INITIAL ASSESSMENT STUDY OF NSB KINGS BAY GA

9/1/1985

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

0015

31547.000
01.02.00.0001

SEPTEMBER 1985

INITIAL ASSESSMENT STUDY OF NAVAL SUBMARINE BASE KINGS BAY, GEORGIA

NEESA 13-086

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY
Port Hueneme, California 93043

Distribution:
CNO (OP-45)
COMNAVFACENGCOM (FAC-112)
CO SUBASE KINGS BAY (N5211)
CO SOUTHNAVFACENGCOM (Code 114)
OICC TRIDENT (09XE) (09XE2)
DIR SSPO (SP2016)
DIR ONAS(ONAS-04H2)

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE, KINGS BAY, GEORGIA

UIC: N42237

Prepared By:

C. C. Johnson & Associates, Inc.
11510 Georgia Avenue
Silver Spring, Maryland 20902

Contract No. N62474-84-C-3384

Initial Assessment Study Team Members

Ulric P. Gibson, Project Manager, Hydrogeologist
Robert M. Gruninger, Environmental Engineer
James A. Susan, Environmental Engineer
Steven D. Stinger, Chemist
Lawren J. Phillips, Biologist

Naval Energy and Environmental Support Activity

Engineer in Charge

William D. Venable

Prepared For:

NAVY ASSESSMENT AND CONTROL
OF INSTALLATION POLLUTANTS PROGRAM
Naval Energy and Environmental Support Activity
Port Hueneme, California 93043

September, 1985

EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Naval Submarine Base (SUBASE) Kings Bay, Georgia. The purpose of the IAS is to identify and assess sites posing a potential threat to human health or to the environment due to contamination from past hazardous materials operations.

SUBASE Kings Bay is located on an arm of Cumberland Sound called Kings Bay. It is between the St. Marys River and Crooked River and connected to the sea by a 12-mile access channel which passes through the St. Marys Inlet. Potential migration pathways of pollutants from past waste disposal and spill sites are through surface water runoff to intermittent streams, the St. Marys River, the Satilla River, and the Crooked River or by infiltration from the surface into ground water. Surface runoff at SUBASE Kings Bay is slow because of the flat slopes and the amount and intensity of the rainfall. The mean annual precipitation at SUBASE Kings Bay is approximately 54 inches. The presence of permeable sands in the area is conducive to rainfall percolation directly into the water table aquifer forming a potential migration pathway. The water eventually migrates eastward through the water table aquifer (which ranges in thickness from 40 to 90 feet) and discharges into streams and springs including the North River, Crooked River and Marianna Creek. These rivers eventually flow to Kings Bay and Cumberland Sound. Two additional aquifers, the secondary artesian aquifer and the primary artesian aquifer exist at SUBASE Kings Bay.

The primary artesian aquifer is approximately 470 to 570 feet below the ground surface. There are 22 known water table aquifer wells and five production wells which tap the primary artesian aquifer at the activity. The water table aquifer wells have been unused since the Navy occupied the activity in 1978. The five wells in the primary artesian aquifer are used by SUBASE for drinking water supply. Only the water table aquifer would pose a potential migration pathway as both the artesian aquifers are under pressure and not recharged from areas within SUBASE Kings Bay.

Potential contaminant receptors include humans, and endangered, threated and rare plants and animals. Since the water table aquifer is hydraulically isolated from any domestic supply aquifers, direct exposure (consumption or contact) to humans would only be through surface water which is not likely as most of the surface waters are used only for recreational boating and navigation. Indirect exposure through the food chain is more likely since Cumberland Sound is a recreational as well as commercial fishery. Contaminants may migrate to Cumberland Sound by way of surface runoff or through sub-surface flow in the water table aquifer and subsequently enter the food chain. Humans consuming fish taken from the Sound could then be exposed to levels of contaminants actually higher

than those found in the water due to food-chain amplification. The Sound also provides a habitat for two endangered fish species, the Atlantic and Short-nose Sturgeous. These species are not consumed by humans, but should be considered potential receptors because of their endangered status.

Based on information from historical records, aerial photographs, field inspections and personnel interviews, a total of sixteen potentially contaminated sites were identified at SUBASE Kings Bay. Each of the sites was evaluated with regard to contamination characteristics, migration pathways and pollutant receptors.

The study concludes that none of the sixteen sites pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for any of the sixteen sites.

Naval
Environmental
Protection
Support
Service

FOREWORD

The Department of the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps Installations. The NACIP program is part of the Department of Defense Installation Restoration Program, and is similar to the Environmental Protection Agency's "Superfund" program authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

In the first phase of the NACIP program, a team of engineers and scientists conducts an Initial Assesment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or to the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and an on-site survey of the activity. This report documents the findings of an IAS at the Naval Submarine Base (SUBASE), Kings Bay, Georgia.

A total of sixteen sites were identified at SUBASE Kings Bay. None of the sites at the SUBASE Kings Bay require Confirmation Studies or Remedial Measures under the NACIP program.

Questions regarding this report should be referred to the Naval Energy and Environmental Support Activity, 112N, at AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351. Questions regarding confirmation work or other follow-on efforts should be referred to SOUTHNAVFACENGCOM, 11421, at AUTOVON 794-5510, FTS 679-5510, or commercial (803) 743-5510.

R. S. MOREAU, LCDR, CEC, USN
Environmental officer
Naval Energy and Environmental Support Activity

ACKNOWLEDGEMENT

The Initial Assessment Study team commends the support, assistance, and cooperation provided by personnel at Naval Submarine Base (SUBASE), Kings Bay, Georgia; Naval Energy and Environmental Support Activity (NEESA); and Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). In particular the team gratefully acknowledges the outstanding effort provided by the following people, who participated in the successful completion of the study.

Michael A. Anderson:

Environmental Engineer, SUBASE Kings Bay, Georgia

William D. Venable:

Environmental Engineer, Engineer in Charge, NEESA

Sonny Chestnut:

Environmental Engineer, SOUTHNAVFACENGCOM

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to increasing national concern regarding these problems, Congress directed the Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 1980.

1.1.1 DOD Program. Department of Defense (DOD) efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. DOD defined the program as the Installation Restoration Program in 1980, and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP), in three phases. Phase one, the Initial Assessment Study (IAS), identifies disposal sites and contaminated areas caused by past hazardous substance storage, handling, or disposal practiced at naval activities. These sites are then individually evaluated with respect to their potential threat to human health or to the environment. Phase two, the Confirmation Study, verifies or characterizes the extent of contamination present and provides additional information regarding migration pathways. Phase three, Remedial Measures, provides the required corrective measures to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations (CNO) initiated the NACIP program in OPNAVNOTE 6240 of 11 September 1980, superseded by OPNAVINST 5090.1 of 26 May 1983. Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM), manages the program within the existing structure of the Naval Environmental Protection Support Services (NEPSS) which is administered by the Naval Energy and Environmental Support Activity (NEESA). NEESA conducts the program's first phase, the IAS, in coordination with COMNAVFACENGCOM Engineering Field Divisions (EFDs). Activities are selected for an IAS by CNO, based on recommendations by COMNAVFACENGCOM, the EFDs, and NEESA. Approval of the Naval Submarine Base (NSB) Kings Bay, Georgia for an IAS is contained in CNO letter ser. 451/4U383534 of 26 March 1984.

1.3 SCOPE

1.3.1 Past Operations. The NACIP program focuses attention on past hazardous substance storage, use, and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and federal regulations and, therefore, are not included in the scope of the NACIP program. The IAS report addresses operational

nonhazardous disposal and storage areas only if they were hazardous waste disposal or storage areas in the past. Current operations are investigated solely to determine what types and quantities of chemicals or other materials were used and what disposal methods were practiced in the past.

1.3.2 Results. If necessary, an IAS recommends mitigating actions to be performed by the activity or EFD, or recommends Confirmation Studies to be administered by the EFD under the NACIP Program. Based on these recommendations, COMNAVFACENGCOM schedules Confirmation Studies for those sites which have been determined by scientific and engineering judgement to be potential hazards to human health or to the environment.

1.4 INITIAL ASSESSMENT STUDY

1.4.1 Records Search. The IAS begins with an investigation of activity records followed by a records search at various government agencies including EFDs, national and regional archieves and records centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's past mission, industrial processes, waste disposal records, and known environmental contamination. Examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists the agencies contacted during this study.

1.4.2 On-Site Survey. After the records searches, the study team conducts an on-site survey to complete documentation of past operations and disposal practices and to identify potentially-contaminated areas. With the assistance of an activity point-of-contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The on-site survey for NSB Kings Bay was conducted from 11-14 March 1985. Information in this report is current as of those dates.

Information obtained from interviews is verified by data from other sources or from corroborating interviews before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification. No samples were collected at the Naval Submarine Base during the IAS.

1.4.3 Confirmation Study Ranking System. With information collected during the study, team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS), developed at NEESA is used to systematically evaluate the relative severity of potential problems. The two steps of the CSRS are a flowchart and numerical ranking model. The first step is a flow chart based on type of waste, type of containment, and hydrogeology. This step eliminates innocuous sites from further consideration. If the flow chart indicates a site poses a potential threat to human health or to the environment, the second step, the model,

is applied. This model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the wastes, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 Site Scoring. After scoring a site, engineering judgment is applied to determine the need for a Confirmation Study or for immediate mitigating measures. At sites recommended for further work, CSRS scores are used to rank the sites in a prioritized list for scheduling project. For a more detailed description, refer to NEESA 20.2-042, Confirmation Study Ranking System.

1.4.5 Confirmation Study Criteria. A Confirmation Study is recommended for sites at which (1) sufficient evidence exists to indicate the presence of contamination, and (2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. Generally, the EFD conducts the Confirmation Study in two phases—verification and characterization. In the verification step, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. Normally, the IAS recommends verification phase sampling and monitoring. The design of the characterization phase usually depends on results from the verification phase. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the confirmation study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings and conclusions from the IAS are presented in Chapter 2. Recommendations are presented in Chapter 3. Chapter 4 describes general activity information, history, biology, and physical features. Chapters 5 through 8 trace the use of chemicals and hazardous materials from storage and transfer, through manufacturing and operations, to waste processing and disposal. The latter chapters provide detailed documentation to support the findings and conclusions in Chapter 2. Figure 1-1 shows the location of the Naval Submarine Base, Kings Bay, Georgia.

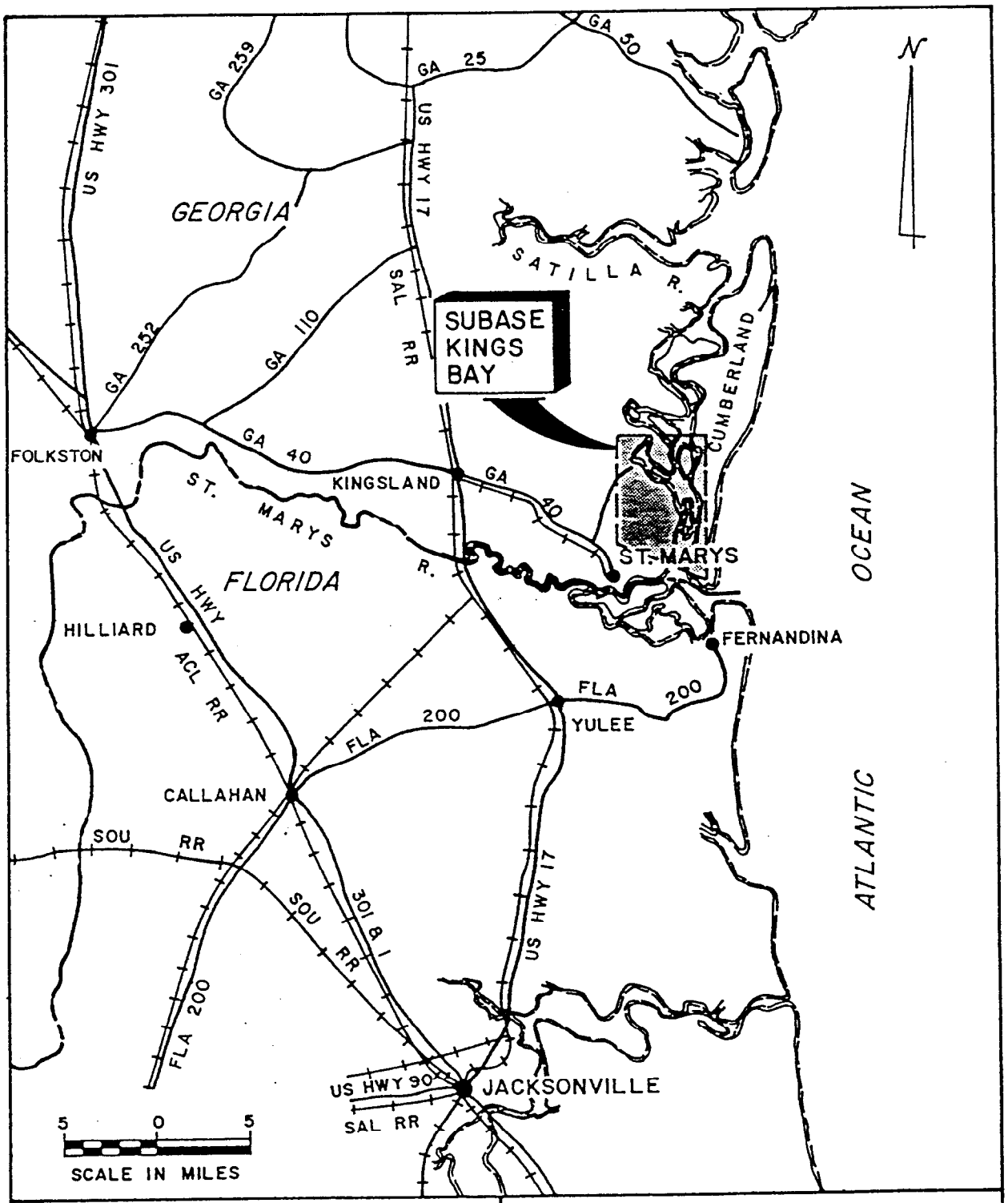


FIGURE 1-1.
VICINITY MAP
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. This chapter summarizes the significant findings and conclusions of the Initial Assessment Study (IAS) team regarding the potential contamination migration pathways, the potential contaminant receptors, and other characteristics of the waste disposal and spill sites identified at SUBASE Kings Bay. Sixteen waste disposal and spill sites at SUBASE Kings Bay were identified during the IAS. None of the sixteen sites require further action under the NACIP program. Figure 2-1 identifies the locations of the sixteen sites at SUBASE Kings Bay.

2.1.1 Hydrogeology and Migration Potential. SUBASE Kings Bay is located on an arm of Cumberland Sound called Kings Bay. It is between the St. Marys River and Crooked River and connected to the sea by a 12-mile access channel which passes through the St. Marys Inlet. Potential migration pathways for pollutants from past waste disposal and spill sites are through surface runoff to unnamed streams or ditches which drain to Kings Bay and its tributaries. An additional potential migration migration is through infiltration from surface water into ground water. Surface runoff at SUBASE Kings Bay is slow because of the highly permeable soils, flat slopes, and the amount and intensity of rainfall. The average elevation is 30 feet above mean sea level (MSL). About one-half of SUBASE Kings Bay, the eastern and south eastern portions, would be inundated by a 100-year flood. The mean annual precipitation at SUBASE Kings Bay is approximately 54 inches. The presence of permeable sands in the area is conducive to rainfall percolation directly into the water table aquifer, which is generally found within ten feet of the ground surface. The depth of the water table aquifer ranges from 40 to 90 feet below the ground surface and is isolated from the underlying artesian aquifers by confining layers of relatively impermeable clays and limestones. Water in the water table aquifer generally migrates along the confining layer and discharges into streams and springs including North River, Crooked River, and Marianna Creek. These streams eventually flow east or southeast to Kings Bay and Cumberland Sound. There are 22 known wells which tap the water table aquifer located on the activity. All of these wells were abandoned in 1978 when the Navy took over the base.

Fresh water at SUBASE occurs in two additional aquifers: the secondary artesian and the primary artesian. Water in the secondary artesian aquifer is generally isolated from the other aquifers by clay and limestone layers within which it occupies only isolated pockets. The secondary artesian aquifer is generally composed of isolated water containing lenses within the randomly layered clay, silt and limestones located between the water table aquifer and the principal artesian aquifer. It is believed that the water of the secondary artesin aquifer can be found at depths anywhere from 40 to 570 feet below the ground surface.

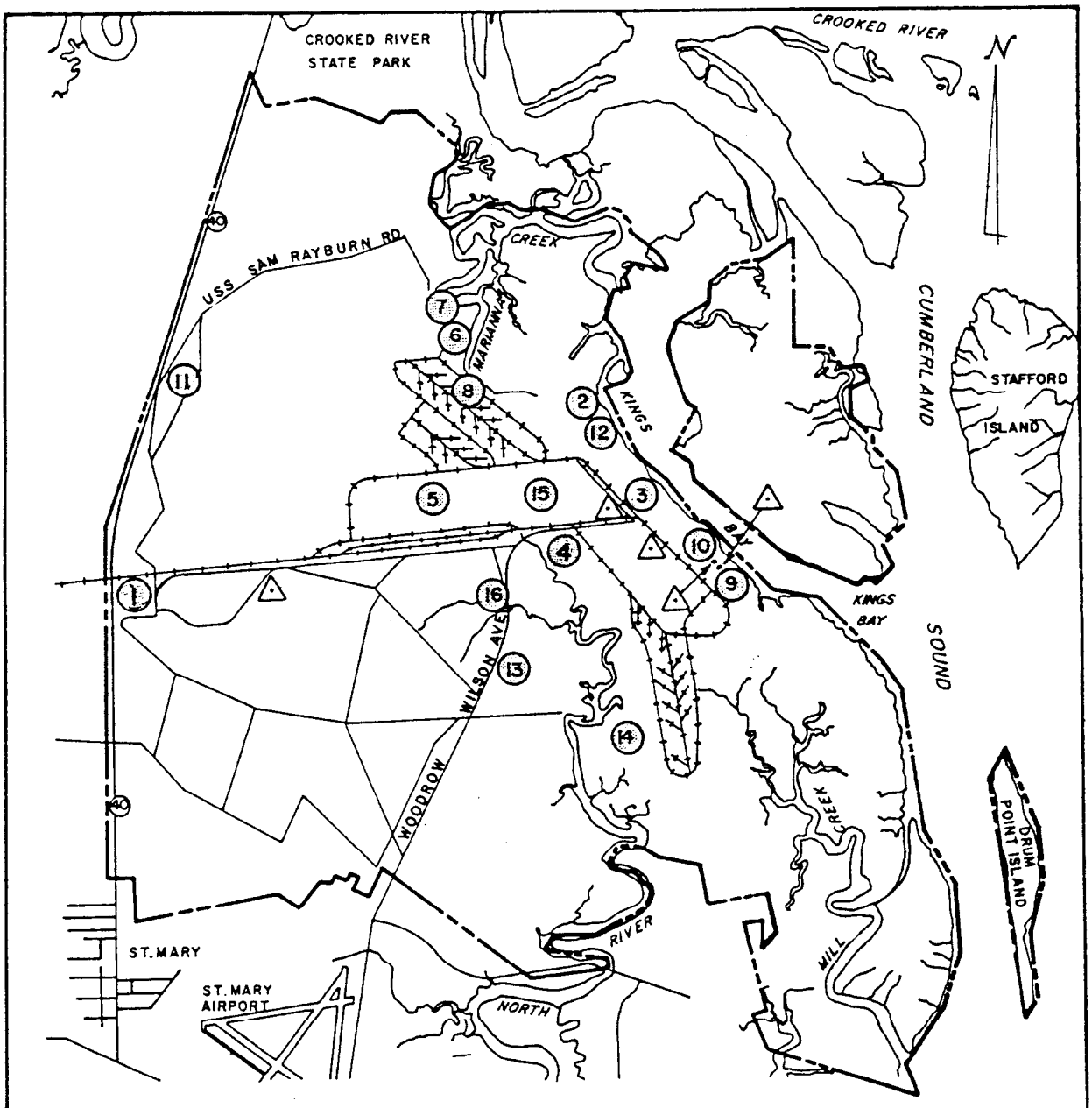


FIGURE 2-1
LOCATION OF DISPOSAL SITES AND POTENTIAL CONTAMINATION AREAS
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

The primary artesian aquifer consists of limestones beginning approximately 470 to 570 feet below the ground surface and extending to approximately 2000 feet below the ground surface. The aquifer is divided into two water bearing zones made up of two different types of limestone and separated by a 100 to 150 feet thick confining layer of dense limestone. Combined, these two zones make up the most productive aquifer in south east Georgia and are used to supply potable water to the base and all the nearby communities. There are five production wells which tap the principal artesian aquifer located at the activity (for locations, see Figure 2-1). The yield of these wells is estimated to be in excess of 1,000 gallons per minute per well. It is unknown which zone of the aquifer the wells located at the activity tap.

It appears that the water table aquifer represents the only potential contaminant migration pathway as both artesian aquifers are under pressure and are not recharged from the water table aquifer in the area of SUBASE Kings Bay.

2.1.2 Potential Contaminant Receptors. Potential contaminant receptors include humans and endangered, threatened and rare plants and animals. Since the water table aquifer is hydraulically isolated from any domestic supply aquifers, direct contact (exposure by consumption or contact) with humans could only be through surface water. This is not likely as most of the surface waters are used only for recreational boating and navigation. Indirect contact through the food chain is more likely since Cumberland Sound is a recreational and commercial fishery. Contaminants may migrate to Cumberland Sound by way of surface runoff or through subsurface flow in the water table aquifer and thereby enter the food chain. Humans consuming fish taken from the Sound could be exposed to levels of contaminants actually higher than levels in the water due to food-chain amplification. The Sound also provides a habitat for two endangered fish species, the Atlantic and Short-nose Sturgeons. These species are not consumed by humans, but should be considered potential receptors because of their endangered status.

2.2 WASTE DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS. Table 2-1 lists the types and estimated quantities of wastes disposed of at the sites. The following are brief descriptions of these sites.

2.2.1 Site 1, PCB Transformer Storage Area No. 1. This site, used from 1979 to 1982, was located approximately 80 feet north of the old vehicle maintenance building (Building 1016) in the far western area of the activity (see Figure 2-2). The area was a fenced, unpaved impoundment, 120 square feet in size, where 10 PCB transformers were stored awaiting disposal. The transformers were acquired from the Army when the Military Ocean Terminal became Navy property. Less than one gallon of PCB oil leaked from the transformers. In 1981, plastic sheets were placed above and below the transformers and a earthen berm was constructed.

