-SS-05-01 | 94.9 | 46.38125 | 312 | No |
| Selenium | 1/8 | 0.18 | 0.19 - 0.24 | PAI-02-SS-04-01 | 0.18 | 0.11125 | 0.285 | No |
| Sodium | 6/8 | 189 - 2100 | 432 - 606 | PAI-02-SS-07-01 | 957 | 783.125 | 240 | Yes |
| Vanadium | 8/8 | 1.4 - 4.1 | NA | PAI-02-SS-04-01 | 2.08 | 2.0875 | 9.5 | No |
| Zinc | 3/8 | 1.2 - 2.3 | 0.92 - 3.2 | PAI-02-SS-01-01 | 1.6 | 1.15125 | 9.70 | No |
| | | | | **SITE 15(1)** | | | | |
| **Inorganics (mg/kg)** | | | | | | | | |
| Lead | 7/7 | 4 - 18.4 | NA | PAI-15-SS-07-01 | 8.48 | 8.48 | 12.5 | Yes |

NA Not Applicable or Available
ND Not Detected
(1) Aroclor-1254 was conservatively retained as a COPC in the ERA based on a 1996 detection of 0.024J mg/kg that slightly exceeded an ecological screening criterion of 0.020 mg/kg.

**TABLE 2-2**

**SUMMARY STATISTICS - GROUNDWATER**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Parameter | Frequency of Detection | Range of Positive Detects | Range of Nondetects | Location of Maximum Positive Detect | Average of Positive Detects | Average All |
|---|---|---|---|---|---|---|
| **Volatiles (μg/L)** | | | | | | |
| Acetone | 2/3 | 1.8 - 3.3 | 5 | PAI-02-GW-04-01 | 2.55 | 2.52 |
| Carbon Disulfide | 1/5 | 4 | 1 | PAI-02-GW-05-01 | 4 | 1.2 |
| Chloroform | 1/5 | 2.9 | 1 | PAI2-GW2-01 | 2.9 | 0.98 |
| Chloromethane | 1/5 | 0.35 | 1 | PAI2-GW3-01-AVG | 0.35 | 0.47 |
| **Semivolatiles (μg/L)** | | | | | | |
| Bis(2-Ethylhexyl) phthalate | 4/5 | 1 | 5 | PAI2-GW1-01 | 1 | 1.3 |
| Diethyl Phthalate | 1/5 | 1 | 5 | PAI-02-GW-05-01 | 1 | 2.2 |
| **Inorganics - Unfiltered (μg/L)** | | | | | | |
| Aluminum | 3/5 | 189 - 1010 | 22-79.5 | PAI2-GW1-01 | 492 | 305 |
| Arsenic | 4/5 | 1.0 - 1.5 | 0.9 | PAI2-GW1-01 | 1.24 | 1.08 |
| Barium | 5/5 | 33.7 - 148 | NA | PAI2-GW3-01-AVG | 73 | 73 |
| Calcium | 5/5 | 6370 - 281000 | NA | PAI-02-GW-04-01 | 104484 | 104484 |
| Chromium | 1/5 | 5.2 | 6.4-11.9 | PAI2-GW3-01-AVG | 5.2 | 4.4 |
| Copper | 2/5 | 5.2 - 28.8 | 2.6 | PAI2-GW1-01 | 17 | 7.58 |
| Iron | 5/5 | 439 - 8370 | NA | PAI-02-GW-05-01 | 3087 | 3087 |
| Magnesium | 5/5 | 2580 - 778000 | NA | PAI-02-GW-04-01 | 203782 | 203782 |
| Manganese | 5/5 | 37 - 187 | NA | PAI-02-GW-05-01 | 115 | 115 |
| Potassium | 4/5 | 400 - 245000 | 558 | PAI-02-GW-04-01 | 74892 | 59969 |
| Sodium | 5/5 | 18100 - 5990000 | NA | PAI-02-GW-04-01 | 1536120 | 1536120 |
| Zinc | 2/5 | 5.5 - 13.3 | 4.1 - 33.4 | PAI2-GW2-01 | 9.4 | 8.89 |
| **Inorganics - Filtered (μg/L)** | | | | | | |
| Aluminum | 2/5 | 195 - 512 | 22 - 60.4 | PAI2-GW1-01-F | 353 | 151 |
| Arsenic | 2/5 | 1.1-1.2 | 0.9 | PAI2-GW2-01-F | 1.15 | 1.55 |
| Barium | 5/5 | 172-243 | NA | PAI-02-GW-04-01-F | 214 | 241 |
| Calcium | 5/5 | 6670 - 276000 | NA | PAI-02-GW-04-01-F | 101344 | 101344 |
| Chromium | 1/5 | 5 | 6.4-15.2 | PAI2-GW3-01-F-AVG | 5 | 4.71 |
| Copper | 2/5 | 3.9-22.9 | 2.6 | PAI2-GW1-01-F | 13.4 | 6.14 |
| Iron | 5/5 | 405 - 7980 | NA | PAI-02-GW-05-01-F | 2697 | 2697 |
| Magnesium | 5/5 | 2520 - 772000 | NA | PAI-02-GW-04-01-F | 197534 | 197534 |
| Manganese | 5/5 | 35.5 - 181 | NA | PAI-02-GW-05-01-F | 111 | 111 |
| Potassium | 4/5 | 602 - 238000 | 682 | PAI-02-GW-04-01-F | 72108 | 57754 |
| Sodium | 5/5 | 21200 - 5970000 | NA | PAI-02-GW-04-01-F | 1491780 | 1491780 |
| Thallium | 1/5 | 18 | 1.8-18 | PAI-02-GW-04-01-F | 18 | 7.56 |
| Zinc | 4/5 | 13.4 - 113 | 24.75 | PAI2-GW1-01-F | 73.75 | 61.5 |