TABLE 2-1

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 1, PCB Transformer Storage Area No. 1	1979 to 1982	Polychlorinated Biphenyls	N290,000-E686,000 less than one gallon	Site cleaned up in September 1982
Site 2, Fire Fighting Pit	1980 to 1981	Waste oil, diesel fuel paint thinner, hydrazine	N294,000-E700,000 100 cubic yards	Site excavated and material sent to the currently operated Camden County Landfill in 1982
Site 3, PCB Transformer Storage Area No. 2	1979 to 1982	Polychlorinated Biphenyls	N292,000-E696,000 less than one gallon	Site cleaned up in 1982
Site 4, PCB Transformer Storage Area No. 3	Early 1980s to 1983	Polychlorinated Biphenyls	N290,000-E700,000 one gallon	Soil and transformer hauled off-base by a waste disposal contractor

TABLE 2-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 5, Army Reserve Disposal Area, Towhee Trail	1969 to 1974	Tree stumps, wooden pallets, metal ammo boxes, aluminum sheeting, concrete block, kitchen garbage	N292,000-E696,000 69,000 cubic yards	Wastes were disposed into pits; some were burned
Site 6, Army Reserve Disposal Area No. 1	At least 1975 to 1979	Dry wastes, office wastes, garbage	N292,000-E696,000 1600 cubic yards	Wastes were disposed into pits and covered with topsoil
Site 7, Army Reserve Disposal Area No. 2	1971 to 1977	Kitchen garbage	N298,000-E696,000 6500 cubic yards	Used during summer training camps
Site 8, Army Reserve Disposal Area No. 3	1973 to 1974	Paper, wood, kitchen garbage	N296,000-E698,000 350 cubic yards	Depression and 1 totally corroded 55-gallon drum were noticed in the area at the time of the IAS on-site visit
Site 9, Blue Star Shipping Disposal Area, Parking Lot	1959 to 1974	Pallets, paper, dunnage, old dynamite	N290,000-E706,000 1400 cubic yards	This area has been completely excavated during construction activities

TABLE 2-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 10, Blue Star Shipping Disposal Area, T-Shed	1974 to 1979	Pallets, paper, dunnage, old dynamite	N290,000-E704,000 1400 cubic yards	This site has been completely excavated
Site 11, Old Camden County Landfill	1974 to 1981	General household and office wastes, scrap paper, wood, treatment plant sludge and grit	N295,000-E687,000 500,000 cubic yards	
Site 12, Army Reserve Disposal, Area Future Dry Dock	1974 to 1978	Wooden and metal ammo boxes, concrete slabs dummy cargo, waste oil drums	N295,000-E701,000 467,000 cubic yards	The area was excavated in 1983
Site 13, Old DPDO Yard	1979 to 1983	Paints, solvents, antifreeze, waste oil, PCB transformers	N-286,000-E698,000 unknown quantities	The site was closed in 1983 and cleaned up
Site 14, Army Reserve Disposal Area, Kamehameha Avenue	1958 to 1978	Lube oil, diesel fuel, paint	N284,000-E702,000 100 to 200 gallons	Several drums were found during the IAS on-site visit

TABLE 2-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 15, Army Reserve Disposal Area near Water Treatment Plant, Stimson Drive	1970 to 1971	Methanol	N292,000-E700,000 50 to 100 gallons	Drums were observed during the IAS on-site visit
Site 16, Army Reserve Disposal Area near Old Sewage Lagoon 3990	1958 to 1964	Food, trash, scrap metal, tree limbs, empty paint and solvent cans	N288,000-E698,000 4000 cubic yards	Site was covered with soil upon closure

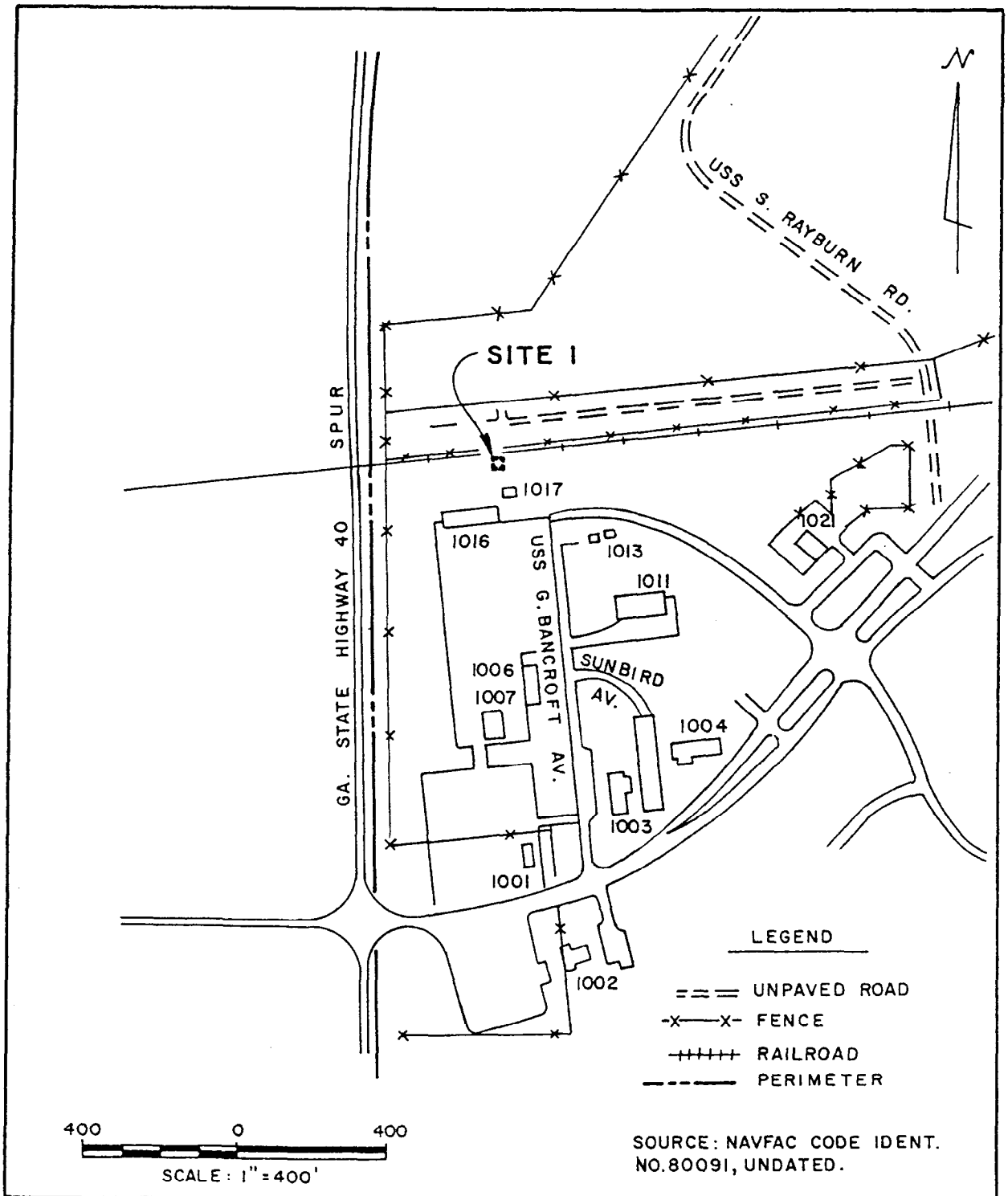


FIGURE 2-2
SITE 1 - PCB TRANSFORMER STORAGE AREA NO. 1

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

One soil sample was taken on September 14, 1982 and laboratory analysis identified 9.2 ppm of PCB (see Appendix D). No Georgia State or Federal standards exist for PCBs in soil. In late September 1982, about 40 cubic feet of soils were excavated over the 120 square foot area. The soil was removed to an average depth of approximately 4 inches. The transformers and contaminated soil were disposed of off-base by a waste disposal contractor in 1982.

Due to the small quantity of PCBs found in the soil and the volume of contaminated soil excavated, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 1.

2.2.2 Site 2, Fire Fighting Pit. The fire fighting training pit (unlined), used from 1980 to 1981, was approximately 30 feet by 30 feet by 2 feet deep. It was located in the waterfront area off Pelican Road near the intersection of Stimson Drive and USS James Monroe Avenue (see Figure 2-3). Contaminated diesel fuel, paints and paint thinners were poured into the bermed pit and burned once every two months by the fire department. Approximately 1500 gallons of waste engine oil and small amounts of diesel fuel, paints and paint thinners were reportedly burned between 1980 and 1981. In 1980, a one time disposal of an unknown quantity of hydrazine was also burned at Site 2. It is unknown whether water or some type of chemical foam or powder was used to extinguish the fires. A soil core sample was taken from the pit in August, 1980 and was tested for EP toxicity. Lab results identified the materials as non-hazardous (see Appendix E). In 1982, approximately 100 cubic yards (3 feet deep in an area of 30 feet by 30 feet) of contaminated soil were excavated from the pit and disposed of by a waste disposal contractor. Because of the EP Toxicity results and the volume of contaminated soil excavated, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 2.

2.2.3 Site 3, PCB Transformer Storage Area No. 2. Site 3 was a contractor paved area used to store an unknown number of transformers and construction materials and equipment from 1979 to 1982. The transformers, an unknown number of which contained polychlorinated biphenyls (PCB), were stored on a 120 square feet area near Building 5006 (see Figure 2-4) with plastic sheets above and below them and within earthen berms. Less than one gallon of transformer coolant (containing PCB) leaked from the transformers onto soil adjacent to the pavement. Three samples were taken from this soil. The results indicated the presence of Aroclor 1260 (PCB) in concentrations of 47.5, 31.2 and 24.0 parts per million. No State or Federal standards exist for PCB in soils.

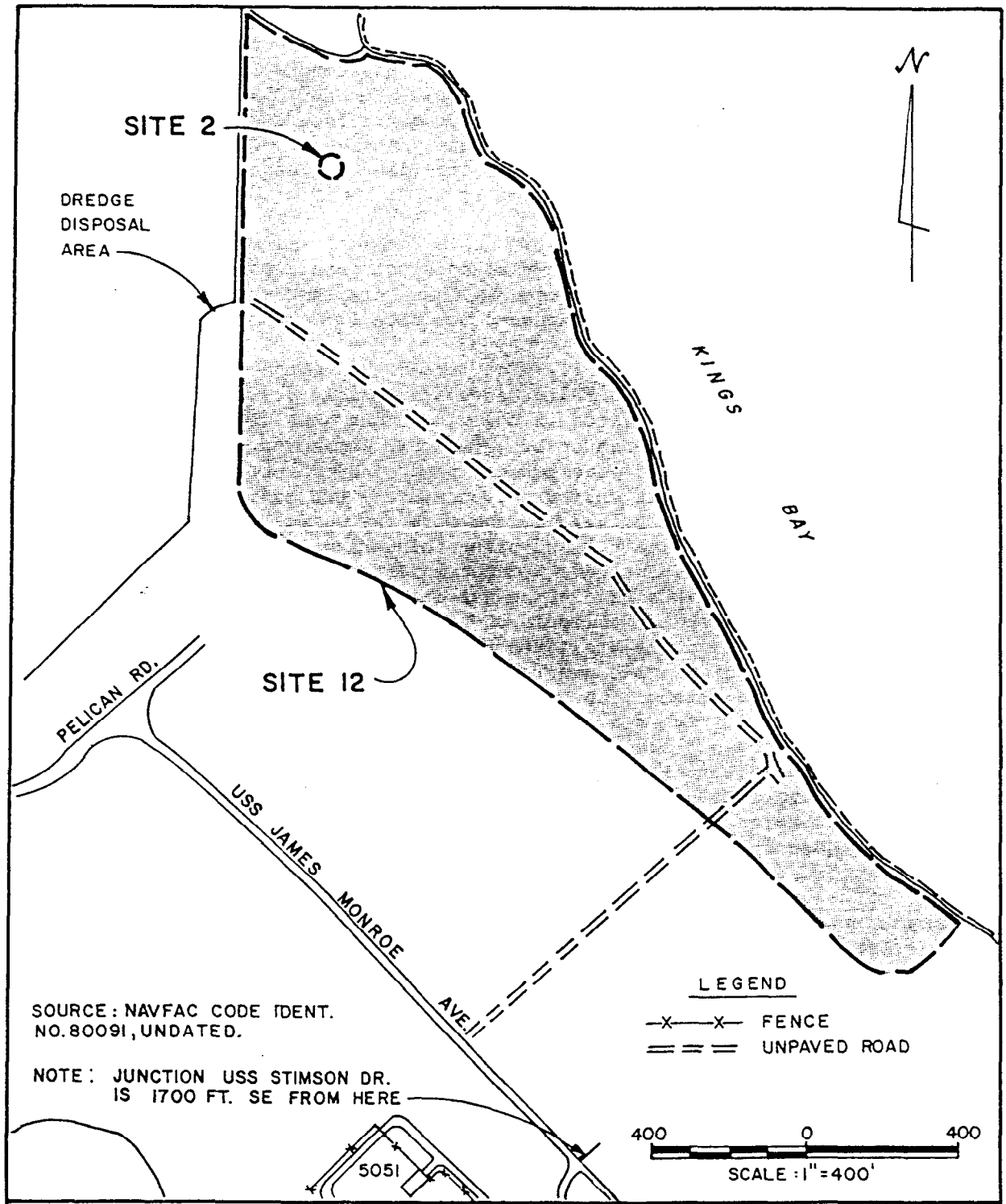


FIGURE 2 - 3
SITE 2 - FIRE FIGHTING PIT.
SITE 12 - ARMY RESERVE DISPOSAL AREA, FUTURE DRY DOCK.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

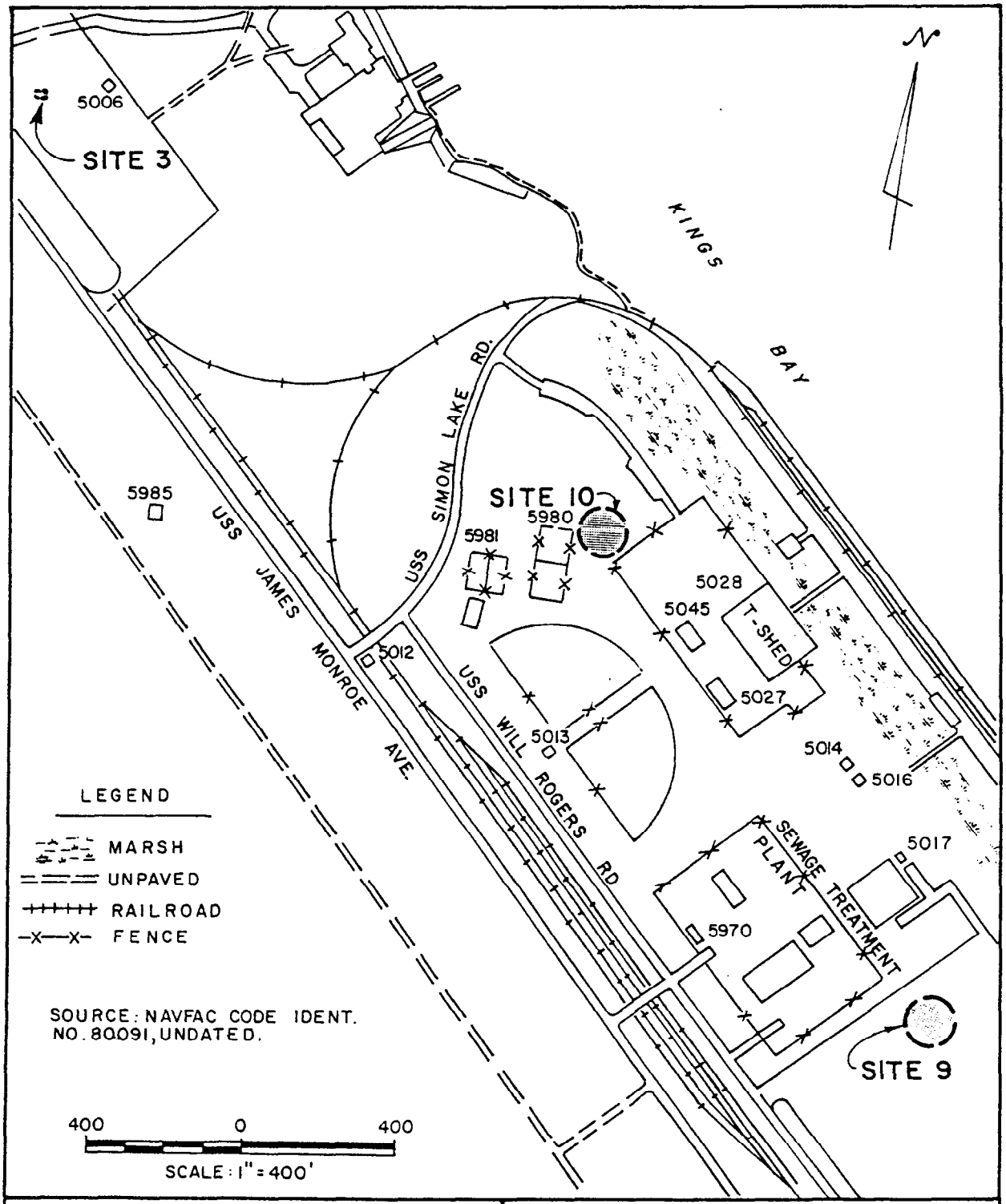


FIGURE 2-4
SITE 3 – PCB TRANSFORMER STORAGE AREA NO. 2.
SITE 9 – BLUE STAR SHIPPING DISPOSAL AREA, PARKING LOT.
SITE 10 – BLUE STAR SHIPPING DISPOSAL AREA, T-SHED.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Soils in an area of approximately 14 feet by 15 feet and 4 inches deep were excavated in September 1982 and, along with the transformers, removed from the base by a waste disposal contractor. The total volume of soil removed was 70 cubic feet. Results of the soil analysis are shown in Appendix F. No sampling was performed after excavation.

Based on the fact that contaminated soils in the area of the PCB spill were excavated, this site does not pose a potential threat to human health or the environment. Therefore, no further action under the NACIP program is recommended for Site 3.

2.2.4 Site 4, PCB Transformer Storage Area No. 3. Reportedly, in the early 1980s, transformer with oil containing polychlorinated biphenyls (PCB) was placed behind the standby water treatment plant at SUBASE Kings Bay (see Figure 2-5). In December, 1982 approximately one gallon of transformer coolant, containing 63 percent PCB by weight, was spilled from a filler cap onto the adjacent soil. In January 1983, the transformer and 8 cubic feet of excavated soil were transferred to 55 gallon drums. Soil was removed to a depth of approximately 11 inches in an area covering one square yard. On September 15, 1983, the drums containing the soil and the transformer were removed from the base by a waste disposal contractor.

Due to the small size of the spill and the fact that contaminated soil in the area was excavated, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 4.

2.2.5 Site 5, Army Reserve Disposal Area, Towhee Trail. This disposal site was used by the Army Reserve from approximately 1969 to 1974. The site covers a total area of approximately 8.5 acres located on both sides of Towhee Trail (see Figure 2-6). The area on the west side of the road is reportedly about 7 acres in size while that on the east side is about 1.5 acres. The areas were both excavated to a depth of five feet before wastes were placed in them. Wastes disposed of in the site included tree stumps, wooden pallets, metal ammo boxes (some empty and some filled with concrete), aluminum sheeting, concrete blocks and kitchen waste. Also, a large pile of dredge spoils and gravel (from abandoned railroad tracks) were spread over most of the western portion of the site. The spoils and gravel were spread to a depth of about 2 feet. Burning of wastes occurred twice a year on the western side of the road. No burning ocurred on the eastern side of the road. A total of approximately 30 to 40 gallons of diesel fuel and waste engine oil were used to ignite the wastes.

Therefore, over the 5 years that the site was in use a total of 300 to 400 gallons of waste oil and fuel were burned. Quantities of wastes disposed are approximated at 69,000 cubic yards.

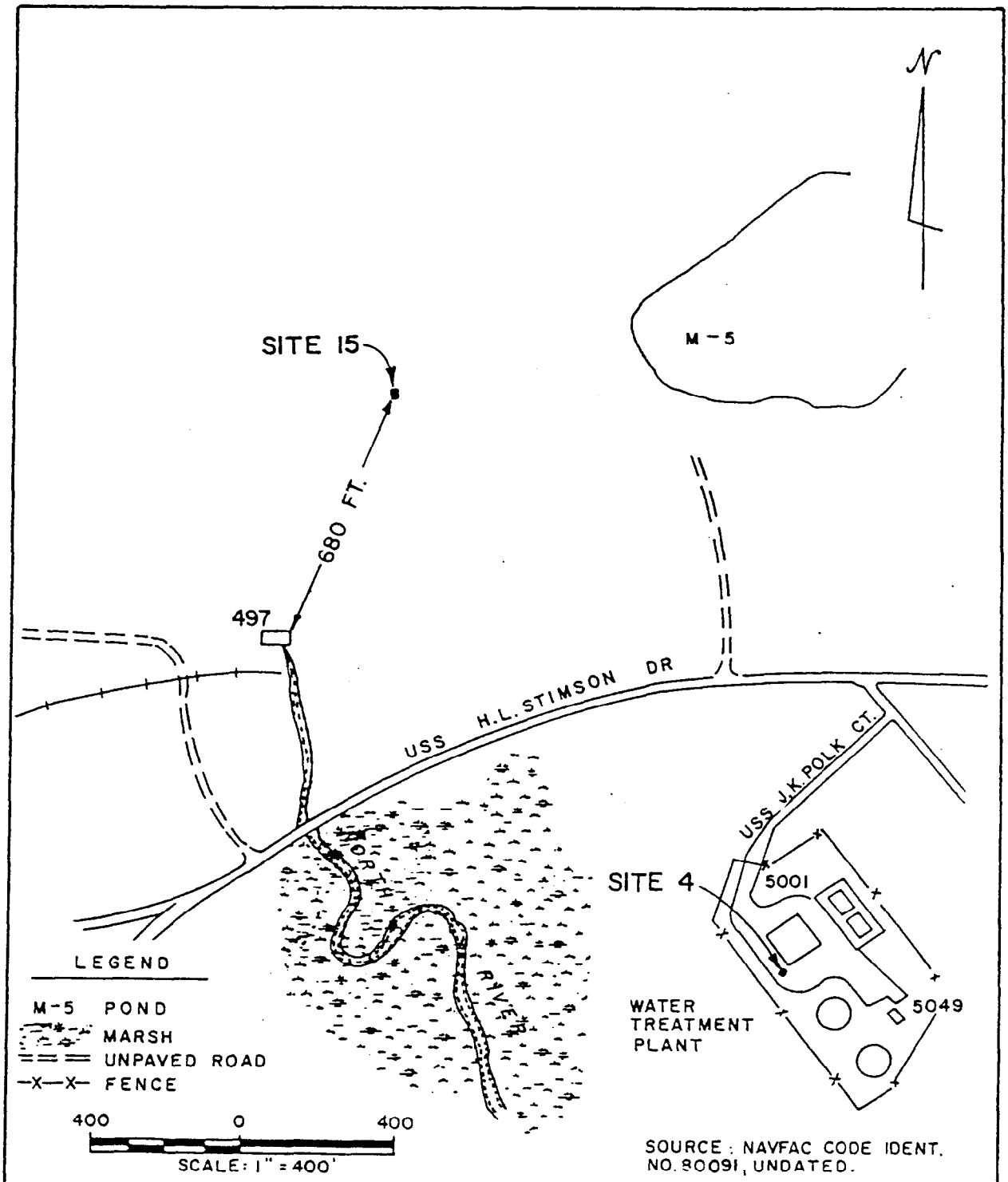


FIGURE 2-5
SITE 4 - PCB TRANSFORMER STORAGE AREA NO. 3
SITE 15 - ARMY RESERVE DISPOSAL AREA NEAR THE WATER TREATMENT PLANT, STIMSON DRIVE.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

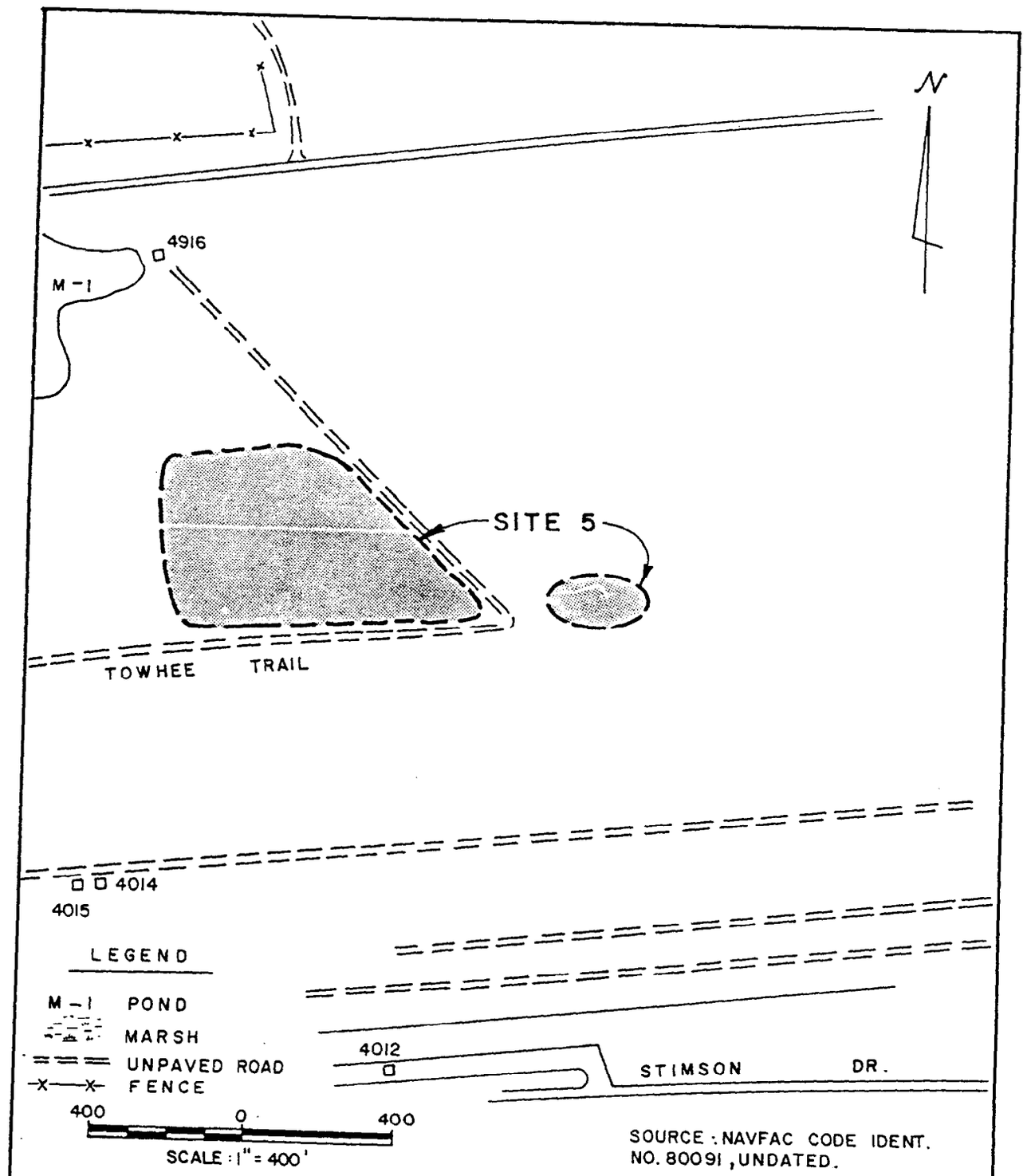


FIGURE 2-6
SITE 5 - ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Because hazardous waste were reportedly not disposed of at Site 5, this site does not pose a potential threat to human health or the environment. Therefore, no further action under the NACIP program is recommended for Site 5.

2.2.6 Site 6, Army Reserve Disposal Area No. A. This site, located east of Proteus Boulevard and north of Calhoun Drive, is adjacent to the wetlands bordering Marianna Creek (see Figure 2-7). The site is a 0.25 acre area that the Army Reserve used from at least 1975 until 1979 for trash and garbage disposal during their six week summer training camps. Pits, approximately five feet in diameter and five to six feet deep, were dug for the disposal of office wastes and garbage. After the pits were filled with wastes, they were then covered with one to two feet of soil. Waste quantity is estimated at 1,600 cubic yards.

Because no hazardous wastes were disposed of at Site 6, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 6.

2.2.7 Site 7, Army Reserve Disposal Area No. B. Site 7, was used by the Army Reserve during summer training camp (6 weeks out of the year) for the disposal of kitchen garbage. The disposal occurred between 1971 and 1977. The site is located east of Proteus Boulevard, just south of Teal Trail, and covers an area of approximately 0.5 acre (see Figure 2-7). The pits were dug to a depth of eight feet and were approximately 5 feet in diameter. Based on the dimension of the disposal area, approximately 6,500 cubic yards of garbage were buried in this site.

Because hazardous wastes were reportedly not disposed of at Site 7, this site does not pose a potential threat to human health or the environment. Therefore, no further action under the NACIP program is recommended for Site 7.

2.2.8 Site 8, Army Reserve Disposal Area No. C. Site 8 is located at the southern end of Proteus Boulevard adjacent to the dredge disposal area (see Figure 2-7). The site was used by the Army Reserve for their six week summer training camps between 1973 and 1974. The site area is about 100 feet by 14 feet by 5 to 8 feet deep, and was used for the disposal of general household wastes such as paper, wood and kitchen garbage. During the IAS on-site visit, a depression was noticed in the area and a totally corroded 55-gallon drum was seen off to one side towards USS Proteus Boulevard. There was no evidence of leakage or spillage. Approximately 350 cubic yards of waste are estimated to have been buried at Site 8.

Since hazardous wastes were reportedly not disposed of at Site 8, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 8.

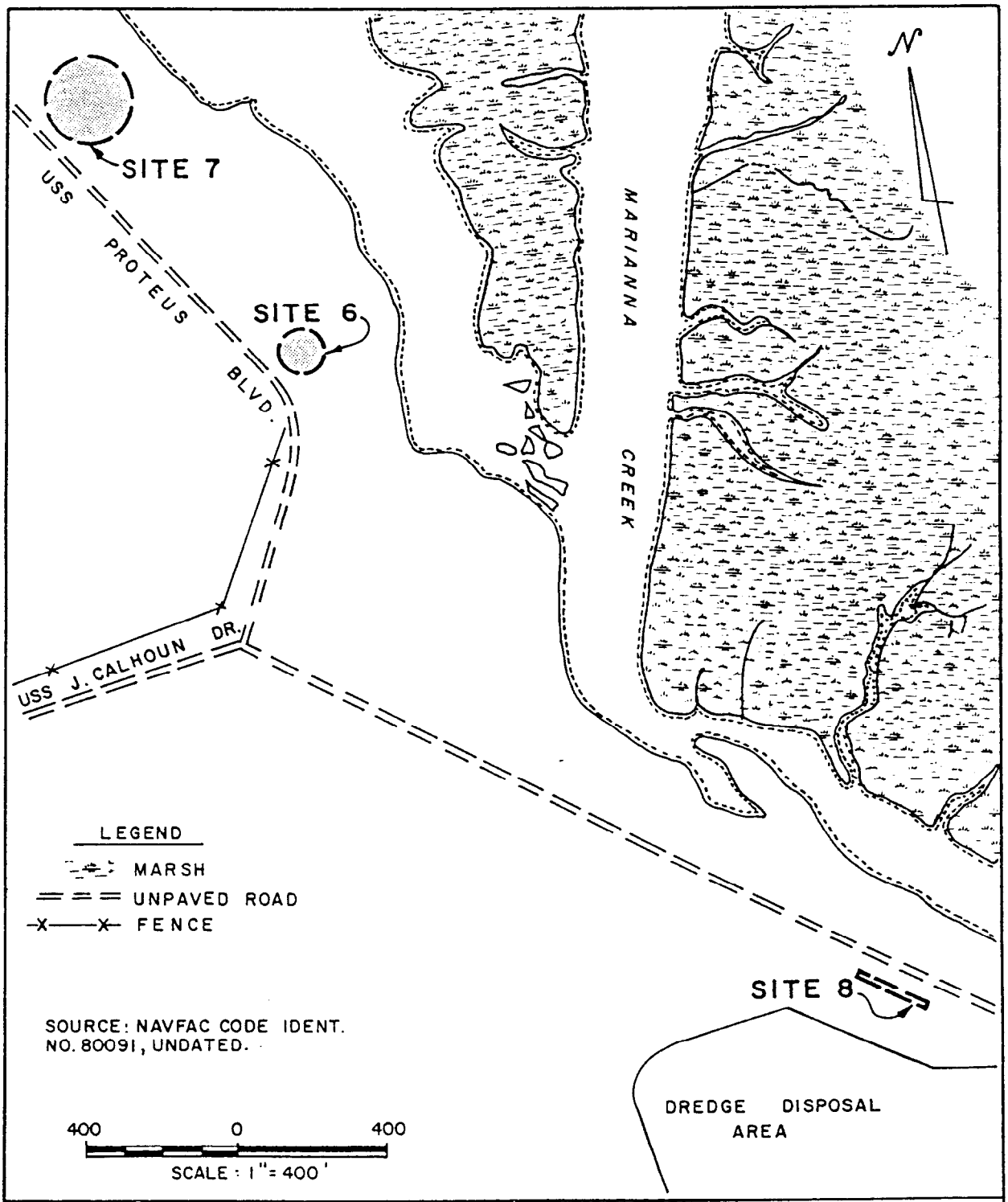


FIGURE 2-7
SITE 6 - ARMY RESERVE DISPOSAL AREA NO. A
SITE 7 - ARMY RESERVE DISPOSAL AREA NO. B
SITE 8 - ARMY RESERVE DISPOSAL AREA NO. C

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

2.2.9 Site 9, Blue Star Shipping Disposal Area, Parking Lot. The Blue Star Shipping Company operated this site from 1959 to 1974. The site was located under the present parking lot next to the water front sewage treatment plant (see Figure 2-4). This burn and burial site was 0.25 acres and 3 to 4 feet deep. It is unknown how often the burning occurred or if any fuel was used to ignite the wastes. Wastes included pallets, paper, dunnage and an unknown quantity of sticks of dynamite. The waste quantity is estimated at 1400 cubic yards. The area was completely excavated during the construction of adjacent buildings and a parking lot in the late 1970s. Since no hazardous wastes were reportedly disposed of at Site 9, this site does not pose a potential threat to human health or the environment. Therefore, no further action under the NACIP program is recommended for Site 9.

2.2.10 Site 10, Blue Star Shipping Disposal Area, T-Shed. Site 10 was used from 1974 to 1979 by the Blue Star Shipping Company as a disposal area similar to Site 9. The site was located east of Building 5080 near the T-shed fence line (see Figure 2-4). Wastes were burned at the site and included pallets, paper, dunnage and an unknown quantity old dynamite. It is unknown how often burning occurred or if any fuel was used to ignite the wastes. The area of the site is approximately 0.25 acres and three to four feet deep. Based on the dimensions of the site approximately 1400 cubic yards of wastes were buried here. This area was completely excavated during construction of the T-Shed parking lot in the early 1980s. Since hazardous wastes were reportedly not diposed of at Site 10, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 10.

2.2.11 Site 11, Old Camden County Landfill. Located in the far western area of the activity (see Figure 2-8), this 35 acres landfill was operated by Camden County from 1974 to October 1981 (Knowlton, 1981). Reportedly, hazardous wastes were not accepted at the landfill. Only domestic wastes were accepted including general household and office wastes, scrap paper, wood, and sludge and grit from the base wastewater treatment plants. The landfill was a trench and fill operation with trenches oriented in an east-west direction across the landfill (approximately 800 feet long by 20 feet wide). Excavation was into the water table which is four to eight feet below the surface at the site. Burning of wastes took place once per week during the first year of the operation only. This practice was discontinued in 1975. At the end of each day the wastes and ashes were compacted and covered with at least six inches of soil. Upon closure, a final soil cover of two feet was placed on the landfill. Estimated waste quantity is 500,000 cubic yards.

Since hazardous wastes were reportedly not disposed of at Site 11, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 11.

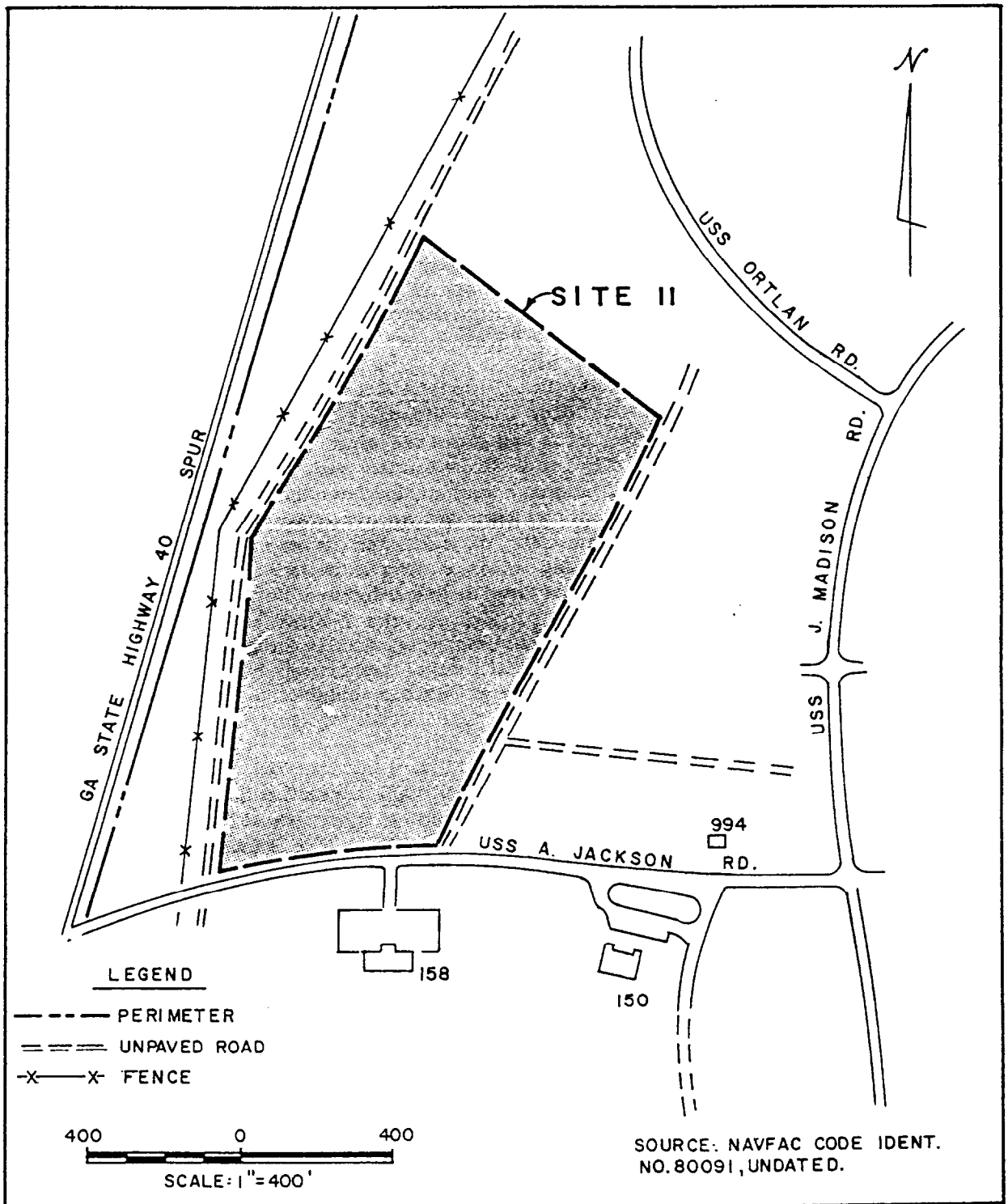


FIGURE 2-8
SITE II - OLD CAMDEN COUNTY LANDFILL.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

2.2.12 Site 12, Army Reserve Disposal Area. Site 12 is located along Kings Bay in the future dry dock area (see Figure 2-3). The site was used by the Army Reserve for amphibious ship-to-shore materials loading and offloading training operations from 1974 to 1978. The size of the disposal area is approximately 41 acres. Wastes included empty wooden and metal ammo boxes, concrete slabs, dummy cargo, and six to eight 55-gallon drums of waste engine oil.

Waste quantity was estimated at 467,000 cubic yards. In 1983, a contractor operating a backhoe at the site uncovered six to eight 55-gallon drums of waste oil. One of the drums was punctured by the backhoe, causing a spill. The stained soils and drums were removed from the base by a waste disposal contractor in 1983. The remaining inert wastes were excavated in late 1983 and buried in the dredge spoil area. Since all wastes were excavated from Site 12, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 12.

2.2.13 Site 13, Old DPDO Yard. The Old DPDO yard was located east of Polaris Lane across USS James Monroe Avenue (see Figure 2-9). The size of the yard was reportedly 450 feet by 75 feet. The fenced and asphalt paved area was used from 1979 to 1983 for storage of waste materials. Materials stored here included:

Type	Percentage of Total Materials
Paints (including polyamide paints)	60-70%
Solvents (including methyl ethyl ketone, methyl isobutyl ketone)	10%
Monomethanol Amine	5%
Antifreeze (ethylene glycol)	5%
2190 Lubricating Oil (used on ships and submarines)	1%
Waste Oil and small amounts of unidentified materials	10%

Reportedly, two old transformers were stored at the site. Some types of waste materials were stored on metal pallets. It was reported that during operation of the site, between one and five 55 gallon drums of the unknown types of materials were spilled onto the asphalt paved area but were cleaned up by Public Works personnel soon after they occurred. Corroded and dented drums and cans of materials were generally repacked, sealed and labelled for off-base disposal. When final cleanup of the site was undertaken in 1984, useable materials were sent to the Naval Air Station, Jacksonville and the remaining hazardous materials were hauled off station by contract waste haulers. Empty drums were sent to a contractor for triple rinse. The site is now covered by more than 5 feet of compacted soil as a part of the on-going construction of SUBASE Kings Bay.

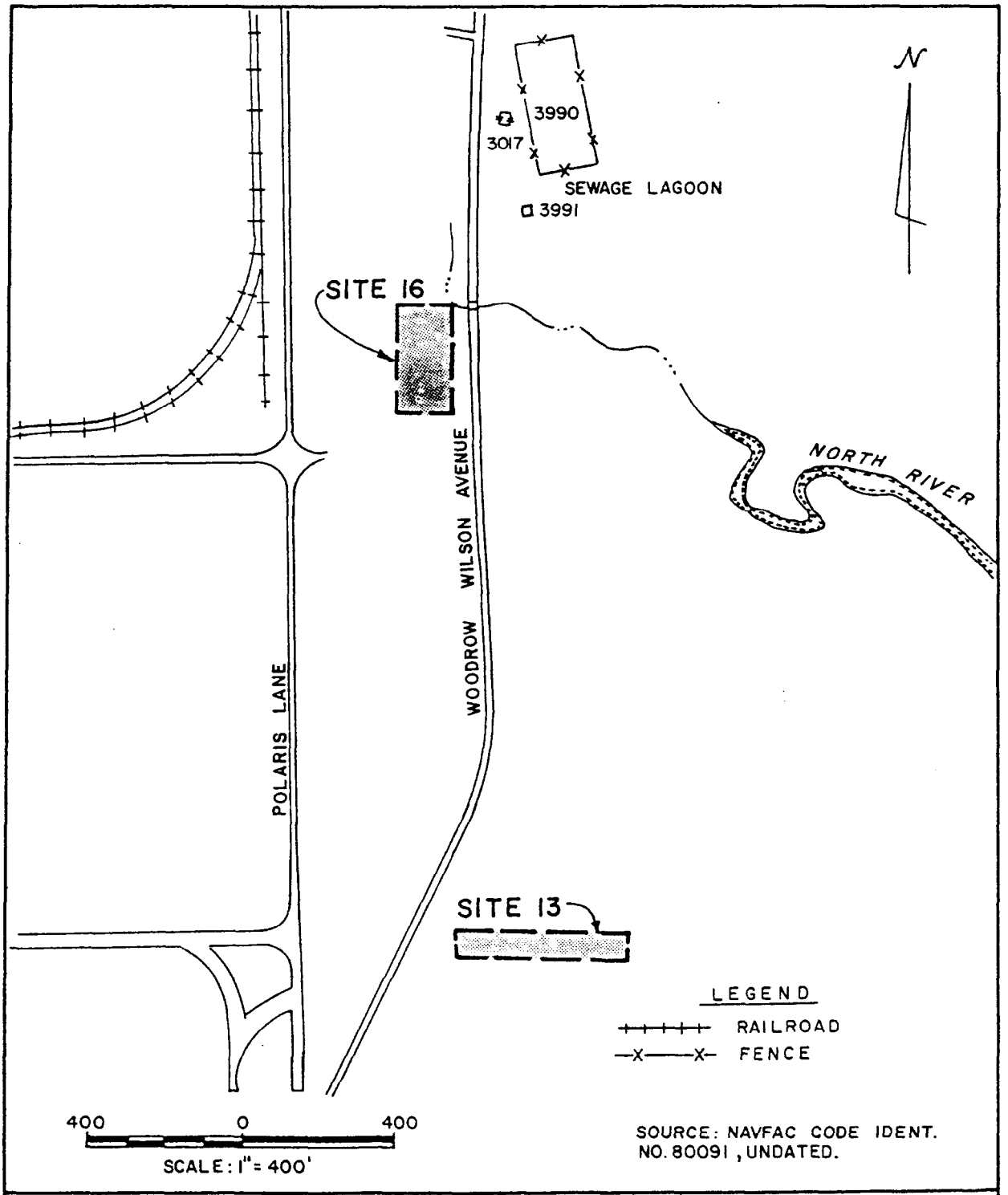


FIGURE 2 - 9
SITE 13 - OLD DPDO YARD.
SITE 16 - ARMY RESERVE DISPOSAL AREA NEAR OLD SEWAGE LAGOON 3990

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Since cleanup actions were taken each time a spill occurred, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 13.

2.2.14 Site 14, Army Reserve Disposal Area, Kaemehameha Avenue. Site 14 is an area approximately 1500 square feet (60 feet by 25 feet) located 1160 feet west of Kamehameha Avenue (see Figure 2-10). Surface waste disposal was first observed at the site in 1978. The period of site operation is estimated to be between 1958 to 1978. Presently, the area is overgrown with forest vegetation. During IAS on-site visit, the following labelled drums were found lying on the ground: three 55-gallon drums marked "lube oil" (partially full); one 55-gallon drum marked "diesel" (partially full); one severely corroded 55-gallon drum with no visible marking (empty); and one 5-gallon can of white paint (full). Evidence of oil leakage from three of the drums was apparent on the area immediately surrounding the drums. The estimated spill quantity of the above materials is 100 to 200 gallons.

Because cleanup actions have been initiated by SUBASE Kings Bay at this site, no further action under the NACIP program is recommended for Site 13.