NA Not Applicable or Available

**TABLE 2-3**

**SUMMARY STATISTICS - SURFACE WATER**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Parameter | Frequency of Detection | Range of Positive Detects | Range of Nondetects | Location of Maximum Positive Detect | Average of Positive Detects | Average All | Background | Maximum Exceed Backgrd. |
|---|---|---|---|---|---|---|---|---|
| **Volatiles (μg/L)** | | | | | | | | |
| Acetone | 2/2 | 0.6 - 0.8 | NA | PAI-02-SW-02-00 | 0.7 | 0.7 | NA | NA |
| Tetrachloroethene (PCE) | 1/4 | 0.3 | 0.5 | PAI-02-SW-02-00 | 0.3 | 0.26 | NA | NA |
| **Semivolatiles (μg/L)** | | | | | | | | |
| Bis(2-Ethylhexyl) phthalate | 2/4 | 14 - 77 | 10 | PAI-02-SW-01-00 | 45.5 | 25 | NA | NA |
| Phenanthrene | 2/4 | 0.074 - 0.16 | 0.097 - 0.098 | PAI-02-SW-04-00 | 0.117 | 0.08 | NA | NA |
| **Pesticides (μg/L)** | | | | | | | | |
| Endosulfan Sulfate | 2/4 | 0.04 - 0.078 | 0.048 - 0.05 | PAI-02-SW-01-00 | 0.059 | 0.04 | NA | NA |
| **Inorganics - Unfiltered (μg/L)** | | | | | | | | |
| Aluminum | 3/4 | 1030 - 1850 | 477 | PAI-02-SW-02-00 | 1376 | 1092 | 3113 | No |
| Antimony | 1/4 | 2.8 | 1.8 - 2.2 | PAI-02-SW-04-00 | 2.8 | 1.4 | ND | Yes |
| Arsenic | 2/4 | 2.9 - 4.4 | 2.1 | PAI-02-SW-01-00 | 3.65 | 2.35 | 5 | No |
| Barium | 4/4 | 19 - 21.4 | NA | PAI-02-SW-04-00 | 20.6 | 20.6 | 38 | No |
| Calcium | 4/4 | 268000 - 303000 | NA | PAI-02-SW-01-00 | 289000 | 289000 | 637000 | No |
| Cobalt | 2/4 | 0.89 - 1.1 | 0.4 | PAI-02-SW-01-00 | 0.995 | 0.59 | ND | Yes |
| Iron | 3/4 | 417 - 1220 | 210 | PAI-02-SW-02-00 | 824 | 644 | 2091 | No |
| Magnesium | 4/4 | 859000 - 950000 | NA | PAI-02-SW-02-00 | 918250 | 918250 | 1918667 | No |
| Manganese | 2/4 | 31.6 - 34.7 | 17.4 - 33.4 | PAI-02-SW-01-00 | 33 | 22 | 53 | No |
| Potassium | 4/4 | 566000 - 642000 | NA | PAI-02-SW-01-00 | 597500 | 597500 | 831333 | No |
| Silver | 1/4 | 0.72 | 0.7 | PAI-02-SW-02-00 | 0.72 | 0.44 | ND | Yes |
| Sodium | 4/4 | 7930000 - 8610000 | NA | PAI-02-SW-01-00 | 8265000 | 8265000 | 16226667 | No |
| Zinc | 4/4 | 4.4 - 10.4 | NA | PAI-02-SW-04-00 | 7.32 | 7.3 | 11 | No |
| **Inorganics - Filtered (μg/L)** | | | | | | | | |
| Arsenic | 2/4 | 3.5 - 5.9 | 2.1 | PAI-02-SW-02-00-F | 4.7 | 2.8 | 4.3 | Yes |
| Barium | 4/4 | 18.1 - 233 | NA | PAI-02-SW-02-00-F | 72 | 72 | 256 | No |
| Calcium | 4/4 | 264000 - 316000 | NA | PAI-02-SW-02-00-F | 293500 | 293500 | 645333 | No |
| Cobalt | 2/4 | 0.67 - 0.77 | 0.4 | PAI-02-SW-01-00-F | 0.72 | 0.46 | ND | Yes |
| Magnesium | 4/4 | 857000 - 998000 | NA | PAI-02-SW-02-00-F | 930250 | 930250 | 1918000 | No |
| Potassium | 4/4 | 581000 - 679000 | NA | PAI-02-SW-02-00-F | 618000 | 618000 | 890667 | No |
| Silver | 2/4 | 0.82 - 0.93 | 0.7 | PAI-02-SW-01-00-F | 0.87 | 0.61 | ND | Yes |
| Sodium | 4/4 | 8120000 - 9200000 | NA | PAI-02-SW-02-00-F | 8545000 | 8545000 | 15986667 | No |
| Zinc | 4/4 | 4.1 - 52.8 | NA | PAI-02-SW-02-00-F | 16.6 | 16.6 | 66 | No |

NA Not Applicable or Available

**TABLE 2-4**

**SUMMARY STATISTICS - SEDIMENT**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Parameter | Frequency of Detection | Range of Positive Detects | Range of Nondetects | Location of Max Positive Detect | Average of Positive Results | Average All | Background | Maximum Exceed Backgrd. |
|---|---|---|---|---|---|---|---|---|
| **Volatiles (mg/kg)** | | | | | | | | |
| Chloroform | 2/5 | 0.004 - 0.005 | 0.006 - 0.008 | PAI-02-SD-04-01 | 0.0045 | 0.0039 | NA | NA |
| **Semivolatiles (mg/kg)** | | | | | | | | |
| Benzo(a)anthracene | 1/4 | 0.0082 | 0.012 - 0.031 | PAI-02-SD-04-01 | 0.0082 | 0.011 | NA | NA |
| Benzo(a)pyrene | 2/4 | 0.0073 - 0.012 | 0.029 - 0.031 | PAI-02-SD-04-01 | 0.00965 | 0.0123 | NA | NA |
| Benzo(b)fluoranthene | 2/4 | 0.0056 - 0.018 | 0.012 | PAI-02-SD-04-01 | 0.0118 | 0.0089 | NA | NA |
| Benzo(k)fluoranthene | 1/4 | 0.008 | 0.0047 - 0.012 | PAI-02-SD-04-01 | 0.008 | 0.0055 | NA | NA |
| Chrysene | 2/4 | 0.011 - 0.021 | 0.029 - 0.031 | PAI-02-SD-04-01 | 0.016 | 0.015 | NA | NA |
| Fluoranthene | 1/4 | 0.038 | 0.012 - 0.031 | PAI-02-SD-04-01 | 0.038 | 0.018 | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2/4 | 0.007 - 0.012 | 0.029 - 0.031 | PAI-02-SD-04-01 | 0.0095 | 0.012 | NA | NA |
| Phenanthrene | 2/4 | 0.008 - 0.011 | 0.023 - 0.025 | PAI-02-SD-04-01 | 0.0095 | 0.01 | NA | NA |
| Pyrene | 1/4 | 0.03 | 0.023 - 0.062 | PAI-02-SD-04-01 | 0.03 | 0.025 | NA | NA |
| **Inorganics (mg/kg)** | | | | | | | | |
| Aluminum | 5/5 | 3140 - 5560 | NA | PAI-02-SD-02-02 | 4498 | 4498 | 24,200 | No |
| Arsenic | 5/5 | 0.79 - 2.1 | NA | PAI-02-SD-01-01 | 1.51 | 1.518 | 12 | No |
| Barium | 5/5 | 4.9 - 7.9 | NA | PAI-02-SD-02-02 | 6.92 | 6.92 | 28 | No |
| Calcium | 5/5 | 362 - 32800 | NA | PAI-02-SD-03-01 | 7411 | 7411.4 | 4000 | Yes |
| Chromium | 5/5 | 5.9 - 10.1 | NA | PAI-02-SD-01-01 | 8.22 | 8.22 | 35.2 | No |
| Cobalt | 2/5 | 0.35 - 0.52 | 0.74 - 0.88 | PAI-02-SD-03-01 | 0.43 | 0.413 | 2.6 | No |
| Copper | 5/5 | 1.2 - 3.2 | NA | PAI-02-SD-01-01 | 2.4 | 2.4 | 10 | No |
| Iron | 5/5 | 2650 - 5390 | NA | PAI-02-SD-01-01 | 3824 | 3824 | 21,500 | No |
| Lead | 5/5 | 3.2 - 7.1 | NA | PAI-02-SD-02-02 | 5.72 | 5.72 | 21 | No |
| Magnesium | 5/5 | 777 - 2380 | NA | PAI-02-SD-02-01 | 1473 | 1473.4 | 6400 | No |
| Manganese | 5/5 | 22.7 - 52.4 | NA | PAI-02-SD-04-01 | 35 | 35.28 | 186 | No |
| Mercury | 1/5 | 0.04 | 0.02 - 0.04 | PAI-02-SD-02-02 | 0.04 | 0.02 | 0.09 | No |
| Nickel | 5/5 | 0.82 - 2.1 | NA | PAI-02-SD-01-01 | 1.6 | 1.604 | 6 | No |
| Potassium | 5/5 | 426 - 1010 | NA | PAI-02-SD-02-01 | 792 | 792.4 | 3200 | No |
| Selenium | 5/5 | 0.23 - 0.42 | NA | PAI-02-SD-01-01 | 0.336 | 0.336 | ND | Yes |
| Sodium | 5/5 | 2770 - 6650 | NA | PAI-02-SD-02-01 | 4598 | 4598 | 19,000 | No |
| Vanadium | 5/5 | 6.1 - 12.8 | NA | PAI-02-SD-01-01 | 9.98 | 9.98 | 50 | No |
| Zinc | 3/5 | 10.9 - 12.6 | 4.4 - 6.7 | PAI-02-SD-01-01 | 11 | 8.05 | 45 | No |