2.2.15 Site 15, Army Reserve Disposal Area Near Water Treatment Plant, Stimson Drive. This site is located north of Stimson Drive near the water treatment plant (see Figure 2-5). The surface waste disposal area is about 10 feet by 5 feet and was reportedly used from 1970 to 1971 by the Army Reserve. During the IAS on-site visit, two 55-gallon drums were observed at the site. One was almost completely corroded with no legible markings or labels. No evidence of leakage from the drums was apparent. The other drum was marked "Methanol Tech Grade A" (Phipps Product, Boston, Mass., Stock No. 6810-221-8355, expiration date 9/71) and was partially full. The area is presently wooded. The estimated spill quantity of methanol is 50 to 100 gallons.

Because cleanup actions have been initiated at this site, no further action under the NACIP program is recommended for Site 15.

2.2.16 Site 16, Army Reserve Disposal Area Near Old Sewage Lagoon 3990. This site, located west of Woodrow Wilson Avenue and south of old sewage lagoon 3990 (see Figure 2-9), was used every six months by the Army Reserve from 1958 to 1964. The site covered an area of one acre and was excavated three to five feet deep. Wastes disposed here included food, wood, trash, scrap metal, tree limbs and empty paint and solvent cans (about 1 or 2 gallon cans per month). The waste quantity is estimated at approximately 4000 cubic yards. Reportedly, burning of waste took place at this site. It is unknown how often burning occurred or if any fuel was used to ignite the wastes. The site was covered with soil upon closure.

Since hazardous wastes were reportedly not disposed of at Site 16, this site does not pose a potential threat to human health or to the environment. Therefore, no further action under the NACIP program is recommended for Site 16.

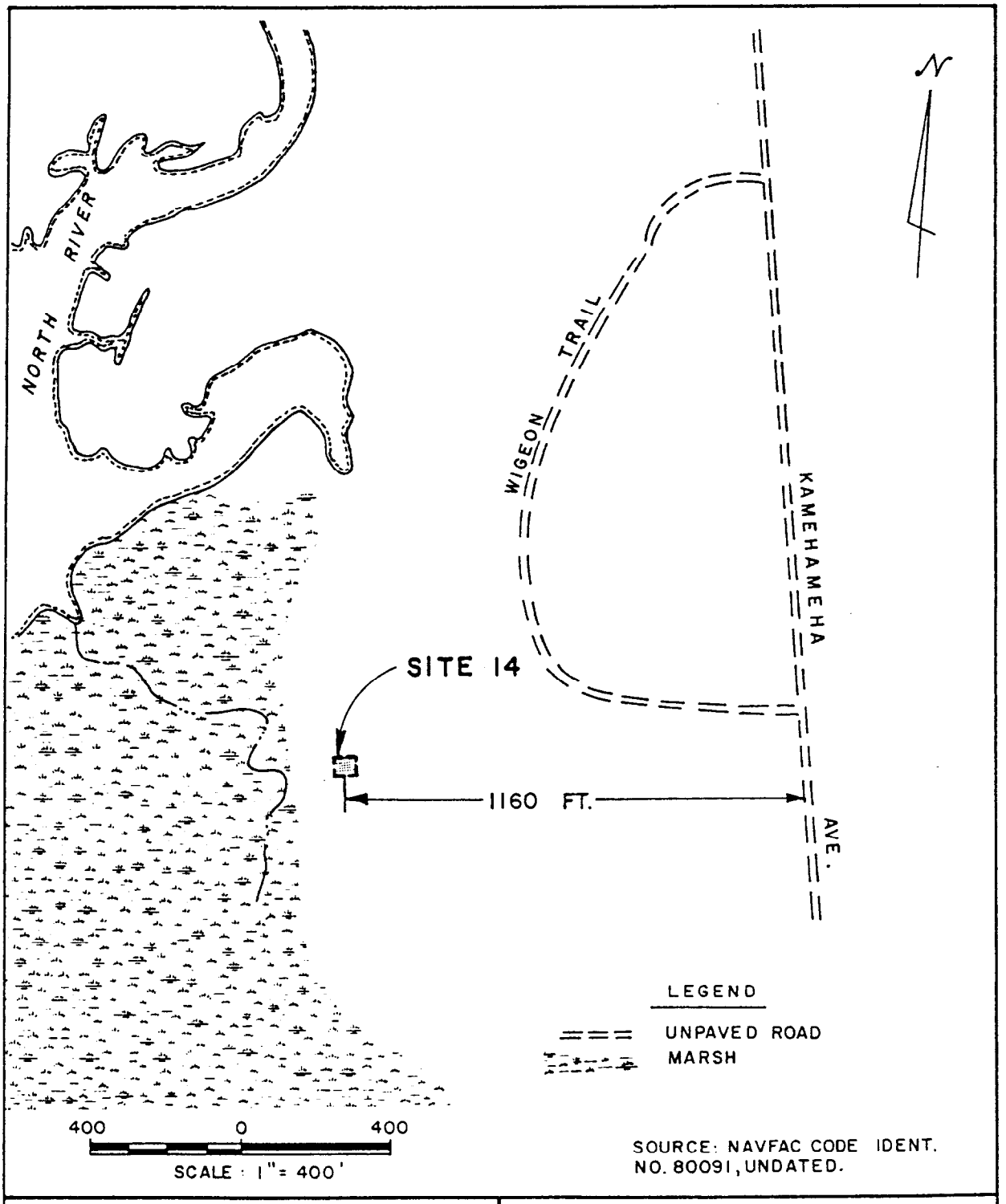


FIGURE 2-10
SITE 14 - ARMY RESERVE DISPOSAL AREA, KAMEHAMEHA AVE.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

CHAPTER 3. RECOMMENDATIONS

3.1 GENERAL RECOMMENDATIONS. It is recommended that the locations of all sixteen sites at SUBASE Kings Bay identified in the Initial Assessment Study be marked on General Development Maps.

CHAPTER 4. BACKGROUND

4.1 INTRODUCTION. The Naval Submarine Base (SUBASE), Kings Bay is located in the southeast corner of Georgia approximately eight miles north of the Georgia-Florida border. It covers a total area of approximately 16,168 acres. The closest community to the activity is the city of St. Marys which borders the southern boundary of the base (see Figure 4-1). SUBASE Kings Bay is located in Camden County. The county has a population of 12,800 living mainly in St. Marys, Kingsland, and Woodbine. The population in Camden County has increased steadily since 1940 with the introduction of paper manufacturing at St. Marys. Kings Bay, which borders the base on the eastern side, empties into Cumberland Sound and eventually the Atlantic Ocean. The bay provides the port for refit facilities on the fleet ballistic missile submarines. Since 1979, SUBASE Kings Bay has supported Submarine Squadron Sixteen. Squadron sixteen was moved from Rota, Spain to Kings Bay in July 1979. Its mission is the maintenance and repair of submarines. Since 1979, SUBASE Kings Bay has employed approximately 3000 people including personnel living on the Reserve Training Facility.

Kings Bay was an inactive Military Ocean Terminal owned and maintained by the U.S. Army for reserve training operations and contingency purposes from 1956 to 1978. Because there was no immediate operational need for this installation, it was placed in an inactive status and remained in that status from 1956 until 1 July 1978. The property was then transferred to the U.S. Navy for development of SUBASE Kings Bay. SUBASE Kings Bay is still being developed into a support facility for Fleet Ballistic Missile Submarines.

4.1.1 Tenant/Host Relationships. The Naval Submarine Base at Kings Bay, Georgia has several tenant activities that contribute in accomplishing its mission. A list of the tenants and their operations is as follows.

4.1.1.1 Mobile Technical Unit Fourteen. This unit is in Building 2014 and its function is to service and repair electronic equipment in submarines, vessels and ships.

4.1.1.2 Navy Publications and Printing Service Jacksonville Detachment. This shop is currently located in trailers 2 and 3. It provides the base with printing and duplicating services.

4.1.1.3 Explosive Ordnance Disposal Group Two Detachment Kings Bay. The Explosive Ordnance Disposal Group Two Detachment Kings Bay is located in Building 2013 and has the responsibility for providing ordnance related support to the SUBASE, USS Simon Lake and Submarine Squadron Sixteen Diving services.

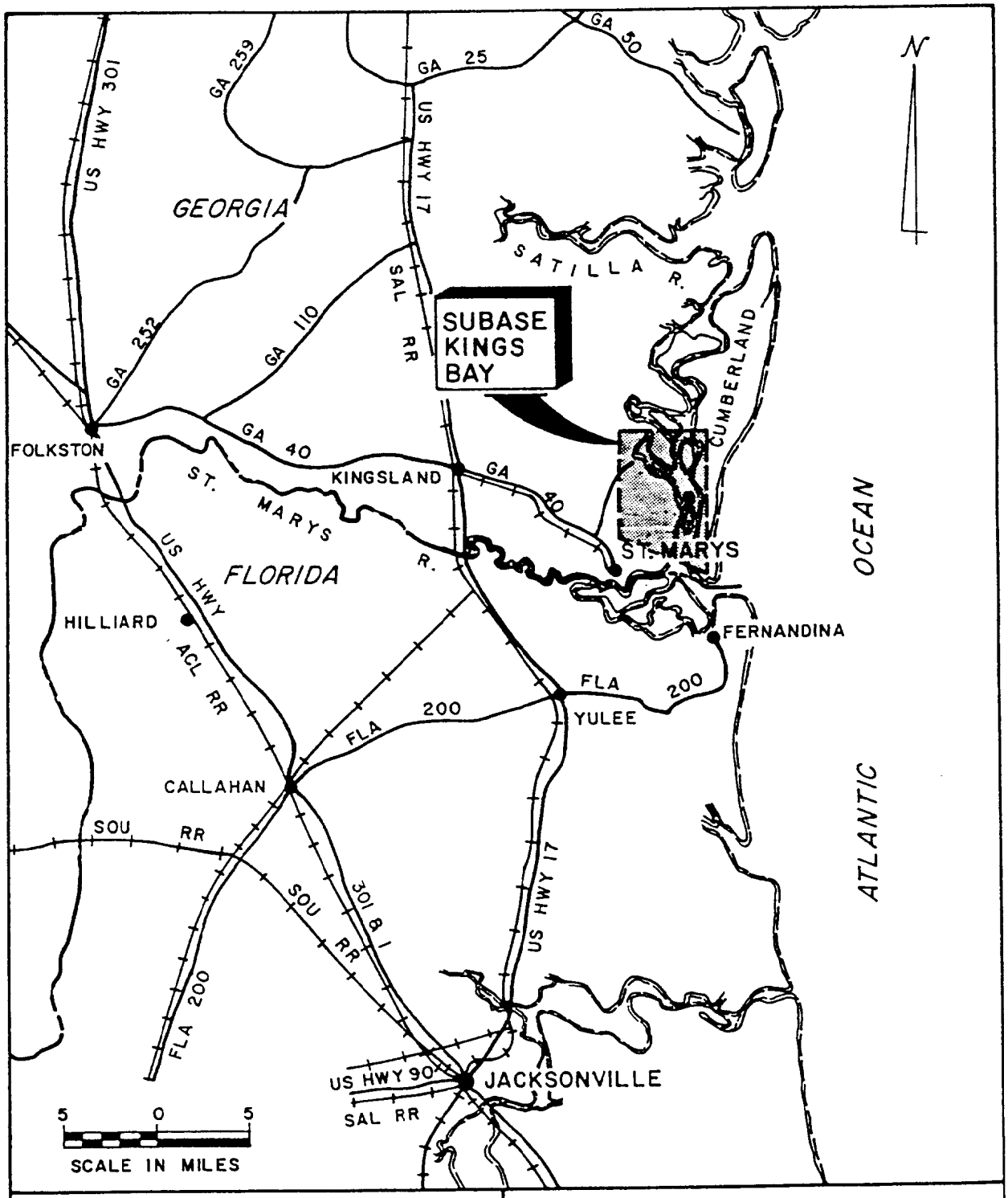


FIGURE 4-1
VICINITY MAP
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

4.1.1.4 Photo Laboratory. The Photo Laboratory, located in Building S-15, provides photographs for newspaper articles.

4.1.1.5 US Army Reserve Three Hundred and Seventieth Engineering Detachment (TI)M. The US Army Reserve 370th Engineering Detachment (TI)M meets on weekends and provides utility services including electrical and plumbing at the base.

4.1.1.6 Residential Officer-In-Charge of Construction. The three groups in this activity are the Resident Officer-In-Charge of Construction, Kings Bay (ROICC,KB), the Resident Officer-In-Charge of Construction, Systems (ROICC,SYS), and the Officer-In-Charge of Construction, Trident. They are responsible for advertising and awarding of construction contracts, supervising on-base construction and managing of service contracts.

4.1.1.7 Defense Investigative Service. The Defense Investigative Service provides counter-intelligence, espionage, security and protective services for the Base.

4.1.1.8 Applied Physics Laboratory, Johns Hopkins University. The Applied Physics Laboratory's major responsibility is the maintenance of electronic communications equipment aboard submarines.

4.1.2 Adjacent Land Use. The existing land use in the region ranges from highly urbanized to rural development. The north, south, and west areas in the vicinity of the base are mostly residential with some commercial development on the west side. Camden County lies midway between Jacksonville to the south, and the smaller urban area of Brunswick to the north. The economy of the region has been directly dependent on manufacturing since the mid-1940s. The Gilman Paper Company is located in the city of St. Marys less than 4 miles southwest of the activity. This company is the largest manufacturing company in Camden County accounting for about 70 percent of the total manufacturing labor force since 1970 (Environmental Science and Engineering, Inc., 1975). On the east side of the base is Kings Bay. The region is predominantly rural with only about 8 percent of the land area developed in the region. The majority of the undeveloped land is either marsh or swamp and does not lend itself to development or agricultural uses.

Excluding public land, only 3.6 percent of Camden County is developed for commercial or residential uses. Over half of this development is in the cities of St. Marys, Woodbine, and Kingsland. Of the undeveloped land in the county, over 70 percent is unsuitable for development because of soil conditions or drainage problems.

4.2 HISTORY.

4.2.1 History. In the early 1950s, the U.S. Army began operations at SUBASE Kings Bay, developing the property as a military ocean terminal. Kings Bay Army Terminal, as it was called, was constructed to meet Department of the Army requirements for east coast port facilities

capable of shipping ammunition and other explosives in the event of a national emergency. Acquisition of land for the terminal began in 1954 and construction activity commenced in 1956 with all facilities being completed in 1958. From its inception until June 30, 1965 the terminal was known as the Kings Bay Army Terminal. On April 1, 1965 as a result of a major reorganization, the terminal was placed under the jurisdiction of the newly organized Military Traffic Management and Terminal Service, and on 1 July 1965 became officially known as the U.S. Army Military Ocean Terminal, Kings Bay (MOTKI). MOTKI had no assigned military personnel and was operated by nineteen U.S. Government Civil Service employees, whose mission was to plan programs, perform utility repairs and provide fire prevention and protection functions for the terminal.

MOTKI was a terminal, not a storage depot, designed to store ammunition or explosives for about three months. MOTKI was directly subordinate to the Military Ocean Terminal, Sunny Point, Southport, N.C. Facilities constructed at the Terminal included a 2000 foot wharf, administration buildings, work shops, utility buildings, and 47 miles of railroad track for transporting explosives. In 1978, the Department of the Navy selected MOTKI as the East Coast basing site for its Fleet Ballistic Missile (FBM) submarine support facility. This selection was made after screening 60 potential sites. Construction of a refit facility for one submarine squadron (T-1) began in 1978 in anticipation of 10 Poseidon submarines. In 1979, the Navy moved Squadron 16 from Spain to Kings Bay. On July 1, 1978 the site was established in a developmental status and was named the Naval Submarine Support Base. The activity became the Naval Submarine Base, Kings Bay in 1979. Although secondary to its primary mission, the terminal has in the past performed valuable service to the United State Government and to the local populace. For example, during the Cuban missile crisis a U.S. Army Transportation Battalion (Boat) consisting of approximately 1,100 military personnel and seventy small craft vessels were temporarily stationed at Kings Bay, and during Hurricane Dora in 1964 the terminal was utilized as a shelter area for nearly one hundred local residents.

4.2.2 Historical Sites. Both aboriginal groups and Euro-American settlers chose the northeast section of the Base as a place for settlement because of its relatively abundant natural resources. There are 34 aboriginal and historic sites located on the activity, 20 of which are located on the coast. Twenty seven of these sites are potentially eligible for the National Register of Historic Places (Environmental Science and Engineering, Inc., 1980) (see Figure 4-2). This area and the area adjacent to the North River are categorized as archaeologically sensitive zones requiring special management practices to preserve the natural resources including the wetlands and bays they contain.

4.3 LEGAL ACTIONS. There is no record of past environmental legal actions against SUBASE Kings Bay.

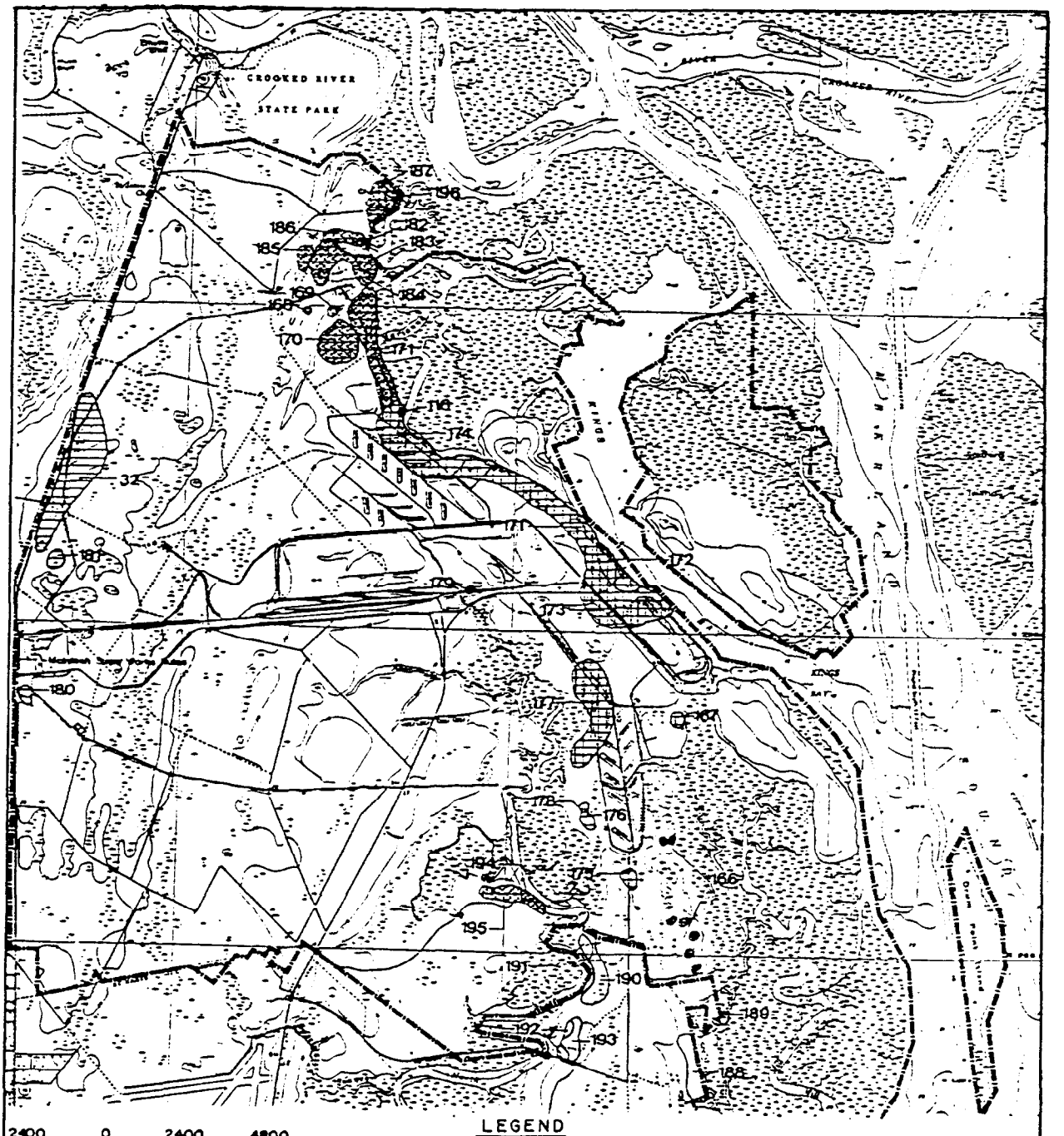


FIGURE 4-2
LOCATION OF ABORIGINAL AND HISTORIC SITES
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

4.4 BIOLOGICAL FEATURES. SUBASE Kings Bay is located on an arm of Cumberland Sound called Kings Bay. It is between the St. Marys River and Crooked River and connected to the sea by a 12-mile access channel which passes through the St. Marys Inlet. SUBASE Kings Bay covers a total area of approximately 16,168 acres. Terrestrial ecosystems comprise 9,621 acres of land area, while salt marsh ecosystems and open water estuarine systems comprise 6,116 acres and 1,010 acres respectively (Environmental Science and Engineering, Inc., 1975). Land areas at SUBASE Kings Bay consist of major upland plant communities of pine flatwoods and pine plantations, salt marshes in the lowland areas, and southern mixed hardwoods occurring in small patches predominantly in the eastern half of the base.

4.4.1 Ecosystem. The Kings Bay area can be divided into three general geographic areas based upon a combination of the elevation, substrates, and physiognomy (general appearance) of the dominant vegetation:

1. The shore area on the east is composed of salt marsh and associated estuaries interspersed with "spoil islands."

2. At the interface of the upland and coast is a transition zone of salt-tolerant species such as live oak (Quercus virginianum), red cedar (Juniperus silicicola), and magnolia (Magnolia grandiflora). However, some of these areas have been cleared and replanted as pine plantation.

3. Inland is a heterogenous assemblage of communities including pine flatwoods, pine plantations, southern mixed hardwoods, early successional stage communities, wooded swamps, freshwater marshes, and developed lands.

Associated with these communities are abundant and diversified species of animals. Aquatic and terrestrial systems of the area support a variety of fauna related to the diversity of habitats (Environmental Science and Engineering, Inc., 1975).

4.4.1.1 Terrestrial Flora And Fauna. Terrestrial floral components at SUBASE Kings Bay consist of pine flatwoods, pine plantations, southern mixed hardwood, early successional stages, wooded swamp, freshwater marsh, and developed lands. A description of these components are as follows (Environmental Science and Engineering, Inc., 1980):

Pine Flatwoods. Pine flatwoods constitute the largest terrestrial community in the Kings Bay vicinity. These habitats are characterized by four pine species which dominate the canopy. These are, in order of abundance, slash pine (Pinus elliottii), longleaf pine (Pinus palustris), loblolly pine (Pinus taeda), and pond pine (Pinus serotina). In the pine flatwood community, these species of pine constitute over 92 percent of the total tree biomass of the 19 species recorded. Pine flatwoods fauna are extremely diverse and are represented by over 58 species. The pine flatwoods on-site have an incomplete canopy. As a result, numerous species of shrubs and herbaceous plants are found in scattered areas. Pines are generally harvested in 18 to 20 years for pulpwood and in 30 to 40 years for saw timber.

Pine Plantation. Pine plantation is the second largest terrestrial plant community at Kings Bay. This man-made community is planted with slash pines (Pinus elliottii). The shrub layer is dominated by gallberry (Ilex glabra), wax myrtle (Myrica cerifera), and saw palmetto (Serenoa repens). The dominant plant comprising a sparse herb stratum is bracken fern (Pteridium aquilinum). Pine plantations in the vicinity have fairly closed canopies and sparse groundcover vegetation; thus, these systems support a more limited quantity of wildlife than is typical of an open canopy stand.

Southern Mixed Hardwoods. The southern mixed hardwoods community in the vicinity of Kings Bay occurs on a variety of sites, from the moist soils adjoining mixed hardwood swamps and freshwater creeks to the well-drained upland soils inland from the tidal salt marsh. The understory exhibits a mosaic pattern and is dominated by wax-myrtle (Myrica cerifera) and sapling laurel oak (Quercus hemisphaerica). The shrub cover consists mainly of wax-myrtle, saw palmetto (Serenoa repens), and vining plants such as catbrier (Smilax spp.) and grape (Vitis rotundifolia). Mammals frequently encountered are grey squirrel(Sciurus carolinesis carolinesis), cotton mouse (Peromyscus gossypinus gossypinus), raccoon (Procyon lotor lotor), ninebanded armadillo (Dasypus, novencinctus) white-tailed deer (Odocoileus virginianus), and wild hog (Sus Scrofa).
Early Successional Stages. Early successional stages were formerly major plant communities such as pine plantations or pine flatwoods until clearing of the land left the areas open to pioneering species. Old fields and other developed lands in the vicinity of the activity characteristically support thick growths of broomsedge, dog fennel, blackberry, panic grasses, sedges, and grasses. Early successional communities include old fields, firelanes, power transmission corridors, and overgrown bunkers or magazines.

Wooded Swamps. Forested wetlands at Kings Bay consist of two types: (1) cypress-gum domes and strands, and (2) mixed hardwood swamps. Groups of cypress trees are termed cypress domes due to their well-defined dome profile. The canopies of these swamp communities are usually dominated by water tupelo (Nyssa sylvatica) and pond cypress (Taxodium ascendens) or bald cypress (T. distichum).

Mixed hardwood swamps occur along the floodplains of active or free-flowing streams and rivers and exhibit a higher diversity of tree species such as red maple (Acer rubrum), sweet bay (Magnolia virginiana), loblolly bay (Gordonia lasianthus), and sweet gum (Liquidambar styraciflua).

Salt Marshes. Saltwater wetlands at Kings Bay are represented by salt marshes regularly inundated by tides. These marshes are dominated by nearly pure stands of smooth cordgrass (Spartina alterniflora), with some intermixing of saltgrass (Distichlis spicata) occurring along the shoreward margin.

On SUBASE Kings Bay, 28 species of mammals, 169 species of birds, 34 species of reptiles and 21 species of amphibians have been reported. These species constitute the major consumers in the terrestrial ecosystem

(Environmental Science and Engineering Inc., 1975). Few species of reptiles occur regularly in the salt marsh. Characteristic reptiles of the salt marsh include the ornate diamondback terrapin (Maloclenys terrapin terrapin), garter snake (Thamnophis sirtalis, ribbon snake (Thamnophis sauritus sackeni), and salt marsh snake (Natrix fasciata clarki). Occasional inhabitants are the American alligator (Alligator mississippiensis) eastern indigo snake (Drymarchon corais couperi), and a few species of frogs (Rana sp.). Some breeding birds which commonly occur are long-billed marsh wren, seaside sparrow, clapper rail and common yellow-throat (Environmental Science and Engineering Inc., 1980).

4.4.1.2 Aquatic Flora And Fauna. The open water estuarine system of SUBASE Kings Bay occupies a total area of 1,010 acres, some 940 acres of which are in the Kings Bay and Marianna Creek basins. Additionally, there are about 1,516 acres of associated marsh lands.

Cumberland Island lies directly east of the activity and encloses Cumberland Sound. Fresh water empties into Cumberland Sound from the St. Marys and Crooked Rivers. The St. Marys River cuts off the island from the south and provides an entrance into Cumberland Sound from the Atlantic Ocean. Tides fluctuate with a mean annual range of 5.8 feet at the southern end of Cumberland Island. The water depth in Cumberland Sound varies between 10 and 20 feet below mean low water level (EDAW, Inc., 1981).

Estuaries serve as nursery, feeding, and spawning areas for the majority of fish species inhabiting the coastal waters. There are approximately 50,000 acres of estuary within the region with salt marshes comprising 60 percent of this area. Decaying marsh grass is ultimately transported into the open estuarine waters by the tides where it becomes a foundation for the marine food chain. Blue crabs are harvested in Cumberland Sound and adjacent water bodies. Cumberland Sound was once an oyster fishing area but has been closed due to pollution of the oyster habitat. A number of fish species inhabit these waters and contribute to the active commercial fishing industry in the region (EDAW, Inc., 1981). The quality of the water in the Cumberland Sound estuary is influenced by both natural conditions and man-made pollution. There are four large point sources of pollution in the immediate vicinity of the sound, including three kraft paper mills, one on the North River and two on the Amelia River, and one municipal sewage treatment plant discharge on the Amelia River. Each of these sources discharge wastewater of high organic content and, hence, high oxygen demand (Environmental Science and Engineering, Inc., 1975).

4.4.2 Endangered, Threatened, and Rare Species. The environment of the SUBASE Kings Bay supports a number of threatened and endangered species identified from both the Federal and State listings. These listings include U.S. Fish and Wildlife Service, 1978-1979, List of Endangered and threatened Wildlife and Plants (Environment Reporter, Federal Register, Vol. 1, 101:1519-1522), and Georgia's Protected Wildlife and Plants, 1976-1977. SUBASE Kings Bay plays an important role as a wildlife refuge. Seventeen endangered and threatened species have been listed as

possibly occurring in the near vicinity of the base. An additional six endangered species have been listed as possibly occurring in the general area by the U.S. Fish and Wildlife Service and the Georgia Department of Natural Resources (see Appendix B). Five of these endangered species were observed during the MOTKI field surveys including the colonial pocket gopher, southern bald eagle, eastern brown pelican, American alligator and Arctic Peregrene Falcon (Environmental Science and Engineering, Inc. 1980).

Two fish species listed as endangered by the Georgia Department of Natural Resources inhabit Cumberland Sound: the Atlantic sturgeon and the short-nose sturgeon. Also, several specimens of the Florida manatee have been observed in the region. The St. Marys River entrance has been designated as part of the critical habitat for this endangered species (EDAW, Inc., 1981)

Appendix B and Appendix C show all endangered, threatened, and unusual flora and fauna occurring or possibly occurring in the vicinity of SUBASE Kings Bay. Unusual species in the State of Georgia have been designated to include "any resident species which exhibits special or unique features and therefore deserves special consideration in its continued survival in the state" (Georgia Department of Natural Resources, Game and Fish Division, 1976).

4.5 PHYSICAL FEATURES

4.5.1 Climatology. The SUBASE Kings Bay, Georgia experiences sub-tropical climate, with hot wet summers and cool, dry winters. The mean annual temperature is approximately 68°F. Temperatures rarely rise above 100°F because of the moderating effect of the ocean. Most of the precipitation occurs in the form of rain from summertime showers or thundershowers. Snowfall is not very common but has been recorded during three of the past five winters. The mean annual precipitation at Kings Bay is estimated to be 54-inches (Environmental Science and Engineering Inc., 1975). Relative humidity varies widely throughout the year from an annual average of 87 percent in the morning to 55 percent during the afternoon. The relative humidity is generally highest during hot summer months (June through September), and lowest during the spring (March through May). Dense fog occurs quite frequently at Kings Bay.

Prevailing annual winds at the activity are westerly, with strong northerly components in winter and southerly components in summer. Highest prevailing wind speeds (9-10 mph) are experienced in late winter and early spring, with lightest winds occurring during the summer. The seasonal and annual wind pattern is influenced by the land/water temperature along the coast. Thunderstorms do occur, but more frequently in summer with an average of 64 days per year. Tropical cyclones and hurricanes have usually occurred in the months of August and September. Tornadoes are very common, but generally occur during the months of March through May (Environmental Science and Engineering, Inc., 1975).

4.5.2 Topography. The area around the SUBASE Kings Bay is generally flat and marshy and traversed by slow, meandering streams. The highest area is about 60 feet above mean sea level (msl), located 10 miles southwest of the Naval Submarine Base (See Figure 4-3). The average elevation at SUBASE Kings Bay is 30 feet above msl (Environmental Science and Engineering, Inc., 1980).

The elevations on the Naval Submarine Base range from zero msl along the Bay and in streams to slightly above 30 feet msl in the extreme western sections along the State Road 40 spur. Generally, elevations decrease from west to east along the activity with average of about 15 feet msl. The area is virtually flat; however, steep slopes can be observed along deeper drainways. These drainways are located north of the activity.

4.5.3 Geology. The Kings Bay region is located in the Georgia coastal plain section of the continental shelf that was once beneath the sea. It emerged from the sea because of land uplift and a general decline of the sea. The present features at the activity were etched during the ice age. The growth of the ice caps caused enough accumulation of water to lower the level of the sea. Once the water melted the sea level rose again. The alternating retreating and advancing of the sea over the area accounted for the existing landforms mainly through carving the ancient shore lines (Environmental Science and Engineering, Inc., 1975). The shoreline complexes which were deposited have not been accurately dated, but it is somewhere around Pleistocene and Holocene in age. Seven different shorelines have been discovered around the Kings Bay as shown in Figure 4-4. They are the Wicomico, Penholoway, Talbot, Pamlico, Princess Anne, Silver Bluff, and Holocane. The oldest is the highest on the landscape. Conversely the youngest is the lowest on the landscape. The description of the shoreline complexes are restricted to Pamlico, Princess Anne, and Silver Bluff which occur in the vicinity of the SUBASE Kings Bay.

The Pamlico shoreline complex generally ranges from 15 to 35 feet above sea level consisting chiefly of clayey and sandy materials.

The Princess Anne shoreline complex is 10 to 15 feet above sea level. SUBASE Kings Bay falls into this classification of complexes (See Figure 4-4). It is on low upland ridges just west of the salt marsh. The complex is not well defined and developed as the others, which indicates that the sea was at this level for a relatively short time.

The silver bluff shoreline complex is 6 to 10 feet above sea level consisting of intercoastal flats, salt marshes, and the off-shore barrier island. Cumberland Island is represented by the silver bluff shoreline (See Figure 4-4). Parts of the barrier islands have been formed in recent times. Most recent deposits, however, are on the flood plain of the major streams.

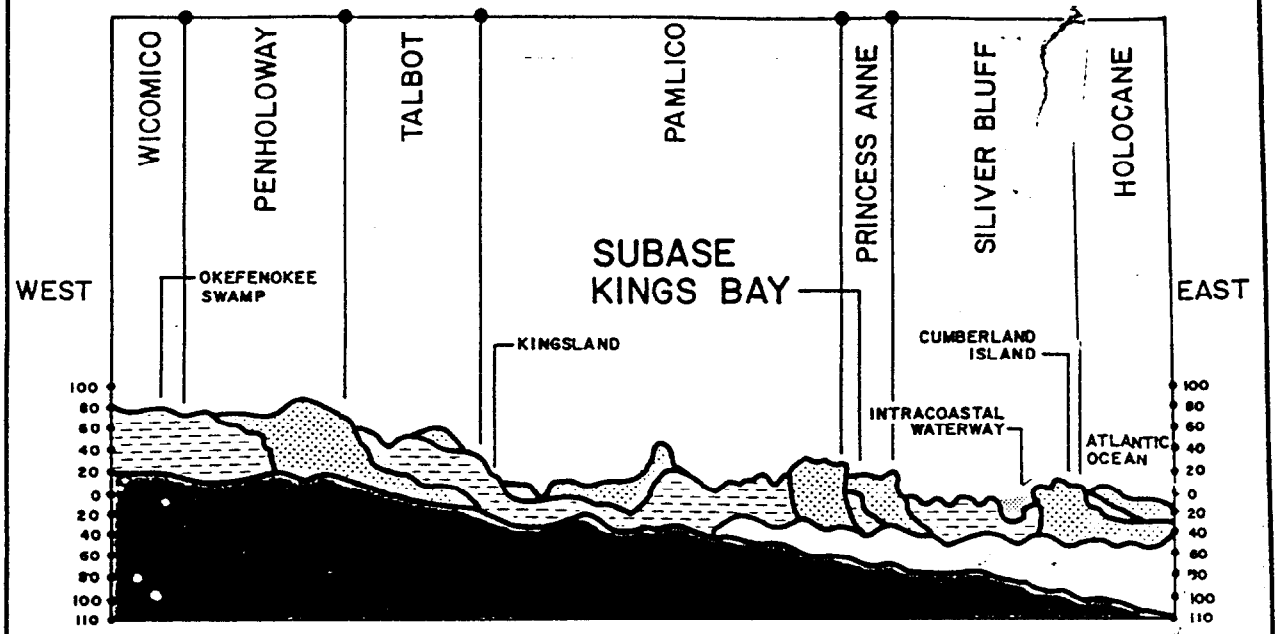
0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | > 30

ELEVATION ABOVE MSL

SOURCE: ENVIRONMENT SCIENCE AND ENGINEERING INC. 1975

FIGURE 4-3
TOPOGRAPHY OF THE
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA



LEGEND

- MIOCENE SEDIMENTS
- PLEISTOCENE SEDIMENTS
- LAGOON-MARSH FACIES
- BARRIER ISLAND FACIES

Vertical Scale exag: 200x 0 1 4miles
Horizontal Scale approx.:

SOURCE : SOUTHERN DIVISION
NAVFACENGCOM, 1981

FIGURE 4-4
GEOLOGIC FORMATIONS IN AND AROUND THE NAVAL SUBMARINE BASE KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

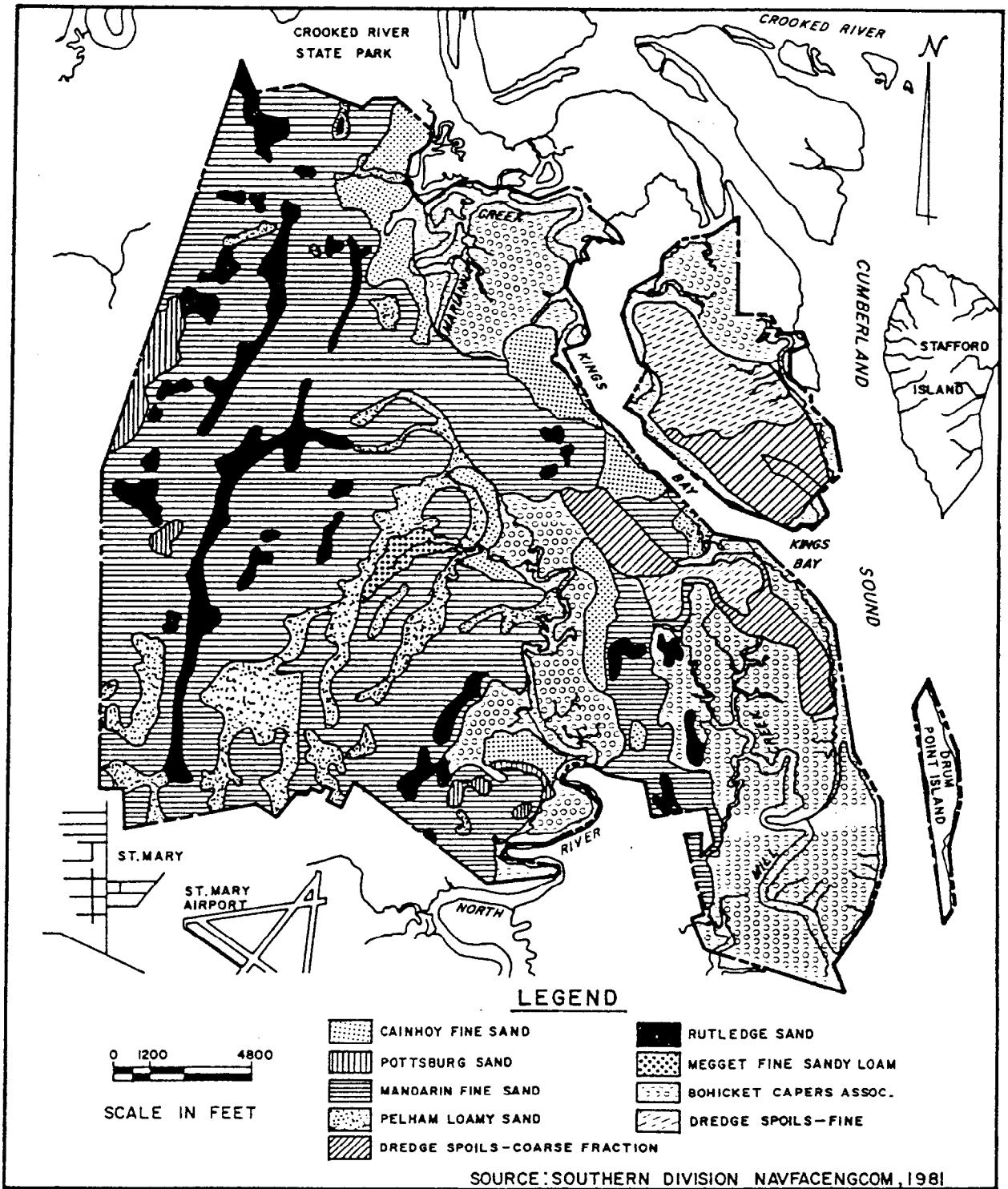
The surficial deposits vary in depth from 40 to 100 feet composed of layers of sedimentary rock dominated by sandstones, shales, and limestone, with some layers of sand and clay. Bedrock is found at 4,000 feet below the surface, consisting of ancient crystalline rocks. This bedrock material has been seismically stable, and there are no known faults within Kings Bay, Georgia.

4.5.4 Soils. The soils at SUBASE Kings Bay are derived from marine deposits. Generally they consist of sands and fine sands on the uplands, and silty clays and clays in the tidal marsh areas. Soils at SUBASE Kings Bay can be classified into seven different categories (Soil Conservation Service, 1980). Figure 4-5 shows soil distribution at the activity, and Table 4-1 depicts the classification of soils and their drainage characteristics. Each of these soil types is listed and described on the following pages.

1. Cainhoy Fine Sand
2. Pottsburg Sand
3. Mandarin Fine Sand
4. Pelham Loamy Sand
5. Rutledge Sand
6. Meggett Fine Sandy Laom
7. Bohicket - Caper & Association

Cainhoy Find Sand: The Cainhoy soils are somewhat excessively drained, nearly level and gently sloping. Typically, the surface layer is dark gray fine sand about 5 inches thick. The underlying layers to a depth of 120 inches are fine sand. The upper 18 inches of the underlying material is brownish yellow. Below this is a very pale brown layer to a depth of 50 inches. Next are light gray and white layers to a depth of 101 inches. Below these is a black and dark reddish brown layer to a depth of 120 inches. These soils occur in narrow strips along the banks of Mill Creek, North River, and Kings Bay (See Figure 4-4).

Pottsburgh Sand: The Pottsburg soils are somewhat poorly drained and are nearly level. Typically, these soils are sand throughout. The surface layer is gray and about 4 inches thick. The subsurface layer extends to a depth of 63 inches. The color varies from light gray with brownish yellow and brown mottles to white with brownish yellow and dark grayish brown mottles. This layer is underlain by weakly cemented, dark brown organic hardpan.



SOURCE: SOUTHERN DIVISION NAVFACENGCOM, 1981

FIGURE 4-5
SOILS MAP OF THE
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

TABLE 4-1

CLASSIFICATION OF SOILS AND
DRAINAGE CHARACTERITICS AT THE
NAVAL SUBMARINE BASE, KINGS BAY, GEORGIA

Type	Rating	Drainage Characteristics
Cainhoy Fine Sand	Class I	Very Good Drainage: Highly Permeable Water Table more than 6 feet Below Surface All Year
Pottsburg Sand Mandarin Fine Sand	Class II	Somewhat Poor Drainage: Moderate Permeability; Water Table within 3.5 feet of Surface for Part of the Year
Pelham Loamy Sand	Class III	Poor Drainage: Moderate Permeability; Water Table within 1.5 feet of Surface for Part of the Year
Rutledge Sand Meggett Fine Sandy Loam Bohicket-Capers Association	Class IV	Poor Drainage: Slow to Moderate Permeability; Water Table at Surface for Part of the Year

Source: EDAW Inc., January 1981.

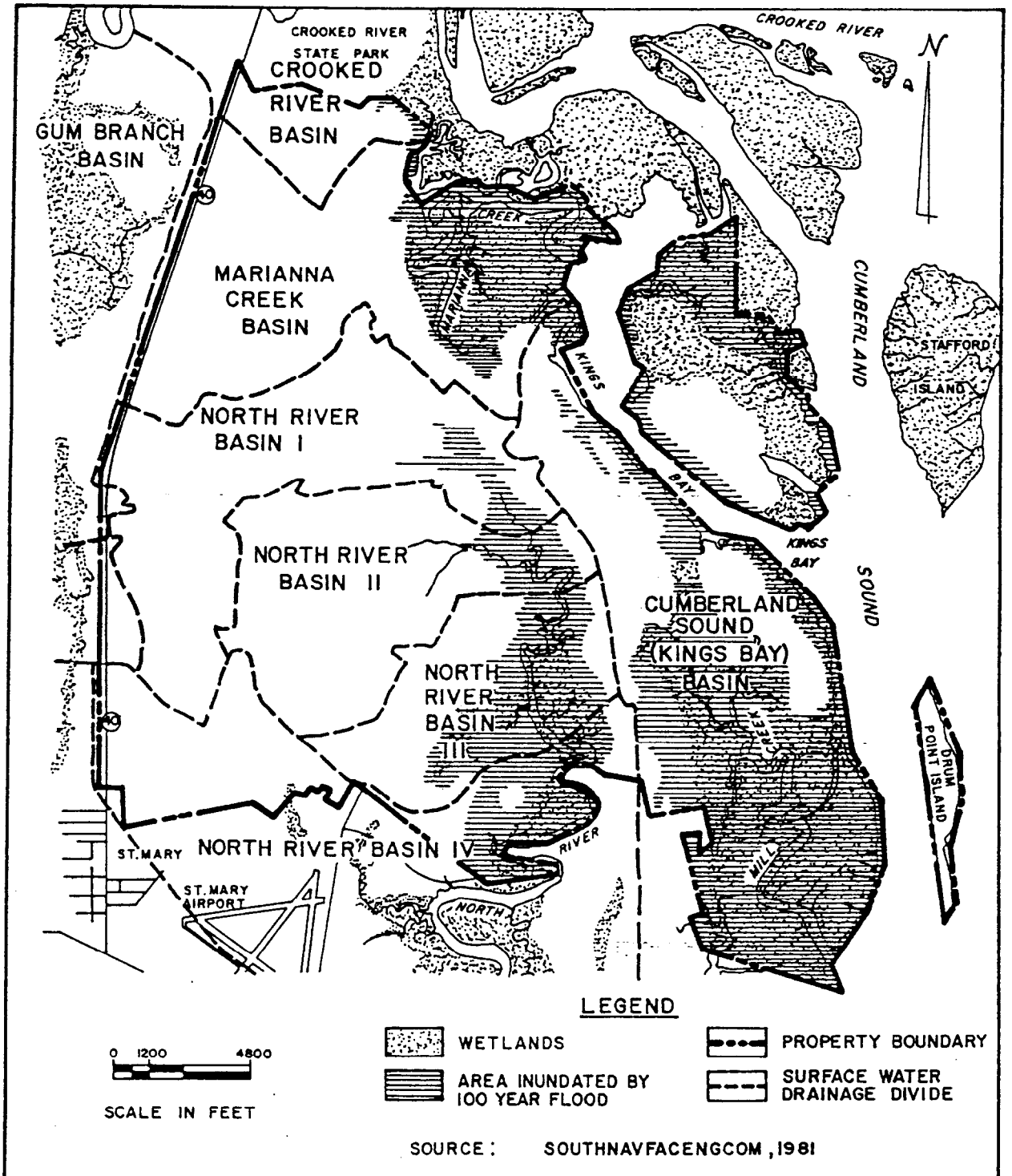


FIGURE 4-6
SURFACE WATER DRAINAGE BASINS AND FLOOD HAZARD AREAS
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

4.5.5.3 Ground Water Hydrology. Ground water at SUBASE Kings Bay occurs in three different aquifers: the water table, the secondary artesian, and the primary artesian aquifer (see Figure 4-7). The water table aquifer is primarily used for irrigation by adjacent communities. The secondary artesian aquifer is not used widely because of extreme variability in water yield. The primary artesian aquifer is used for public water supply by SUBASE and surrounding towns and urban areas.