NA = Not Applicable or Available
ND = Not Detected

**TABLE 2-5**

**SUMMARY STATISTICS - SEDIMENT**
**SITE 15 - DIRT ROADS**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Parameter | Frequency of Detection | Range of Positive Detects | Range of Nondetects | Location of Max Positive Detect | Average of Positive Results | Average All | Background | Maximum Exceed Backgrd. |
|---|---|---|---|---|---|---|---|---|
| **Semivolatiles (mg/kg)** | | | | | | | | |
| Benzo(a)anthracene | 1/3 | 0.015 | 0.006 - 0.011 | PAI-15-SD-03-01 | 0.015 | 0.0078 | NA | NA |
| Benzo(a)pyrene | 1/3 | 0.012 | 0.006 - 0.011 | PAI-15-SD-03-01 | 0.012 | 0.0068 | NA | NA |
| Benzo(b)fluoranthene | 2/3 | 0.0038 - 0.033 | 0.0044 | PAI-15-SD-03-01 | 0.0184 | 0.013 | NA | NA |
| Benzo(g,h,i)perylene | 1/3 | 0.013 | 0.0095 - 0.018 | PAI-15-SD-03-01 | 0.013 | 0.0089 | NA | NA |
| Benzo(k)fluoranthene | 1/3 | 0.012 | 0.0024 - 0.0044 | PAI-15-SD-03-01 | 0.012 | 0.0051 | NA | NA |
| Bis(2-Ethylhexyl)phthalate | 1/3 | 0.28 | 0.44 - 0.66 | PAI-15-SD-02-01 | 0.28 | 0.27 | NA | NA |
| Chrysene | 3/3 | 0.011 - 0.028 | NA | PAI-15-SD-03-01 | 0.018 | 0.018 | NA | NA |
| Fluoranthene | 2/3 | 0.0093 - 0.034 | 0.011 | PAI-15-SD-03-01 | 0.021 | 0.016 | NA | NA |
| Fluorene | 1/3 | 0.013 | 0.017 - 0.022 | PAI-15-SD-02-01 | 0.013 | 0.01 | NA | NA |
| Indeno(1,2,3-cd)pyrene | 2/3 | 0.013 - 0.046 | 0.011 | PAI-15-SD-02-01 | 0.029 | 0.021 | NA | NA |
| Phenanthrene | 2/3 | 0.0081 - 0.014 | 0.0088 | PAI-15-SD-02-01 | 0.011 | 0.0088 | NA | NA |
| Pyrene | 1/3 | 0.028 | 0.012 - 0.022 | PAI-15-SD-03-01 | 0.028 | 0.015 | NA | NA |
| **Inorganics (mg/kg)** | | | | | | | | |
| Aluminum | 3/3 | 648 - 15500 | NA | PAI-15-SD-03-01 | 6952 | 6952 | 24,200 | No |
| Antimony | 1/3 | 0.2 | 0.18 - 0.29 | PAI-15-SD-02-01 | 0.2 | 0.145 | ND | Yes |
| Arsenic | 3/3 | 0.3 - 6.5 | NA | PAI-15-SD-03-01 | 3.8 | 3.8 | 12 | No |
| Barium | 3/3 | 1.9 - 19.4 | NA | PAI-15-SD-03-01 | 9.3 | 9.3 | 28 | No |
| Beryllium | 1/3 | 0.71 | 0.06 - 0.21 | PAI-15-SD-03-01 | 0.71 | 0.28 | 0.98 | No |
| Cadmium | 1/3 | 0.16 | 0.03 | PAI-15-SD-03-01 | 0.16 | 0.06 | 0.28 | No |
| Calcium | 3/3 | 346 - 5550 | NA | PAI-15-SD-03-01 | 2218 | 2218 | 4000 | Yes |
| Chromium | 3/3 | 2 - 27.8 | NA | PAI-15-SD-03-01 | 12.6 | 12 | 35.2 | No |
| Cobalt | 2/3 | 0.69 - 3.1 | 0.06 | PAI-15-SD-03-01 | 1.8 | 1.27 | 2.6 | Yes |
| Copper | 2/3 | 4 - 8.7 | 0.58 | PAI-15-SD-03-01 | 6.3 | 4 | 10 | No |
| Iron | 3/3 | 604 - 14700 | NA | PAI-15-SD-03-01 | 6388 | 6388 | 21,500 | No |
| Lead | 3/3 | 2.7 - 11.3 | NA | PAI-15-SD-03-01 | 7.6 | 7.6 | 21 | No |
| Magnesium | 3/3 | 370 - 4220 | NA | PAI-15-SD-03-01 | 1960 | 1960 | 6400 | No |
| Manganese | 3/3 | 5.3 - 113 | NA | PAI-15-SD-03-01 | 50 | 50 | 186 | No |
| Nickel | 2/3 | 1.5 - 6.5 | 0.11 | PAI-15-SD-03-01 | 4 | 2.68 | 6 | Yes |
| Potassium | 3/3 | 205 - 2560 | NA | PAI-15-SD-03-01 | 1154 | 1154 | 3200 | No |
| Sodium | 3/3 | 2040 - 10200 | NA | PAI-15-SD-03-01 | 5333 | 5333 | 19000 | No |
| Vanadium | 3/3 | 2.3 - 37.4 | NA | PAI-15-SD-03-01 | 17 | 17 | 50 | No |
| Zinc | 2/3 | 12.9 - 32.3 | 1.9 | PAI-02-SD-01-01 | 22.6 | 15 | 45 | No |

NA = Not Applicable or Available
ND = Not Detected

**TABLE 2-6**

**CHEMICALS RETAINED AS HUMAN HEALTH COPCs**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Chemical | Surface Soil | Subsurface Soil | Soil to Air | Soil to Groundwater | Groundwater | Sediment | Surface Water | Fish Tissue |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| Chloroform | | | | | X | | | |
| **Semivolatile Organic Compounds** | | | | | | | | |
| Bis(2-Ethylhexyl) phthalate | | | | | | | X | |
| Benzo(a)pyrene | | | | | | | | X |
| **Inorganics** | | | | | | | | |
| Arsenic | | | | | X | | | |
| Iron | | | | | X | | | |
| Manganese | | | | | X | | | |