The water table aquifer at the activity is mainly composed of sands and limestone, with aquifer thickness ranging from 40 to 90 feet. On the western portion of the activity, the aquifer is composed of loose to dense fine sands throughout its thickness. However, on the eastern portions of the activity near Kings Bay, the sands are only about 40 to 60 feet thick, and overlie limestone 60 feet in thickness (Environmental Science and Engineering, Inc., 1975). There are 22 known water table aquifer wells at the activity, ranging in depth from 47 to 81 feet. These wells have been unused since 1978 when the property was transferred to the U.S. Navy.

The secondary artesian aquifer which is located approximately 40 to 90 feet below the ground surface, is generally composed of isolated limestone lenses between the water table aquifer and the principal artesian aquifer. The limestone lenses are highly variable both in thickness and extent. The aquifer thickness ranges from approximately 380 feet to 530 feet. The yields are extremely variable, and hence the aquifer cannot be considered as a principal source of water. The yield is generally better than the overlying water table aquifer, but not as good as the underlying principal artesian aquifer (Environmental Science and Engineering, Inc., 1975). There are no major production wells on the SUBASE Kings Bay tapping the secondary artesian aquifer.

The principal artesian aquifer consists of limestone located approximately 470 to 570 feet below the ground surface. Drinking water for the activity and adjacent communities, is pumped from this aquifer, which is the deepest and most productive in the vicinity of the base (Environmental Science and Engineering, Inc., 1981). The principal artesian aquifer is divided into two water bearing zones with different types of limestone, separated by a dense, confining 100 to 150 feet thick layer.

The major production wells at SUBASE Kings Bay tap the principal artesian aquifer. Wells tapping this aquifer are under pressure, and water levels within a tightly cased well will rise to an altitude of between 20 and 30 feet above sea level. Most wells tapping this aquifer yield in excess of 1,000 gallons per minute. Well depths vary from 600 to 894 feet, with four of the five production wells greater than 800 feet in depth (Environmental Science and Engineering, Inc. 1980). Location of these wells are presented in Figure 2-1.

4.6 WATER QUALITY. The State of Georgia has established water quality standards which are contained in the "Rules for Georgia Water Quality Control" (Georgia Department of Natural Resources, 1980).

TABLE 4-2

WATER QUALITY STANDARDS FOR GEORGIA WATERS

Parameter	Standard		
	Warm Water Fishing	Industrial	Recreational
General	Freedom from sludge deposits, floatables, oil, turbidity, color, odor, toxicity, radioactivity, and physical alterations associated with human activities which may result in objectionable, unsightly conditions or fail to protect indigenous human, animal, and aquatic life usages.		
Dissolved Oxygen			
Daily Average	>5.0 mg/l		>5.0 mg/l
Daily Minimum	≥4.0 mg/l	≥3.0 mg/l	≥4.0 mg/l
pH Range	6.0-8.5	6.0-8.5	6.0-8.5
Temperature Maximum	≤90°F (32°C)	≤90°F (32°C)	≤90°F(32°C)
Temperature Increase			
Fresh waters	<5°F (2.8°C)	<5°F (2.8°C)	<5°F (2.8°C)
Estuarine waters	≤1.5°F (0.8°C)	≤1.5°F (0.8°C)	≤1.5°F (0.8°C)
Fecal Coliform Bacteria			
Fresh waters	1000 organisms/100 ml mean* 4000 organisms/100 ml max*	—	200 organisms/100 ml mean*
Estuarine waters	National Shellfish Sanitation Program		100 organisms/100 ml mean*
Toxic Wastes and Other Deleterious Materials	None in concentration that would harm man, fish, and game, or other beneficial aquatic life	None in concentrations that would prevent fish survival or interfere with legitimate and beneficial uses.	None in concentrations that would harm man, fish, and game or other beneficial aquatic life

* Geometric mean of no less than 4 samples at a given site over a 30-day period at intervals not less than 24 hours.
† National Shellfish Sanitation Program Manual of Operations (U.S. Public Health Service, 1965). Specified bacteriological criteria for shellfish and designation of contaminated areas.

Source: Rules of the Georgia Department of Natural Resources, Environmental Protection Division; Chapter 391-3-6, Water Quality Control; Environment Reporter, 1978.

(ml is milliliter; mg/l is milligrams per liter)

TABLE 4-3

SELECTED WATER QUALITY STANDARDS FOR
FLORIDA CLASS III WATERS -- PREDOMINANTLY MARINE

Parameter	Standard
Biochemical Oxygen Demand	Not to depress the dissolved oxygen below the limit.
Dissolved Oxygen	≥5.0 mg/l daily average ≥4.0 mg/l minimum
Chloride	No more than a 10% increase over background; natural fluctuation maintained.
Nutrients	None which will create an ecological imbalance.
Toxic Substances	None present.
Bacteriological Quality	Fecal Coliform / Total Coliform
Monthly Average	≤200/100 ml / ≤1000/100 ml
Maximum	≤800/100 ml / ≤2400/100 ml
Aluminum	≤1.5 mg/l
Arsenic	≤0.05 mg/l
Cadmium	≤0.05 ug/l
Chromium	≤1.0 mg/l
Copper	≤0.015 mg/l
Iron	≤0.3 mg/l
Mercury	≤0.1 ug/l
Nickel	≤0.1 mg/l
Lead	≤0.03 mg/l
Silver	≤0.05 ug/l
Zinc	≤0.03 mg/l
pH	pH 6.0-8.5; less than 1.0 unit change, 0.2 unit for open coastal water.
Oil and Grease	≤5.0 mg/l; no visible slicks or sheen
Turbidity	≤50 Jackson Candle units above background
Shannon-Weaver Diversity Index	Not decreased to ≤75% of background for benthic invertebrates

Source: Florida Department of Environmental Regulation. Rules 17-3, 17-4, and 17-5, Florida Administrative Code, March 1, 1979.

Engineering, Inc., 1980) concluded that the water from the water table aquifer is acidic in composition (pH range 4.0 to 6.6) with high levels of organic carbon. Occasionally, chlorides were high near salt water bodies. Mercury exceeded the Federal Primary Drinking Water Limits (EPA, 1976).

Water in the secondary artesian aquifer has fewer minerals than the underlying primary artesian aquifer, but more than the upper water table aquifer (Environmental Science and Engineering, Inc., 1975).

Public water supplies for SUBASE and adjacent communities are drawn from the principal artesian aquifer, and the water is of such quality that only chlorination and aeration are required. Aeration removes high concentrations of iron and hydrogen. The treated waters typically are not softened even though hardness levels exceed 300 mg/l of calcium carbonate. Dissolved solids concentrations sometimes exceed the U.S. Public Health Service limit of 500 mg/l. The water in the principal artesian aquifer is categorized as very hard and alkaline with moderate amounts of dissolved solids (Environmental Science and Engineering, Inc., 1975).

Contamination of brackish water with the fresh groundwater has also been noticed in Coastal areas around Kings Bay.

4.7 WATER SUPPLY. The water supply system on the base consists of two water treatment plants. One facility, the Waterfront Water Treatment Facility (WWTF), serves the Waterfront Development Area, while the other facility, the Base Water Treatment Facility (BWTF), serves all other areas. Each system has associated distribution lines. A service line connecting the two water plants was constructed to meet the base fire flow requirements. The two plants act separately except during a fire. Water for these plants is supplied by five wells yielding in excess of 1000 gallons per minute each. Well depths vary from 600 to 894 feet with four of the five production wells greater than 800 feet in depth.

The entire region of SUBASE Kings Bay is underlaid by an abundant source of water in the Principal Artesian Aquifer. The aquifer water is of good quality and provides sufficient yield for present population levels. The only limitation of future supplies is the posibility of contamination by saltwater intrusion. Within the region, water is distributed by county and municipal agencies. Private wells supply water for most of the individual homes and businesses in rural areas.

In Camden County, water treatment facilities for St. Marys, Woodbine, and Kingsland are adequate for present demands. However, the water distribution systems of both St. Marys and Woodbine require extensions and replacement of inadequate sized lines. Kingsland's distribution system is adequate.

4.8 MIGRATION POTENTIAL. SUBASE Kings Bay is located on an arm of Cumberland Sound called Kings Bay. It is between the St. Marys River and Crooked River and connected to the sea by a 12-mile access channel which

passes through the St. Marys Inlet. Major routes of contaminant migration are through surface runoff to the intermittent creeks and rivers by storm drainage ditches, or by infiltration from the surface into the ground water. Surface runoff at SUBASE Kings Bay is slow because of the flat slopes and the amount and intensity of the rainfall. The mean annual precipitation at SUBASE Kings Bay is estimated to be 54 inches. The water table aquifer is isolated from the underlying artesian aquifers by confining layers of relatively impermeable clays and limestones. The presence of permeable sands in the area is conducive to rainfall percolation directly into the water table aquifer which is a potential source of ground water contamination. The water eventually migrates through the water table aquifer and discharges into streams, rivers, and springs including the North River, Crooked River and Marianna Creek. These streams and rivers eventually flow to Kings Bay and Cumberland Sound. The fresh water bodies described above are used principally for noncontact recreation including boating, fishing and navigation (see Section 4.6.1).

CHAPTER 5. WASTE GENERATION

5.1 INDUSTRIAL OPERATIONS. Most of the shops and operations described in this section have existed subsequent to the Navy's aquisition of the Naval Submarine Base property in 1978. The Base is the site of a former U.S. Army Terminal. Originally designated as the Kings Bay Army Terminal, it was constructed to meet Department of the Army requirements for east coast port facilities, capable of shipping ammunition and other explosives in the event of a national emergency. Upon completion in 1958, there was no immediate operational need for this installation, and it was subsequently placed in an inactive status. On April 1, 1965, as result of a major reorganization, the terminal was placed under the jurisdiction of the newly organized Military Traffic Management and Terminal Service, and on July 1, 1965 became officially known as the Military Ocean Terminal, Kings Bay (MOTKI). MOTKI was designed to store ammunition or explosives for short periods of time, generally less than 3 months. The terminal was directly subordinate to the Military Ocean Terminal, Sunny Point, N.C.

MOTKI had no assigned military personnel and was operated by nineteen U.S. Government Civil Service employees, whose mission was to plan programs, perform repairs on utilities, and provide fire prevention and protection functions for the terminal. The most prominent feature of the terminal was its wharf. This steel and concrete wharf was two thousand feet long, eighty-seven feet wide and contained three parallel railroad tracks. As a result of these features, trains and tractor trailors could enter the wharf from one end and depart from the other without reversing direction. MOTKI had its own complete railroad system, consisting of forty-seven miles of railroad tracks within the terminal which connected with the St. Marys Railroad just outside the terminal. Operating facilities on the wharf included the railroad tracks, various administrative and operational buildings including the headquarters, bachelor officers' quarters, fire station, motor pool and cafeteria, smokehouses, a public address system, floodlights for round-the-clock operations, and a water system for firefighting.

In July 1, 1978, ownership of the property that MOTKI had occupied was transferred to the Navy for development of the Naval Submarine Base. The following sections discuss the various shops that are operated by the Navy at SUBASE Kings Bay.

5.1.1 Public Works Shops. A number of shops at SUBASE Kings Bay have been operated by a private contractor for the Public Works Department. The Base Operating Services Contractor (B.O.S.C.), is supervised by the Public Works Department and operates the Vehicle Maintenance, Carpentry, Paint and Plumbing, Heating, Ventilation and Air Conditioning, Steam and Compressed Air, Roads and Grounds, and Electrical Shops to their specifications.

5.1.1.1 Vehicle Maintenance Shop. The vehicle maintenance shop has been located in Building 2007 since 1981. Between 1979 and 1981 this shop was located in Building 1016, which is now the interim hazardous waste storage facility. The shop's responsibilities include the maintenance and repair of all government vehicles and equipment (including locomotives, ships, and lawn maintenance equipment).

Waste oil has been contained in a 500 gallon underground tank located next to the asphalt driveway until it is hauled off base by a private contractor. Reportedly, small quantities of paint solvents and transmission, brake, and other automotive fluids are also added to the waste oil tank. Absorbent material is used to contain minor spills and is placed in the dumpster for removal from the base. An automobile and equipment painting operation has also been active at the motor vehicle maintenance shop. Waste materials (paints and thinners) from this operation are stored in drums and removed periodically off-base. Waste batteries have also been generated. Quantities and disposal methods associated with these wastes are presented in Table 5-1.

5.1.1.2 Carpentry, Paint and Plumbing Shop. This shop has been located in Building 2006 since its inception in 1980. All three operations have been performed in one work area. Reportedly, the carpentry and plumbing operations do not generate any hazardous waste. Only minor plumbing work has been done and all paint wastes from carpentry operations have been handled by paint shop personnel.

The main responsibility of the paint shop has been the general painting of all buildings at SUBASE Kings Bay. These operations generate approximately six 55-gallon drums of waste paints and solvents such as lacquer, thinners and mineral spirits each year which have been hauled off-station by a contract waste hauler. Paint (mostly latex) and thinner have been purchased in small containers (less than 5 gallons) and the empty containers have been disposed of in the dumpsters. Solvents have been received in 55-gallon drums which have been sold for recycle when empty.

5.1.1.3 Heating, Ventilation and Air Conditioning. The heating, ventilation and air conditioning shop has been responsible for the maintenance and repair of the air movement systems for all buildings at SUBASE Kings Bay. Boilers, condensers, and heat exchangers are handled by the steam and compressed air shop. Reportedly, the heating, ventilation and air conditioning shop uses no chemicals that are considered hazardous or that require special disposal.

TABLE 5-1

ESTIMATED VEHICLE MAINTENANCE SHOP
WASTE GENERATION AND DISPOSAL, SUBASE KINGS BAY

Years of Generation	Waste Types	Estimated Total Quantity	Location of Disposal	Comments
1981-1985	Waste Oil	3,000-5,000 gallons	Hauled off base by waste hauling contractor	
1981-1985	Batteries	500	Turned in for recycle to supply Building 2006	Batteries are turned in containing acid
1981-1985	Paint waste, thinner and solvent	1,300	Hauled off base by waste hauling contractor	Waste from vehicle and equipment painting

5.1.1.4 Steam and Compressed Air Shop. This shop is responsible for the maintenance and repair of all boilers, condensers, heat exchangers, and related equipment. Scale removal using muriatic acid and tri-sodium phosphate is the only shop operation generating quantities of chemical waste. Quantities disposed and disposal methods used are presented in Table 5-2. The muriatic acid is diluted to approximately one half strength before use. In the past until early 1985, the spent muriatic acid was further diluted and disposed at unknown locations on the ground. The quantity of acid disposed of on these occasions is unknown. Since early 1985, the acid has been neutralized with tri-sodium phosphate and discharged into the sewage system.

Approximately 100 bags of waste asbestos insulation were generated when the cooling towers at the housing development were replaced in February 1985. The doubled plastic bags of asbestos were disposed of off-station by a contract waste hauler.

5.1.1.5 Electrical Shop. The electrical shop, a part of the Public Works Department, has been located in Building 2010 since early 1981. The shop has been responsible for the maintenance and repair of the electrical distribution system, building electrical wiring, and all electric motors. Reportedly, the electrical shop uses no solvents or chemicals requiring disposal. The storage and disposal of PCB-filled transformers is handled by the Public Works Department as discussed in Section 6.1.5.

TABLE 5-2

ESTIMATED STEAM AND COMPRESSED AIR SHOP
WASTE GENERATION AND DISPOSAL, SUBASE KINGS BAY

Years of Generation	Waste Types	Estimated Total Quantity	Location of Disposal
1980-1981	Muriatic acid	4,000 gal	Neutralized and poured down drain to activity WWTP
1981 early 1985	Muriatic acid	2,700 gal	Diluted and poured onto ground at various unknown locations
1980 early 1985	Tri-sodium phosphate	1,400 gal	Neutralized and poured down drain to activity WWTP
1982 early 1985	Tri-sodium phosphate	900 gal	Diluted and poured onto ground at various unknown locations

5.1.1.6 Roads and Grounds Maintenance. The roads and grounds maintenance shop has been located in Building 2010 since November 1984. The shop has been responsible for the maintenance of all roads and grounds at SUBASE Kings Bay. All vehicles and equipment used by roads and grounds shop personnel have been serviced by the Public Works Vehicle Maintenance Shop. The only operation using hazardous materials has been the application of herbicides.

5.1.2 USS Simon Lake. The USS Simon Lake, a submarine tender, has been responsible for the maintenance and repair of submarines since July 1979. The USS Simon Lake has on-board capabilities to perform all industrial operations required as part of the maintenance and repair of submarines. Additional responsibilities include the transferring of submarine generated wastes to the T-Shed (Building 5028) for ultimate disposal and the reloading of provisions. Reportedly, lead acid batteries, which have been received from submarines and vehicles, periodically break causing minor spills (of less than 10 gallons). Oily wastes generated by the submarine tender go to either the oil/water separator at the Auxillary Repair Dock Medium (ARDM) or to the waterfront wastewater treatment plant which also includes an oil/water separator. Table 5-3 is a list of typical wastes generated in a three month period from the USS Simon Lake. These wastes have been stored at the T-shed unitl transferred to Building 1016 (interim hazardous waste storage facility).

5.1.3 Dry Dock (ARDM) Operations. The main function of the ARDM (Auxillary Repair Dock Medium) has been to provide a work area for the refitting of submarines since 1979. Refitting of submarines has included the removal of marine growth and paint, repainting, and replacement of worn parts. Large amounts of wastewater have been generated by hydroblasting operations during the marine growth removal. This water, (containing paint chips) has been discharged directly to the wastewater treatment plant. Oily wastewater from the submarines has been pumped to the oil/water separator at the ARDM and then to the wastewater treatment plant. Approximately 21,000 gallons of waste oil have been pumped from the oil/water separator storage tank each year since 1981. This waste oil is sold to a waste oil recycling contractor. Paint chips from paint removal, solvents, and waste lubricating oil and grease are placed in drums and sent to the interim hazardous waste storage facility (Building 1016) prior to removal by a waste disposal contractor. A list of typical chemical wastes generated at the ARDM during a three month period is presented in Table 5-4.

5.1.4 Auto Hobby Shop. The auto hobby shop, located in Building 1021, has provided facilities to military personnel for private vehicle maintenance since 1981. The shop began at Diamondback area between 1979 and 1980 during which time military personnel were permitted to use the facilities at the vehicle maintenance shop in Building 1016. As part of the construction of Building 1021 in 1981, a 500 gallon underground waste

TABLE 5-3

CHEMICAL WASTES GENERATED FROM THE USS SIMON LAKE
DURING A TYPICAL THREE MONTH PERIOD, SUBASE KINGS BAY

WASTE TYPE	QUANTITY GENERATED[1]
Waste lubricating oil	1200 gallons
Neutralized battery acid	(1) 55-gallon drum
Monoethanol amine and monoethanol amine residues	650 gallons
Potassium hydroxide	(5) 55-gallon drums
Soda ash contaminated with acetic acid	(1) 55-gallon drum
Empty monoethanol amine containers	(50) 5 gallon containers
Mercuric nitrate	(3) 55-gallon drums
Hydrogen peroxide	52 ounces
Paint and thinners	(11) 55-gallon drums
Sulfuric acid	30 gallons
Lithium hydroxide	12 lbs
Caustic soda	(4) 55-gallon drums
Ammonium hydroxide	6 gallons
Triethanol amine	2 gallons
Catalyst carbon monoxide	10 gallons
Acetic acid	(1) 55-gallon drum
Lithium bromide	(4) 55-gallon drums
Ion exchange compound	450 lbs
Hydrochloric acid	7 gallons
Hydrazine	310 gallons
Empty grease cans	(22) 5 gallon cans
Oxygen breathing apparatus cannisters	75
Bleach	5 gallons
Perchloroethylene	(1) 55-gallon drum

[1]Wastes generated are stored at the T-Shed until they can be transferred to Building 1016 (interim hazardous waste storage).

TABLE 5-4

CHEMICAL WASTES GENERATED AT THE ARDM DURING
A TYPICAL THREE MONTH PERIOD, SUBASE KINGS BAY

WASTE TYPE	QUANTITY GENERATED
Mixed waste paints	(20) 55-gallon drums
Waste grease	(5) 55-gallon drums
Empty grease containers	(42) 5-gallon containers
Hydrochloric acid	(1) 55-gallon drum
Sulfuric acid	(1) 55-gallon drum
Boiler compound	(2) 5-gallon containers
Monoethanol amine	15-gallons
Oily sludge	(1) 55-gallon drum

Oil storage tank was also installed. Waste engine oil and other automotive fluids as well as approximately five gallons per week of solvents are added to the tank. On several occasions the tank has overflowed onto the ground. When this occurs the fluid is contained with an absorbent material and placed in a 55-gallon drum for removal by the waste oil contractor. The shop also collects waste batteries and sells them to a private salvage operation. Quantities of waste generated and methods used for their disposal are shown in Table 5-5.

5.1.5 Port Services. Port services has been located on the wharf in Building 5026 since July 1979 and is operated by the Operations Department. The main function of the Port Services is to provide incoming ships with tug boat and pilot services; berthing space with electric, water and sewer services; and reloading services for provisions. Port services has never been responsible for the off-loading of any wastes from ships. Off-loading of ship generated wastes has been performed by the Public Works Department.

Land vehicles operated by port services have been maintained by the Public Works vehicle maintenance shop. Port services maintains three tug boats, one landing craft, and two floating cranes. Waste oil, other engine fluids and solvents (trichloroethane) generated by the maintenance of these crafts have been stored in 55-gallon drums. About 3300 gallons per year of these materials have been generated. They have then been hauled off-base by a waste disposal contractor. Unknown quantities of bilge water from the water craft have been pumped to the oil/water separator and on to the dockside wastewater treatment plant. No method of bilge water measurement currently exists.

5.1.6 Fire Fighting. The fire station at SUBASE Kings Bay has been located in Building 2004 since 1979. Burning for fire fighter training was conducted at SUBASE Kings Bay once every two months between 1980 and 1981. The burning consisted of igniting three to six 55 gallon drums of fluid including waste oil, diesel fuel, and small quantities of paints and paint thinners in an open pit (see Site 2, Section 8.3). Training was discontinued in 1981. No fire fighter training has taken place at SUBASE Kings Bay since 1981.

TABLE 5-5

ESTIMATED AUTO HOBBY SHOP
WASTE GENERATION AND DISPOSAL, SUBASE KINGS BAY

Years of Generation	Waste Types	Estimated Total Quantity	Location of Disposal	Comments
1981-1985	Waste oil	6000-8000 gallons	Hauled off base by waste hauling contractor	
1981-1985	Batteries	200	Sold to private contractor for recycle	Batteries are turned in containing acid
1981-1985	Waste solvents	1040 gallons	Hauled off base by waste hauling contractor, along with with waste engine oil.	

5.1.7 Pest Control Shop. The pest control shop has been at its current location in Building 2010 since 1983. Prior to 1983, the Navy housed the operation in a small building located approximately 200 feet west of Pond M-6. The Army did not operate a full time pest control shop; however, mosquito-control pesticides were applied during summer months when the base was occupied by the Army Reserve. The material was mixed at the job area and applied using thermal foggers. Reportedly, pesticides were never stored on base and spillage of pesticides did not occur.

The pest control shop has been responsible for the control of a variety of rodents, insects, and plants. The pesticides used to accomplish this task included: chlordane, carbaryl, diazinon, dursban, malathion, and naled. Most chemicals have been diluted before application. The majority of the mixing of pesticides have been performed in a dedicated mixing room and minimal spillage has occured. Rinse water from container and equipment rinsing has been contained and used in the next mixture. Empty pesticide containers have been crushed and disposed of off-station by a waste disposal contractor.

Prior to 1981, naptha was mixed with insecticides to help them adhere to tree branches and leaves. In 1984, most unused naptha was turned over to the Defense Property Disposal Office (DPDO), however, three 55-gallon drums were kept in storage at the shop. A list of pesticides reportedly used by the pest control shop during 1980 is shown in Table 5-6. It is believed that these quantities are representative of a typical yearly usage.

Since November 1984, Diaquat has been used at an annual rate of approximately 60 gallons per year. Diaquat, which has been diluted with water and applied through the use of backpack tanks or a larger trailer tank, has been used to kill weeds along fence lines. Mixing has been performed outdoors near the shop and only the amount to be used has been mixed. The Diaquat has been obtained in one gallon containers and empty containers have been washed, rinsed and disposed in the dumpster. Rinse water has been used in subsequent mixtures.

5.1.8 Medical Clinic. The medical clinic, located in Building 1028, has been operating at SUBASE Kings Bay since about 1980. The clinic provides medical service to active duty members and their dependents.

Wastes generated by the medical clinic include infectious wastes and culture plates. Approximately five 20 gallons plastic bags of infectious wastes have been collected each day. The bags have been deposited in a dumpster and disposed of off-station by a private contractor. Between 1980 and early 1984, the infectious wastes were disposed of off-station with the general solid waste of the activity. X-ray development solutions containing silver have been collected in plastic containers and retained by the Supply Department prior to being sent to DPDO at NAS Jacksonville. Approximately 40 grams of silver sludge and 120 grams of silver flakes were accumulated from X-ray operations during August 1984. These quantities vary from month to month depending on the work load at the Medical Clinic.

5.1.9 Dental Clinic. The dental clinic, located adjacent to the hospital in Building 1028, has been providing dental services for personnel on the base since 1982. Wastes from the department include amalgam (containing mercury), silver from x-ray developing, and beryllium dust from grinding tooth casts.

Amalgam has been stored in HGX solution (mercury solution used in filling cavaties). The solution has been collected in plastic containers and kept in a storage closet in the clinic. Approximately one gallon of the solution has been accumulated yearly. Disposal of the waste has not been required.

X-ray developing solution containing silver has been stored in the medical X-ray department prior to transfer to the NAS Jacksonville DPDO.

TABLE 5-6

PESTICIDE USAGE FOR 1980
SUBASE KINGS BAY, GEORGIA

TYPE	QUANTITY	APPLIED CONCENTRATION (Per Cent)
chlordane	24,340 gallons	1.0
	16 pounds	10.0
dursban (chlorpyrifus)	100 gallons	0.5
	100 gallons	0.12
baygon (propoxur)	5 gallons	1.0
malathion	314 gallons	95
	5 gallons	2.5
mineral oils	3,475 gallons	100
naled (dibrom)	36 gallons	85
altosid (methoprene)	7 pounds	7.9
pyrethrum	1 gallons	0.40
diuron	800 pounds	80
anticoagulant	10 pounds	0.025

Beryllium dust has been placed in plastic bags and deposited in a hazardous waste dumpster behind the dental clinic. Approximately once every six months, wastes in the dumpster are collected and disposed of off-station by a waste disposal contractor.

5.2 TENANT ACTIVITIES. SUBASE Kings Bay provides space and services for a number of tenant activities. Brief descriptions of the various tenant activities are presented below.

5.2.1 Mobile Technical Unit 14. The Mobile Technical Unit 14 has been a tenant at SUBASE Kings Bay since about 1982 and has been housed in Building 2014. The function of the unit has been to service and repair electronic equipment used in submarines, vessels and ships. Alcohol and rosin-based flux have been used to clean circuit boards and related components. Approximately 1 quart of alcohol and 4 ounces of rosin based flux per month have been used since 1982. The chemicals have been stored in the building. No waste has been produced since the chemicals have been completely used in the cleaning process. Empty chemical cans have been deposited in a dumpster.

5.2.2 Navy Publishing and Printing Service Jacksonville Detachment. The print shop, presently located in Trailer S-2 and Trailer S-3, has been a tenant activity at SUBASE Kings Bay since 1983. The shop operates two presses and several copy machines. Printing machines have been cleaned once a week using two chemicals: electrostatic solution and blanket wash solution. Most of these solutions evaporate during use and do not generate any liquid waste. During machine cleaning, blanket wash solution, a petroleum base solvent used in cleaning the heads of the press, has been drained from the machine to a one gallon jug. After the solution in the jug settles, the liquid portion has been decanted and reused leaving a residue (dirt and dust from press) at the bottom of the jug. It has been estimated that less than a quarter of a gallon of residue has been produced and not enough has accumulated during the past three years to require disposal.

5.2.3 Explosive Ordnance Disposal Group, Two Detachment. The Explosive Ordnance Disposal Group, Two Detachment (EOD Group Two Detachment) has been located in Building 2013 since 1979. Reportedly, the Army had no EOD or ordnance type detachment at Kings Bay during its period of operation.

The EOD Detachment's principal activity has been to provide ordnance related support to SUBASE Kings Bay, USS Simon Lake, and Submarine Squadron Sixteen. The Detachment also provides diving services to SUBASE Kings Bay.

There have been no waste generating ordnance activites such as manufacturing, loading, or demilitarization at SUBASE Kings Bay. Retrograde ordnance (defective ammo and explosives) have been disposed of by the EOD Group Two Detachment either at Naval Air Station (NAS) Cecil Field, Florida for flares, hand grenades, and small explosives or at the demolition range (Buildings 4979 and 4980) in the case of small arms.

The demolition range consists of an unlined area of 300 feet by 75 eet and is enclosed on three sides by a u-shaped berm which is about 30 feet high. The detonated materials are vaporized, leaving no residue except for occasional pieces of metal debris. This debris has been collected in special metal bins and hauled off-base for disposal by a private contractor.

5.2.4 Photo Laboratory. Since 1983, SUBASE Kings Bay has operated an on-base photo laboratory in Building S-15. One of the main functions of the laboratory has been the preparation of photographs for newspaper articles and most of the processing involves black and white film. The laboratory has also been capable of color slide processing. Estimated quantities of these chemicals and the methods used for their disposal are shown in Table 5-7.

5.2.5 U.S. Army Reserve 370th Detachment. The U.S. Army Reserve 370th Detachment has been at Kings Bay since 1973 and is located in 5 trailers in the Diamondback Area. The Detachment's principal mission at the base has been to provide utility services including electrical and plumbing services. Reportedly, hazardous wastes have not been generated from the utility services. Waste from past camping activities have included tree stumps, wooden pallets, metal ammo boxes, kitchen garbage, and office waste. Approximately 77,000 cubic yards of wastes were disposed between 1973 and 1979 at Site Nos. 5, 6, 7, 8, 12, 14, and 15. The Detachment has not been involved in any ordnance-related operations, nor have they been involved in any transformer work or storage.

TABLE 5-7

ESTIMATED PHOTO LABORATORY
WASTE GENERATION AND DISPOSAL, SUBASE KINGS BAY

Years of Generation	Waste Types	Estimated Total Quantity	Location of Disposal
1983-1985	Black and white developer	72 gallons	Drain to base wastewater treatment plant
1983-1985	Black and white activator	108 gallons	Drain to base wastewater treatment plant
1983-1985	Black and white stop bath (acetic acid)	9 gallons	Drain to base wastewater treatment plant
1983-1985	Mixture of color developer, conditioner, bleach, fixer and stabilizer	162 gallons	Drain to base wastewater treatment plant
1983-1985	Fixer	90 gallons	Turned over to DPDO for silver recovery
1983-1985	Scrap film	6 cu.ft.	Turned over to DPDO for silver recovery

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 INDUSTRIAL. This section describes the storage and transportation of industrial materials at Naval Submarine Base (SUBASE) Kings Bay.

6.1.1 Materials Storage Defense Property Disposal Office (DPDO). The Old DPDO yard was located east of Polaris Lane across USS James Monroe Avenue (see Figure 2-9). The size of the yard was reportedly 450 feet by 75 feet. The fenced and asphalt paved area was used from 1979 to 1983 for storage of waste materials. Materials stored here included 55 one gallon and five gallon paint cans, ten to fifteen 55-gallon drums of waste oil mixed with solvents (including methyl ethyl ketone, and methyl isobutyl ketone). Two transformers were also reportedly stored at this site. It was reported that during operation of the site, between one and five 55 gallon durms of unknown types of materials were spilled onto the asphalt paved area. The materials were cleaned up by Public Works personnel soon after they occurred (see section 8.14 site 13, old DPDO yard).

The DPDO at SUBASE Kings Bay has been at its present location in Building 6016 since January 1984. The office is not a disposal operation but rather a storage and transfer facility. DPDO performs the paper work for hazardous wastes, but does not accept physical custody at its present location.

The size of the present DPDO yard is approximately one acre. Since January 1984 various items have been stored in the paved fenced yard located behind the DPDO office (see Table 6-1). Much of the material has been stockpiled on metal shelves. During the IAS on-site visit, approximately 300 five gallon cans of paint with expired shelf life were being stored. Other shelves contained various metal items such as office equipment. In the southeast corner of the yard, approximately 300 empty lube oil drums were stored. A metal shed, to protect perishable items from the weather has also been in the southeastern corner of the yard. Next to the shed were about 100 empty drums that had contained non-hazardous materials. This area has been used for receiving and storing empty used drums since 1984. No signs of leakage were evident during the IAS on-site visit. Lead acid batteries from submarines were drained at the wharf, they were then stored at DPDO for about two weeks prior to being sent off-base for reclaimation. Ship batteries have been sent to Naval Air Station (NAS) Jacksonville for disposal. Mercury from tender operations has been collected (about 50 pounds per year) and sent to Building 1016, known as the interim hazardous waste storage facility for off-station contractor disposal.

6.1.2 Supply Storage. Supply storage at SUBASE Kings Bay has been located in Buildings 2006, 2007, 2010, 2020 and 2022 in the Industrial Support Area. The Supply Department has provided storage and supply capabilities to the industrial shop area and the waterfront area since 1979. The majority of materials have been delivered to the five buildings mentioned above by truck. Since 1984, Building 2022 has been

TABLE 6-1

TYPICAL MATERIALS STORED AT
SUBASE KINGS BAY DPDO YARD

ITEM	APPROXIMATE QUANTITY
Cans of Paint (5 gallons)	300
Office Equipment	-
Empty Lube Oil Drums	300
Empty Drums (previously containing non-hazardous materials)	100
Scrap Metal	-
Metal Equipment	-

used for storage of lube oil drums, one gallon cans of solvent, spray paint, construction materials, service mart supplies, tools and medical supplies. From 1980 to 1984, Building 2006 was also used to store these types of materials. From 1979 to 1980, Building 2007 was used as a general supply warehouse. The Base Operating Services Contract (BOSC) has stored various supplies in Building 2006 since 1984, including food, uniforms, plumbing and carpentry supplies. The supplies stored in Building 2006 were also used by the submarine tender. The submarine tender stored supplies for its steam engine such as gaskets, nuts, bolts, and tools for repairs. From 1980 to 1984, Building 2010 was used for these supplies and until 1980 a metal building (no longer standing) was utilized. Public Works Transportation stores supplies such as lube oils, lube greases, auto paint and thinners in Building 2007. A flammable storage area measuring 8 feet by 55 feet has been located in Building 2010 for the storage of paints and paint solvents for use by the industrial shops since 1979. The quantities of materials stored varies depending on the rate at which they are used. On the average Building 2010 stores approximately 200 gallons of paint per month.

6.1.3 Chemical and Hazardous Materials Storage. From 1978 to 1982, the major storage area for chemical and hazardous materials used in the pier area has been the Transit Storage Warehouse (T-shed), Building 5028. Materials have been received here by ship and truck and include all materials necessary for operation and maintenance of the submarines. A listing of typical materials can be found in Table 6-2. Chemical and hazardous materials have also been stored at three of the supply storage warehouses, Buildings 2007, 2010 and 2022 since 1979. Since 1982, hazardous wastes awaiting off-base contract disposal have been stored in Building 1016. This building, known as the interim hazardous waste storage facility, has accepted hazardous waste from throughout

TABLE 6-2

MATERIALS STORED AT THE
T-SHED SUBASE KINGS BAY

TYPE	QUANTITY	AVERAGE STORAGE TIME
Paint	48 gallons	Continually as required
Disinfectant	2 gallons	Continually as required
Linsed Oil	1 gallon	Continually as required
Hydrochloric Acid		N/A
Moriatic Acid	30 gallons	3 months
Herbicides	100 pounds	2 weeks
Lube Oil	20 barrels	4 months
Subtropical Bleach	50 pounds	N/A
Lead-Acid Battery	8	N/A
DS2	1 pint	N/A
Chlorine Gas	20 cyclinders	2 weeks
Chemical Sulphoric Acid	15 quarts	3 weeks
Compressed Gases - Oxygen - Air	5 Tanks 2 tanks	5 tanks on hand at all times
Flit MLO	80 drums	12 months
Cleaning Compounds	5 gallons	3 months
Thinner	180 gallons	Continually as required
Freon	19 pounds	N/A

Source: Applied Engineering and Science, 1984.

N/A = Not Available

SUBASE Kings Bay, repackaged it as necessary and stored it prior to pick-up and off-base disposal by a waste hauling contractor. Waste received at Building 1016 has been separated into seven categories for storage. These categories include general waste materials, organics, unknown wastes, reactive wastes, oxidizers, corrosives and acids. About 100 five gallon containers of waste per month have been stored in Building 1016. The two most common types of wastes have been waste paint and mono-ethanolamine (a chemical used in submarine air purifying systems).

Occasionally, there have been small leaks (less than 1/2 gallon) at Building 1016. These leaks are cleaned up immediately with absorbant. Leaking containers and contaminated absorbant are over packed and handled like other waste in the building.

Since 1979, two additional areas have been used to package and stage hazardous wastes from ships at SUBASE Kings Bay. An outside waste staging facility at the T-shed, accepted hazardous wastes from the USS Simon Lake and other ships docked at SUBASE Kings Bay. Reportedly, waste was transported from the staging area to Building 1016 once a week. Table 6-3 identifies the usual types and quantities of wastes stored at this facility as noted during the IAS on-site survey. All of the wastes are staged on an asphalt pad. Additionally, small quantities of hydrogen peroxide, ammonium hydroxide, sodium chromate and acetic acid were awaiting disposal at the time of the IAS on-site survey. An asphalt paved outside waste oil storage area has been located adjacent to Building 5045 since 1979. Typical types and quantities of wastes stored included hydraulic fluid (twenty 55-gallon drums) and lube oil (fifteen 55-gallon drums). There were no reports or evidence of leakage or spillage at the storage area. Building 5027, in the waterfront area has been used by the Submarine Squadron 16 as a flammable materials/acid storage building since 1978. Table 6-4 lists materials that have been stored in Building 5027 since 1980. Compressed gases, such as oxygen (5 tanks), acetylene (3 cyclinders), and argon (2 cylinders), have been stored on covered metal shelves in an area adjacent to Building 5027.

6.1.4 Petroleum, Oil, Lubricant Storage. Petroleum, oil and lubricant (POL) products have been used for the various industrial shops and waterfront facilities at SUBASE Kings Bay since 1979. Materials stored have included Fuel Oil No. 2 (diesel fuel), Mogas, and leaded and unleaded gasoline. Three 48,000 gallon Fuel Oil No. 2 underground tanks have been used by the Mobile Utility Support Equipment, (MUSE) boiler in the wharf area since 1979. A summary of the petroleum storage facilities at SUBASE Kings Bay is shown on Table 6-5. Ships are fueled at pierside with trucks using hose connections. These tank trucks have ranged in capacity from 500 to 5000 gallons. No spills have been reported from pierside fueling operations, nor have any leaks from tanks been reported.

TABLE 6-3

MATERIALS AWAITING DISPOSAL AT
T-SHED STAGING FACILITY DURING IAS ON-SITE VISIT
SUBASE KINGS BAY

ITEM	APPROXIMATE QUANTITY	COMMENT
Caustic Sodas	Unknown	Used with breathing apparatus
CO_2 Absorbant	2 pallets of cans (5-10 gallons each)	
Lube Oil	400 gallons	Picked up monthly by private contractor
Perchloroethylene	Ten 55-gallon drums	
Potassium Hydroxide	Three 55-gallon drums	
Paints and Thinners	Six 55-gallon drums	
Carbon Monoxide	Unknown	

TABLE 6-4

TYPICAL MATERIALS STORED AT
BUILDING 5027 SINCE 1980
SUBASE KINGS BAY

ITEM	APPROXIMATE QUANTITY
Paints	12 gallons
Oil	6 gallons
Mono-ethanolyene	165 gallons
Ion exchange compounds	1 cubic yard
Amonium hydroxide	14 gallons
Lithum hydroxide	12 pounds
Sodium phosphate	275 gallons
Nitric acid	1 quart
Potassium hydroxide	45 gallons

TABLE 6-5

SUBASE KINGS BAY PETROLEUM STORAGE FACILITIES

TANK NUMBER[1]	TYPE[2]	PRODUCT	SIZE (GALLONS)
99	UG	Fuel Oil #2	2,060
90	UG	Fuel Oil #2	2,060
95	UG	Fuel Oil #2	2,060
86	UG	Fuel Oil #2	2,500
199	UG	Fuel Oil #2	940
1040	UG	Fuel Oil #2	8,000
1003	UG	Fuel Oil #2	5,500
2022	UG	Fuel Oil #2	4,000
1991(a)	UG	Mogas	4,000
1991(b)	UG	Mogas	4,000
1991(c)	UG	Mogas	4,000
1991(d)	UG	Mogas	9,000
1991(e)	UG	Mogas	4,000
1986	UG	Fuel Oil #2	550
1029	UG	Fuel Oil #2	10,000
1931	UG	Fuel Oil #2	15,000
1939	UG	Fuel Oil #2	15,000
1933	UG	Fuel Oil #2	700
2990	UG	Fuel Oil #2	550
2987(a)	UG	Mogas	12,000
2987(b)	UG	Diesel	4,000
2987(c)	UG	Diesel	5,000
2987(d)	UG	Mogas	5,000
2010	UG	Fuel Oil #2	2,800
2007	UG	Fuel Oil #2	3,000
5038	UG	Fuel Oil #2	500
5026	AG	Fuel Oil #2	200

NOTES: 1. In some cases tanks are numbered according to an adjacent building.

2. U.G. - Underground
A.G. - Above ground

TABLE 6-5 (Continued)

SUBASE KINGS BAY PETROLEUM STORAGE FACILITIES

TANK NUMBER[1]	TYPE[2]	PRODUCT	SIZE (GALLONS)
2983	UG	Fuel Oil #2	2,000
1028	UG	Fuel Oil #2	10,000
1979	UG	Fuel Oil #2	6,000
2904	UG	Fuel Oil #2	2,000
2915	UG	Fuel Oil #2	2,000
5027	UG	Fuel Oil #2	250
5972(a)	Earth Mounted	Fuel Oil #2	48,000
5972(b)	Earth Mounted	Fuel Oil #2	48,000
5972(c)	Earth Mounted	Fuel Oil #2	48,000

Underground total 148,470 gallons
Above ground total 200 gallons
Emergency total 144,000 gallons

NOTES: 1. In some cases tanks are numbered according to an adjacent building.

2. U.G. - Underground
A.G. - Aboveground

Source: Naval Facilities Engineering Command, 1983.

6.1.5 PCB Storage. Less than 40 transformers were acquired by the Navy from the Army's Kings Bay Military-Ocean Terminal. These transformers were stored at four locations at SUBASE Kings Bay from 1979 until 1984 awaiting disposal.

Four of these areas were Public Works storage yards (see Section 6.1.8). These storage yards were located behind the interim hazardous waste storage facility, Building 1016, (see Section 8.2, Site 1); a paved area near Building 5006 (see Section 8.4, Site 3); a storage yard behind the water treatment plant (see Section 8-5, Site 4); and behind Building 2016 in the Industrial Support Area. When the regulations defining PCB transformers were changed in 1982 (from less than 500 parts per million PCB to less than 50 parts per million PCB) two of the transformers stored behind Building 2016 were changed from "non-PCB" status to "PCB" status and were moved (in 1982) to Building 1016 for temporary storage while awaiting disposal. There were no reports or evidence of leakage or spills at the storage area. Transformers stored at Sites 1 and 3 were removed and the sites were excavated in 1982 (see Sections 8.2 and 8.4). A spill at transformer oil occurred in December 1982 at the storage area behind the water treatment plant (see Section 8.5, site 4). Approximately one gallon of transformer coolant containing polychlorinated biphenyls (PCB) was spilled from a filler cap onto adjacent soil. The Naval Air Station in Jacksonville tested a sample for PCB and determined coolant was 63 percent PCB. The transformer and 8 cubic feet of contaminated soil were placed in 55-gallon drums and hauled off-base for proper disposal on September 15, 1983 (Simons, 1983).

6.1.6 Pesticide Storage. Pesticides were stored in Building S-130 and Building S-214 from 1978 to 1983. Building S-130 was an area 25 feet by 40 feet and stored household pesticides. Building S-214 was an area about 20 feet by 12 feet and stored pesticides for mosquitoes. Since 1983 pesticide operations have been handled out of Building 2010. A listing of pesticides stored and used at SUBASE Kings Bay during 1980 is shown in Table 6-6. From 1980 until 1984, an outdoor area near Building 4019 was used as a storage facility for about twenty-five 55-gallon drums of Chevron Chemical Company's Flit® MLO (Mineral Oil Light). Flit MLO is a biodegradable pesticide that was used to kill mosquito larva. Flit MLO was the only pesticide stored at this location. However, in 1984 all of the pesticide had been used and the empty drums were sent to DPDO for disposal.

6.1.7 Nuclear, Biological, Chemical (NBC) Decontamination Agents Storage. Since 1980, DS-2 and supertropical bleach (STB) have been stored by the EOD Detachment as part of their required decontamination materials. About 24 one quart containers of DS-2 have been stored in a flammable storage locker behind Building 2013. About 50 pounds of STB have been stored in a locked trailer. These quantities are typical of past amounts stored by the EOD. Disposal of these materials has never been required.