**Notes**
X - Indicates chemical was retained as a COPC.

**TABLE 2-7**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks >$10^{-4}$ | Chemicals with Cancer Risks >$10^{-5}$ | Chemicals with Cancer Risks >$10^{-6}$ | Hazard Index | Chemicals with HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Worker | Groundwater | Dermal Contact | 1.7E-08 | -- | -- | -- | 0.09 | -- |
| | Surface Water | Ingestion | 1.2E-08 | -- | -- | -- | 0.003 | -- |
| | | Dermal Contact | 1.8E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.45 | -- |
| | | Total | 1.8E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.45 | -- |
| | | Total All Media | 1.8E-06 | | | | 0.54 | |
| Adolescent Recreational User | Surface Water | Ingestion | 1.1E-08 | -- | -- | -- | 0.0002 | -- |
| | | Dermal Contact | 4.4E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.11 | -- |
| | | Total | 4.6E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.11 | -- |
| Adult Recreational User | Surface Water | Ingestion | 4.2E-09 | -- | -- | -- | 0.0002 | -- |
| | | Dermal Contact | 2.6E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.11 | -- |
| | | Total | 2.6E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.11 | -- |
| | Shellfish | Ingestion | 1.4E-06 | -- | -- | cPAHs | 0.07 | -- |
| | | Total All Media | 4.0E-06 | | | | 0.18 | |
| Child Resident | Surface Water | Ingestion | 9.9E-08 | -- | -- | -- | 0.004 | -- |
| | | Dermal Contact | 4.3E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.17 | -- |
| | | Total | 4.3E-06 | -- | -- | Bis(2-Ethylhexyl)phthalate | 0.18 | -- |
| | Groundwater | Ingestion | 1.2E-05 | -- | Arsenic | -- | 2.7 | Iron |
| | | Dermal Contact | 5.0E-08 | -- | -- | -- | 0.05 | |
| | | Inhalation | 9.7E-08 | -- | -- | | 0.02 | -- |
| | | Total | 1.3E-05 | -- | Arsenic | | 2.8 | Iron |
| | | Total All Media | 1.7E-05 | | | | 3.0 | |
| Adult Resident | Surface Water | Ingestion | 1.7E-08 | -- | | -- | 0.0002 | -- |
| | | Dermal Contact | 1.0E-05 | -- | Bis(2-Ethylhexyl)phthalate | | 0.11 | -- |
| | | Total | 1.0E-05 | -- | Bis(2-Ethylhexyl)phthalate | | 0.11 | -- |
| | Groundwater | Ingestion | 2.1E-05 | -- | Arsenic | -- | 1.2 | -- |
| | | Dermal Contact | 1.2E-07 | -- | -- | -- | 0.03 | -- |
| | | Inhalation | 1.7E-07 | -- | -- | -- | 0.01 | -- |
| | | Total | 2.2E-05 | -- | Arsenic | -- | 1.2 | -- |
| | | Total All Media | 3.2E-05 | | | | 1.3 | |
| Lifelong Resident | Surface Water | Ingestion | 1.2E-07 | -- | | -- | NA | -- |
| | | Dermal Contact | 1.4E-05 | -- | Bis(2-Ethylhexyl)phthalate | | NA | -- |
| | | Total | 1.4E-05 | -- | Bis(2-Ethylhexyl)phthalate | | NA | -- |
| | Groundwater | Ingestion | 3.4E-05 | -- | Arsenic | -- | NA | -- |
| | | Dermal Contact | 1.7E-07 | -- | -- | -- | NA | |
| | | Inhalation | 2.6E-07 | -- | -- | -- | NA | -- |
| | | Total | 3.4E-05 | -- | Arsenic | -- | NA | -- |
| | | Total All Media | 4.9E-05 | | | | NA | |

**TABLE 2-8**

**CHEMICALS RETAINED AS ERA STEP 2 ECOLOGICAL COPCs**
**SITE 2 - BORROW PIT LANDFILL**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Chemical | Surface Soil | Groundwater | Surface Water | Sediment |
|---|---|---|---|---|
| **VOCs** | | | | |
| Acetone | X | X | X | |
| Carbon disulfide | | X | | |
| Chloroform | X | | | X |
| Tetrachloroethene | | | X | |
| **SVOCs** | | | | |
| Bis(2-ethylhexyl) phthalate | | X | X | |
| **Inorganics** | | | | |
| Aluminum | X | X | X | X |
| Antimony | | | X | |
| Barium | | X | X | X |
| Chromium (hexavalent) | | | | X |
| Cobalt | | | X | X |
| Copper | | X | | |
| Iron | X | X | X | X |
| Manganese | | X | X | X |
| Selenium | | | | X |
| Silver | | | X | |
| Vanadium | X | | | X |
| Zinc | | X | | |

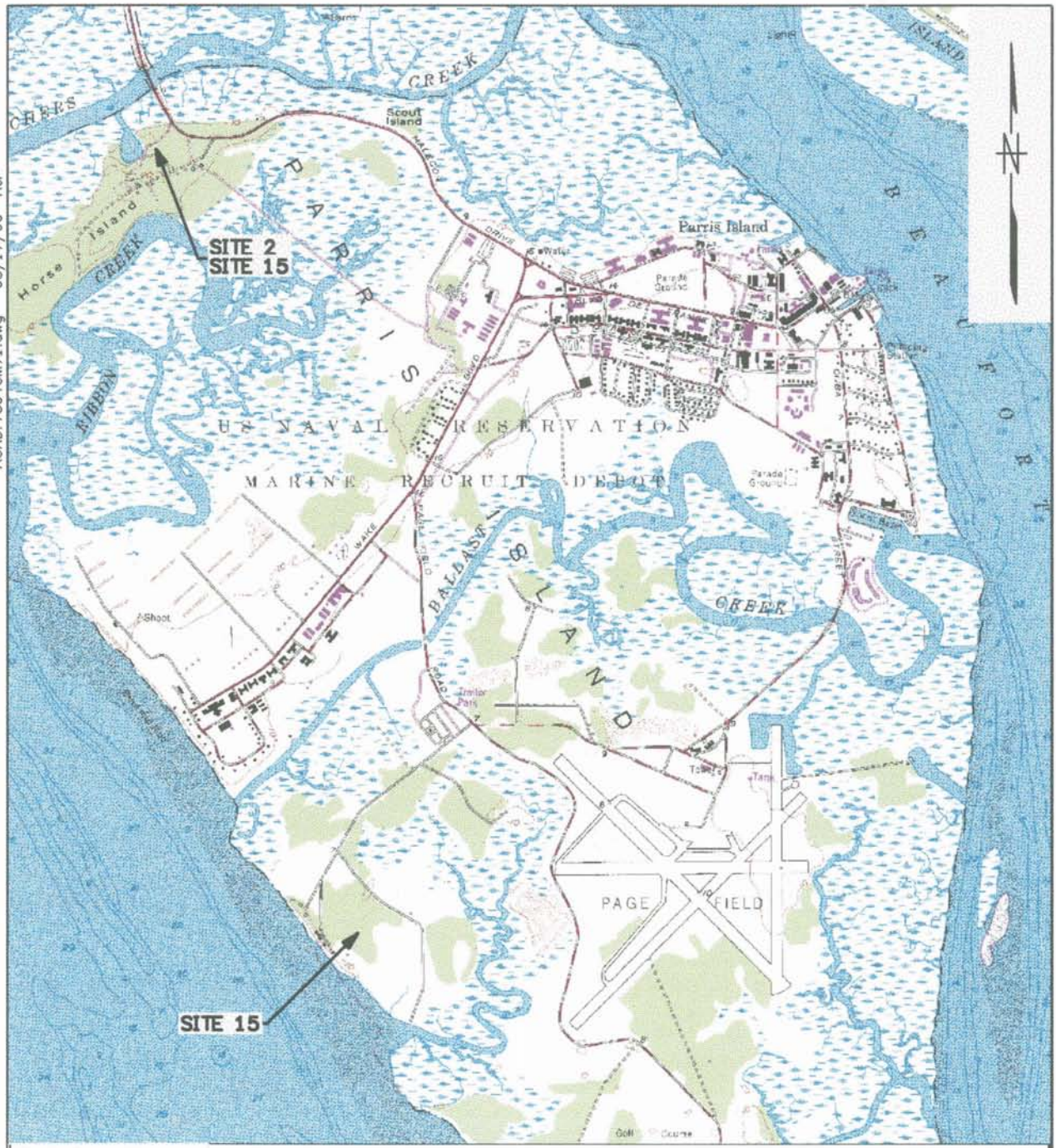
**TABLE 2-9**

**CHEMICALS RETAINED AS ERA STEP 2 ECOLOGICAL COPCs**
**SITE 15 - DIRT ROADS**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

| Chemical | Surface Soil | Groundwater | Surface Water | Sediment |
|---|---|---|---|---|
| **SVOCs** | | | | |
| Bis(2-ethylhexyl) phthalate | | | | X |
| **Pesticides/PCBs** | | | | |
| Aroclor-1254 | X(1) | | | |
| **Inorganics** | | | | |
| Barium | | | | X |
| Beryllium | | | | X |
| Cobalt | | | | X |
| Iron | | | | X |
| Manganese | | | | X |
| Vanadium | | | | X |

(1) Aroclor-1254 was conservatively retained as as COPC based on a 1996 detection of 0.024 J mg/kg that slightly exceeds an ecological screening value of 0.020 mg/kg.

ACAD: 7394CM71.dwg 08/17/00 HJP



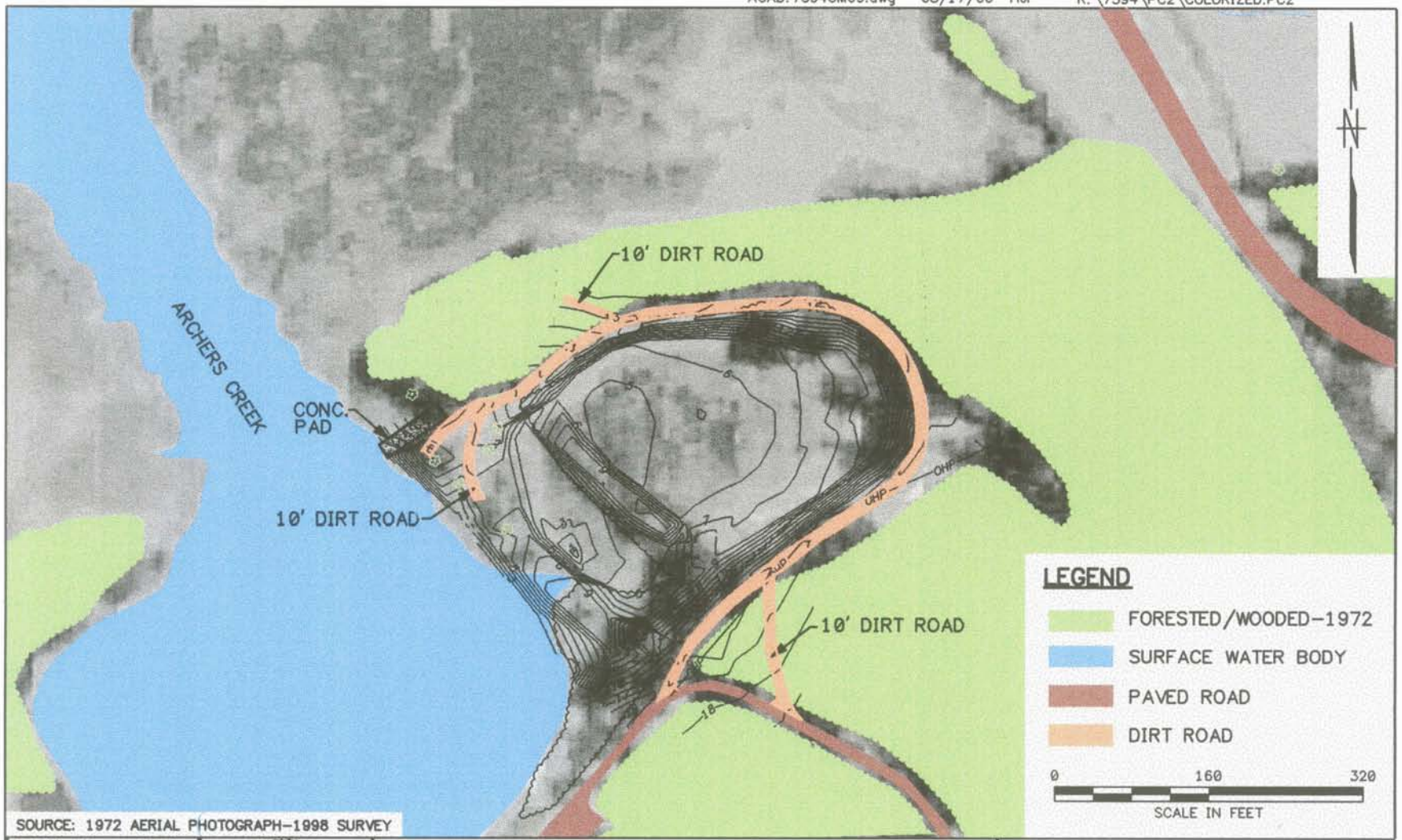
SOURCE: USGS 7.5 MINUTE PARRIS ISLAND QUADRANGLE, 1956. PHOTOREVISED 1979.

0 3000 6000
SCALE IN FEET

| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 8/17/00 | DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD | DEPOT LOCATION MAP<br>MCRD PARRIS ISLAND, SOUTH CAROLINA | CONTRACT NO. 7394 |
| CHECKED BY DATE | | | APPROVED BY DATE |
| COST/SCHED-AREA | | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 2-1 / REV. 0 |

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

ACAD: 7394CM69.dwg 08/17/00 HJP R:\7394\PC2\COLORIZED.PC2

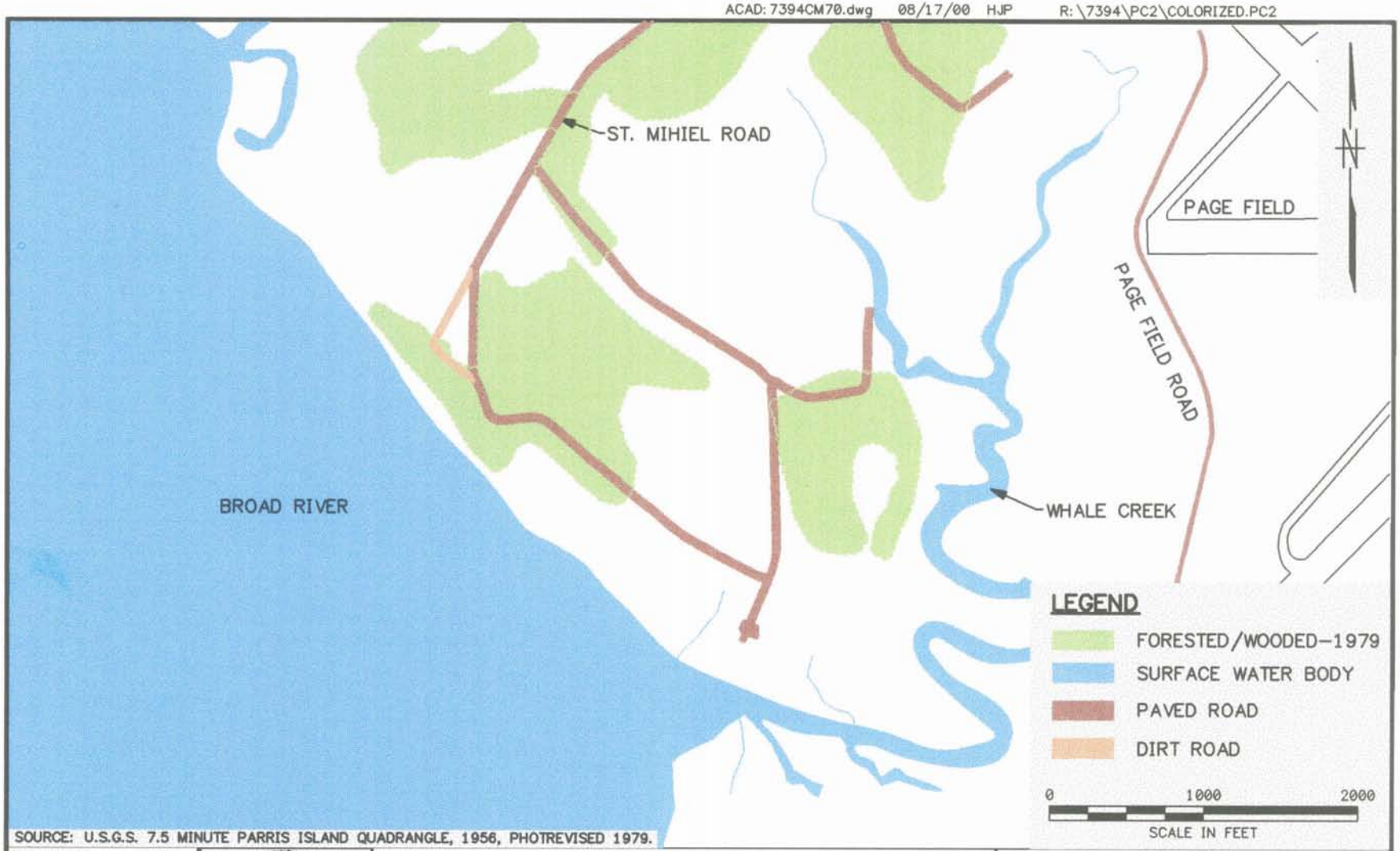



SOURCE: 1972 AERIAL PHOTOGRAPH-1998 SURVEY

| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 8/17/00 | DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD | SITE LAYOUT<br>SITE 2 – BORROW PIT LANDFILL<br>AND SITE 15 – DIRT ROADS<br>MCRD PARRIS ISLAND, SOUTH CAROLINA | CONTRACT NO. 7394 |
| CHECKED BY DATE | | | APPROVED BY DATE |
| COST/SCHED-AREA | | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 2-2 REV. 0 |

FORM CADD NO. SDIV_AH.DWG - REV 0 - 1/20/98

ACAD: 7394CM70.dwg 08/17/00 HJP R:\7394\PC2\COLORIZED.PC2




SOURCE: U.S.G.S. 7.5 MINUTE PARRIS ISLAND QUADRANGLE, 1956, PHOTREVISED 1979.

| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 8/17/00 | | | CONTRACT NO. 7394 |
| CHECKED BY DATE | | | APPROVED BY DATE |
| COST/SCHED-AREA | | | APPROVED BY DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 2-3 REV. 0 |

DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMD

**SITE LAYOUT**
**SITE 15 – DIRT ROADS AT ELLIOT'S BEACH**
**MCRD PARRIS ISLAND, SOUTH CAROLINA**

FORM CADD NO. SDIV_AH.DWG - REV 0 - 1/20/98

# 3.0 RESPONSIVENESS SUMMARY

## 3.1 STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES

No comments were made during the public information session for the Proposed Plan for No Action/No Further Action at Sites 2 and 15. No written comments were received during the public comment period for the Proposed Plan. A description of the public review and comment period activities is included in Appendix A.

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# APPENDIX A

# RESPONSIVENESS SUMMARY

# RESPONSIVENESS SUMMARY

A public comment period was held from August 10, 2000 to September 25, 2000 for the Proposed Plan for No Action/No Further Action at Sites 2 and 15. On August 10, 2000, the Proposed Plan was made available to the public in the Information Repository at the Beaufort County Public Library's Headquarters Location at 311 Scott Street, Beaufort, South Carolina 29902. Public notice of the Proposed Plan was also published in the *Beaufort Gazette* on August 11, 17, and 24, 2000. This local newspaper targets the communities closest to MCRD Parris Island. Furthermore, a public information session was held on August 24, 2000, to present the results of the RI, explain the preferred remedy, and solicit comments from the community. At this information session, representatives from Southern Division Naval Facilities Engineering Command, MCRD Parris Island, U.S. EPA Region 4, and SCDHEC were available to discuss aspects of Sites 2 and 15.

No comments were made during the public information session and none were received during the public comment period.

D H E C
PROMOTE PROTECT PROSPER
C. Earl Hunter, Commissioner
*Promoting and protecting the health of the public and the environment.*

August 17, 2006

Commanding Officer
Department of the Navy
SOUTHNAVFACENGCOM
ATTN: Mr. Art Sanford
2155 Eagle Drive
North Charleston, South Carolina 29406

RE: Concurrence
Record of Decision, Site / SWMU 2 – Borrow Pit Landfill and Site / SWMU 15 – Dirt Roads
Marine Corp Recruit Depot, Parris Island
SC6 170 022 762

Dear Mr. Sanford:

The Corrective Action Engineering Section and Division of Hydrogeology of the South Carolina Department of Health and Environmental Control (Department) have completed the review of the above referenced document, which was received by the Department on June 9, 2006. The purpose of this Record of Decision (ROD) is to formalize the remedy for SWMUs 2 and 15.

The investigation for SWMUs 2 and 15 included test pitting operations as well as the collection of surface soil, subsurface soil, and groundwater samples. The result of the baseline human health risk assessment concluded that the human health exposure is within the U.S EPA's acceptable risk range. Furthermore, the ecological risk assessment concluded that there is no significant potential risk to terrestrial and aquatic receptors.

The Proposed Plan for SWMUs 2 and 15 was public noticed on August 11, 2000. A public information session was held on August 24, 2000 to explain the proposed remedy and solicit comments. No comments were received regarding to the proposed remedy.

The Department has deemed that the No Further Action (NFA) determination is appropriate, is protective of human health and the environment, and satisfies the RCRA corrective action requirements of Section VI of the Federal Facilities Agreement (FFA) effective March 31, 2006. Consequently, the Department concurs with this ROD. Please be advised that this determination is based upon currently available data. Additional investigation may be necessary in the future should information become available warranting such action.

If you have any questions or concerns, please feel free to contact me at (803) 896-4070.

Sincerely,

Richard Haynes, P.E., Director
Division of Waste Management
Bureau of Land and Waste Management

cc:
Tim Harrington, MCRD Parris Island
Don Hargrove, Hydrogeology
Priscilla Wendt, SCDNR
Russell Berry, EQC Region 8, Beaufort
Lila Koroma-Llamas, EPA Region 4
Tom Dillon, NOAA
Mark Sladic, TtNUS