TABLE 6-6

PESTICIDE USAGE FOR 1980
SUBASE KINGS BAY, GEORGIA

TYPE	QUANTITY	APPLIED CONCENTRATION (Per Cent)
chlordane	24,340 gallons	1.0
	16 pounds	10.0
dursban (chlorpyrifus)	100 gallons	0.5
	100 gallons	0.12
baygon (propoxur)	5 gallons	1.0
malathion	314 gallons	95
	5 gallons	2.5
mineral oils	3,475 gallons	100
naled (dibrom)	36 gallons	85
altosid (methoprene)	7 pounds	7.9
pyrethrum	1 gallons	0.40
diuron	800 pounds	80
anticoagulant	10 pounds	0.025

6.1.8 Public Works Storage Yards. There were four known Public Works storage yard locations. One of the largest of these storage yards was known as Area No. 1. This storage yard was 120 square feet, located at Site 1 approximately 80 feet north of the old vehicle maintenance building (Building 1016) in the far western area of the activity. This yard was used as a temporarily fenced impoundment from 1979 to 1982 (see Section 8.2 Site 1). Ten PCB transformers were stored at this location awaiting disposal. It was reported that minor quantities (less than one gallon) of PCB oil leaked from the transformers. All ten transformers and the contaminated soils were removed from the site in 1982 through a private waste hauling contract.

There was a second storage yard behind the water treatment plant. This storage yard was a 20 feet by 30 feet unpaved area with pallets. This area was used as a storage yard from 1983 to 1984.

A third storage yard was located behind Building 2016 in the Industrial Support Area. This storage yard was a 6 feet by 10 feet paved area with pallets. From 1983 until 1984 this yard was used as a temporary storage area.

The fourth storage yard was a fenced, paved area located near Building 5006 (see Section 8.4, Site 3). This storage yard was 120 square feet was used as a temporary impoundment area from 1979 until 1982. Site 3 was used by a contractor to store an unknown number of transformers and construction materials and equipment. Less than one gallon of transformer coolant (containing PCBs) leaked from the transformers onto soil adjacent to the pavement. Soils in an area of approximately 14 feet by 15 feet and 4 inches deep were excavated and, along with the transformers, removed from the base by waste disposal contractor.

6.1.9 Pier Operations: Loading and Unloading from Ships. From 1959 to 1979 the Blue Star Shipping Company was involved in the handling of dynamite and unknown types of explosives at the Army's Military Ocean Terminal Pier. Ordnance materials were trucked to a holding area on the wharf (presently the T-shed) prior to loading on ships. Two disposal sites (Sites 9 and 10; see Section 8.10 and 8.11) reportedly originated from the Blue Star Shipping operations. These two sites near the wharf were used to burn unknown quantities of pallets, paper, dunnage and old dynamite.

An inside concrete paved flammable materials storage facility has been in Building 5027 since 1979. Typical types and quantities of materials stored included monoethyanolamine (thirty 55-gallon drums), paint (thirty 5 gallon cans), methyl sobuty ketone (forty-five 5 gallon cans), toluene (fifteen 5 gallon cans), and trichloromonofluoromethane (thirty 40 gallon drums). There were no reports or evidence of leakage or spillage at the facility.

Presently, the Port Services (under the Operations Department) loads and unloads provisions and waste materials from ships entering port. The wastes have been given to Public Works for off-station contractor disposal.

6.1.10 Materials and Waste Transportation. Since 1979, when the Navy began operations at SUBASE Kings Bay, all in-coming materials entered the Base through the T-Shed. The majority of supplies were brought by truck from Charleston, South Carolina. Every 45 days ships would enter port and off-load fuel and supplies. All materials were stored at the T-Shed or on the submarine tender.

The majority of waste generated at the SUBASE Kings Bay has been domestic solid waste. The wastes have been placed in dumpsters and hauled off-base by a waste disposal contractor. Salvageable materials, such as scrap metal, have been collected and sold by DPDO. Since 1982, hazardous wastes have been transported to Building 1016 for interim storage until picked up by a contract waste hauler. Waste oil was sent to Charleston for recycling from 1979 to 1981. Since 1981, it has been handled by private contract (see Section 7.4). During 1981, other waste materials such as paints and solvents were sent to the Naval Air Station, Jacksonville, because of their large storage facility.

6.1.11 Auxillary Repair Dock Medium (ARDM) Storage Area. This facility, located near the ARDM pier adjacent to Monroe Avenue (see Figure 2-5), has been a paint storage area since 1979. The facility has an area of approximately 1000 square feet. The ARDM is a floating dry dock used for submarine maintenance and repair. Wastes from the USS Oak Ridge were stored here in a 10-foot square building, (Building 221), which was removed sometime after 1982. The facility has been in use since 1979. Waste generated included waste paint, oil, grease, small amounts of paint thinner and cleanup rags. Every 6 months approximately ten, 55-gallon drums of these waste materials were repackaged and transferred to the Public Works Department hazardous waste storage facility (Building 1016) or stored on-site prior to private contractor disposal. It was reported that approximately 100 gallons of waste including vinyl, antifouling and epoxy were spilled on the ground during past use of the area. This spill was cleaned up by repackaging the waste near the end of 1984.

6.2 ORDNANCE. Ordnance storage facilities are currently under construction at SUBASE Kings Bay. From 1959 to 1979, dynamite and unknown types of explosive were stored in what is now the T-Shed, by the Blue Star Shipping Company (see Section 6.1.9). Reportedly no ordnance supplies have been stored in the bunkers since 1959. These bunkers are large earthen mounds surrounding the railroad tracks. Most have been removed, and plans are to use the remaining bunkers as fill for future structures.

CHAPTER 7. WASTE PROCESSING

7.1 GENERAL. This chapter discusses the various methods of waste processing used at SUBASE Kings Bay, Georgia. Waste processing operations at SUBASE Kings Bay include: sewage treatment, solid waste disposal, hazardous waste disposal, oil and solvent recycling, and ordnance disposal.

7.2 WASTEWATER CONVEYANCE AND TREATMENT PLANT. The sewage and wastewater treatment system at SUBASE Kings Bay consists of two independent facilities. The Waterfront Sewage Treatment Plant (WSTP) services the Waterfront Development Area and the Base Sewage Treatment Plant (BSTP) services all other base development areas.

The WSTP, located south of the T-Shed, was constructed in 1978. The 0.4 million gallon per day (mgd) facility includes the following unit processes: aerated pretreatment (equalization), influent pumping, activated sludge, secondary clarification, chlorine contact, aerobic digestion, and sludge dewatering via drying beds. The treatment plant is designed to treat bilge wastewater and sanitary sewage pumped from naval ships in port through lift stations located at the wharf and ARDM area. Daily flows vary considerably with fluctuations in ship loads; however, for the period July 1982 to June 1983, daily flow averaged 0.26 mgd (SOUTHNAVFACENGCOM, 1983).

Effluent from the facility is discharged into Kings Bay under authorization of the National Pollutant Discharge Elimination System (NPDES) permit Number GA 0027707. When the Camden County landfill at SUBASE Kings Bay (Site 11) was operational (1974 to October 1981), sludge and grit from the treatment plants were disposed here. Since late 1981, dried sludge from the sludge drying beds has been periodically removed by a private contractor and disposed of off-station. The estimated quantity of sludge removed is 15 cubic yards per month based on the removal of three beds every two months.

The BSTP is a 0.3 mgd land application treatment system constructed in 1979. The plant, located north of the "Industry Support" area, is an aerated lagoon treatment plant with screening and grit removal. After chlorination, the wastewater effluent has been land applied to forest areas using a spray irrigation system. Sludge has been removed from the lagoons manually on an as needed basis. From 1979 to late 1981, sludge was disposed on-site at Site 11. Since late 1981, the sludge and grit have been disposed off-station. The aerated lagoons have been designed for 15 years of operation without sludge removal.

7.3 SOLID WASTE DISPOSAL. Solid wastes generated at the base during the Blue Star Shipping Company's operation consisted of pallets, paper, dunnage and individual sticks of dynamite. These wastes were burned and buried at Sites 9 and 10 from 1959 to 1979 (see Sections 2.3.9 and 2.3.10). The Army Reserve generated general trash such as office wastes,

wooden pallets, concrete blocks, metal ammo boxes and kitchen wastes. These disposal areas are Sites 5, 6, 7, 8, and 12. Sites 14, 15 and 16 were also used by the Reserves for disposal of drums, empty paint and solvent cans and the wastes mentioned above. SUBASE Kings Bay disposal of solid wastes occured at Site 11, Camden County Landfill (see Section 2.2.11) from 1974 to 1981. Since Site 11 closed, solid wastes from the base have been disposed of off-station by a waste disposal contractor. Since 1981, inert construction material, trees, stumps, roots and brush have been disposed within one of the dredge spoil areas and burned daily to reduce volume. There are approximately 25 acres of dredge spoil areas at the activity. No hazardous waste material have been reported to be disposed in these areas. An average of 28 tons of solid wastes has been generated at the base during the Navy's tenure (1969-1985).

7.4. OIL AND SOLVENT RECYCLING. During the Army's occupation of the base, oil and solvents were not recycled. From 1979 until 1981, waste oil was recycled through Navy facilities in Charleston, South Carolina. This practice occurred until 1981, at which time the recycling was handled through a private waste recycler. Approximately 5,000 gallons of waste oil has been collected per month for recycling. Waste solvents generated at SUBASE Kings Bay have always been recycled through DPDO at the Naval Air Station, Jacksonville.

7.5 ORDNANCE. No ordnance processing operations have occurred at SUBASE Kings Bay in the past.

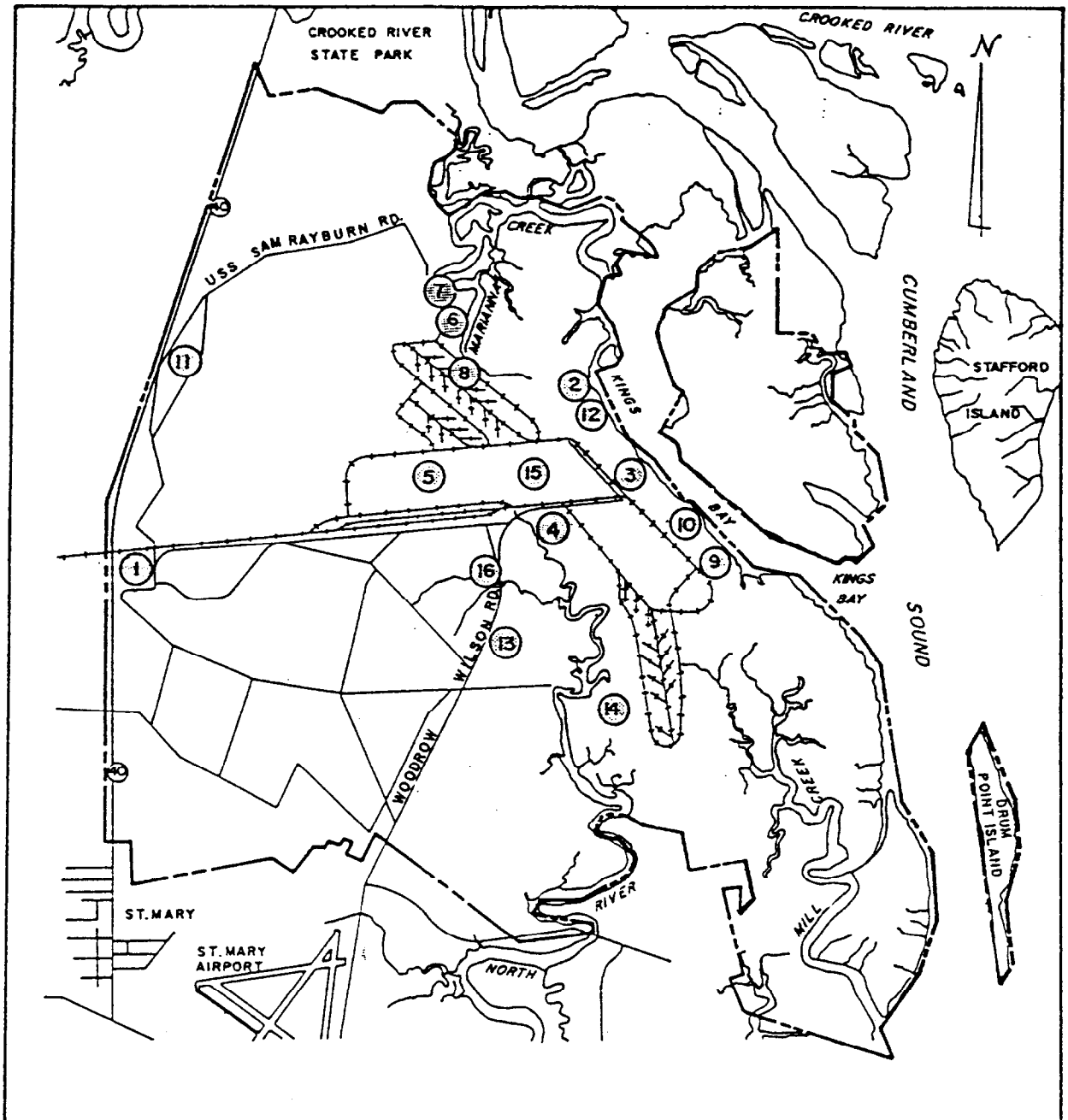
CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 GENERAL. This chapter describes each of the disposal sites or potentially contaminated areas identified at the Naval Submarine Base (SUBASE), Kings Bay, Georgia at the time of the IAS. The locations of the sites are found on Figure 8-1 with more detailed maps following site descriptions. Table 8-1 summarizes the information collected for these sites.

8.1.1 Site Identification. The sites described were identified through several sources including SUBASE records, correspondence, and maps; interviews with activity personnel; examination of aerial photographs; and field examination. For all sites, efforts were made to confirm data through multiple sources.

8.2 SITE 1, PCB TRANSFORMER STORAGE AREA NO. 1. This site, used from 1979 to 1982, was located approximately 80 feet north of the old vehicle maintenance building (Building 1016) in the far western area of the activity (see Figure 8-2). The area was a temporarily fenced impoundment, 120 square feet in size, where ten PCB transformers were stored awaiting disposal. The transformers, as part of the aerial electrical distribution system, were acquired from the Army when the Military Ocean Terminal became Navy property. It was reported that minor quantities (less than one gallon) of PCB oil leaked from the transformers. While the transformers were stored here, they isolated from the environment (since 1981) with plastic sheets placed above and below them and surrounded by earthen berms. A soil sample was taken on September 14, 1982 and analyzed in accordance with Part VI, Volume 44, Number 106, pages 315-38 of the Federal Register. The result of the sample analysis (see Appendix D) found 9.2 ppm PCB (Type 1260) in the soil (Holley Electric Corp., 1982). No Georgia State or Federal standards exist for PCB in soil. Cleanup and removal of approximately 40 cubic feet of soil occurred in September 1982. Soils were excavated over the 120 square foot area to an average depth of approximately 4 inches. All ten transformers and the contaminated soils were removed from the site in 1982 through a private waste hauling contract. During the IAS on-site visit, there were no transformers stored at the site.

8.3 SITE 2, FIRE FIGHTING PIT. The fire fighter training pit (unlined), used from 1980 to 1981, was aproximately 30 feet by 30 feet by 2 feet deep. It was located in the waterfront area off Pelican Road near the intersection of Stimson Drive and Monroe Avenue (see Figure 8-3). Waste oil (from vehicle maintenance), contaminated diesel fuel, paints and paint thinners were poured into the bermed pit and burned once every two



0 1200 4800

SCALE IN FEET

SOURCES: • EDAW, INC., 1981
• AERIAL PHOTO NO. 1-25-82 BC 4078

LEGEND

(4) DENOTES DISPOSAL SITES

SECURITY FENCE AND BOUNDARY LINE

RAILROAD

FIGURE 8-1
LOCATION OF DISPOSAL SITES AND POTENTIAL CONTAMINATION AREAS
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

TABLE 8-1

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 1, PCB Transformer Storage Area No. 1	1979 to 1982	Polychlorinated Biphenyls	N290,000-E686,000 less than one gallon	Site cleaned up in September 1982
Site 2, Fire Fighting Pit	1980 to 1981	Waste oil, diesel fuel paint thinner, hydrazine	N294,000-E700,000 100 cubic yards	Site excavated and material sent to the currently operated Camden County Landfill in 1982
Site 3, PCB Transformer Storage Area No. 2	1979 to 1982	Polychlorinated Biphenyls	N292,000-E696,000 less than one gallon	Site cleaned up in 1982
Site 4, PCB Transformer Storage Area No. 3	Early 1980s to 1983	Polychlorinated Biphenyls	N290,000-E700,000 one gallon	Soil and transformer hauled off-base by a waste disposal contractor

TABLE 8-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 5, Army Reserve Disposal Area, Towhee Trail	1969 to 1974	Tree stumps, wooden pallets, metal ammo boxes, aluminum sheeting, concrete block, kitchen garbage	N292,000-E696,000 69,000 cubic yards	Wastes were disposed into pits; some were burned
Site 6, Army Reserve Disposal Area No. 1	At least 1975 to 1979	Dry wastes, office wastes, garbage	N292,000-E696,000 1600 cubic yards	Wastes were disposed into pits and covered with topsoil
Site 7, Army Reserve Disposal Area No. 2	1971 to 1977	Kitchen garbage	N298,000-E696,000 6500 cubic yards	Used during summer training camps
Site 8, Army Reserve Disposal Area No. 3	1973 to 1974	Paper, wood, kitchen garbage	N296,000-E698,000 350 cubic yards	Depression and 1 totally corroded 55-gallon drum were noticed in the area at the time of the IAS on-site visit
Site 9, Blue Star Shipping Disposal Area, Parking Lot	1959 to 1974	Pallets, paper, dunnage, old dynamite	N290,000-E706,000 1400 cubic yards	This area has been completely excavated during construction activities

TABLE 8-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 10, Blue Star Shipping Disposal Area, T-Shed	1974 to 1979	Pallets, paper, dunnage, old dynamite	N290,000-E704,000 1400 cubic yards	This site has been completely excavated
Site 11, Old Camden County Landfill	1974 to 1981	General household and office wastes, scrap paper, wood, treatment plant sludge and grit	N295,000-E687,000 500,000 cubic yards	
Site 12, Army Reserve Disposal, Area Future Dry Dock	1974 to 1978	Wooden and metal ammo boxes, concrete slabs dummy cargo, waste oil drums	N295,000-E701,000 467,000 cubic yards	The area was excavated in 1983
Site 13, Old DPDO Yard	1979 to 1983	Paints, solvents, antifreeze, waste oil, PCB transformers	N-286,000-E698,000 unknown quantities	The site was closed in 1983 and cleaned up
Site 14, Army Reserve Disposal Area, Kamehameha Avenue	1958 to 1978	Lube oil, diesel fuel, paint	N284,000-E702,000 100 to 200 gallons	Several drums were found during the IAS on-site visit

TABLE 8-1 (Continued)

AREAS OF CONTAMINATION-NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

AREA OF CONCERN	PERIOD OF OPERATION	TYPES OF WASTES DISPOSED OR SPILLED	MAP COORDINATES ESTIMATED TOTAL QUANTITY	COMMENTS
Site 15, Army Reserve Disposal Area near Water Treatment Plant, Stimson Drive	1970 to 1971	Methanol	N292,000-E700,000 50 to 100 gallons	Drums were observed during the IAS on-site visit
Site 16, Army Reserve Disposal Area near Old Sewage Lagoon 3990	1958 to 1964	Food, trash, scrap metal, tree limbs, empty paint and solvent cans	N288,000-E698,000 4000 cubic yards	Site was covered with soil upon closure

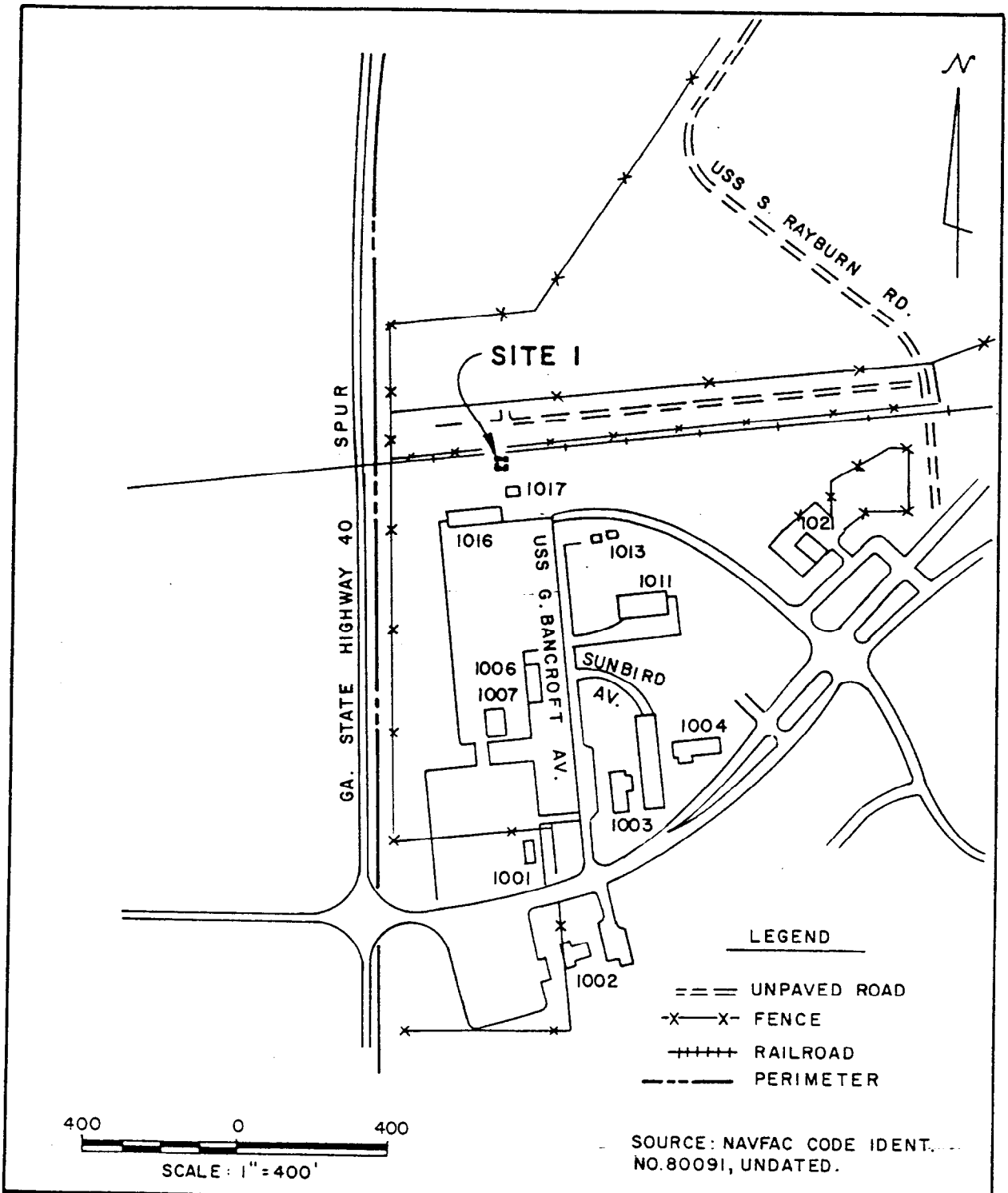


FIGURE 8 - 2
SITE 1 - PCB TRANSFORMER STORAGE AREA NO. 1

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

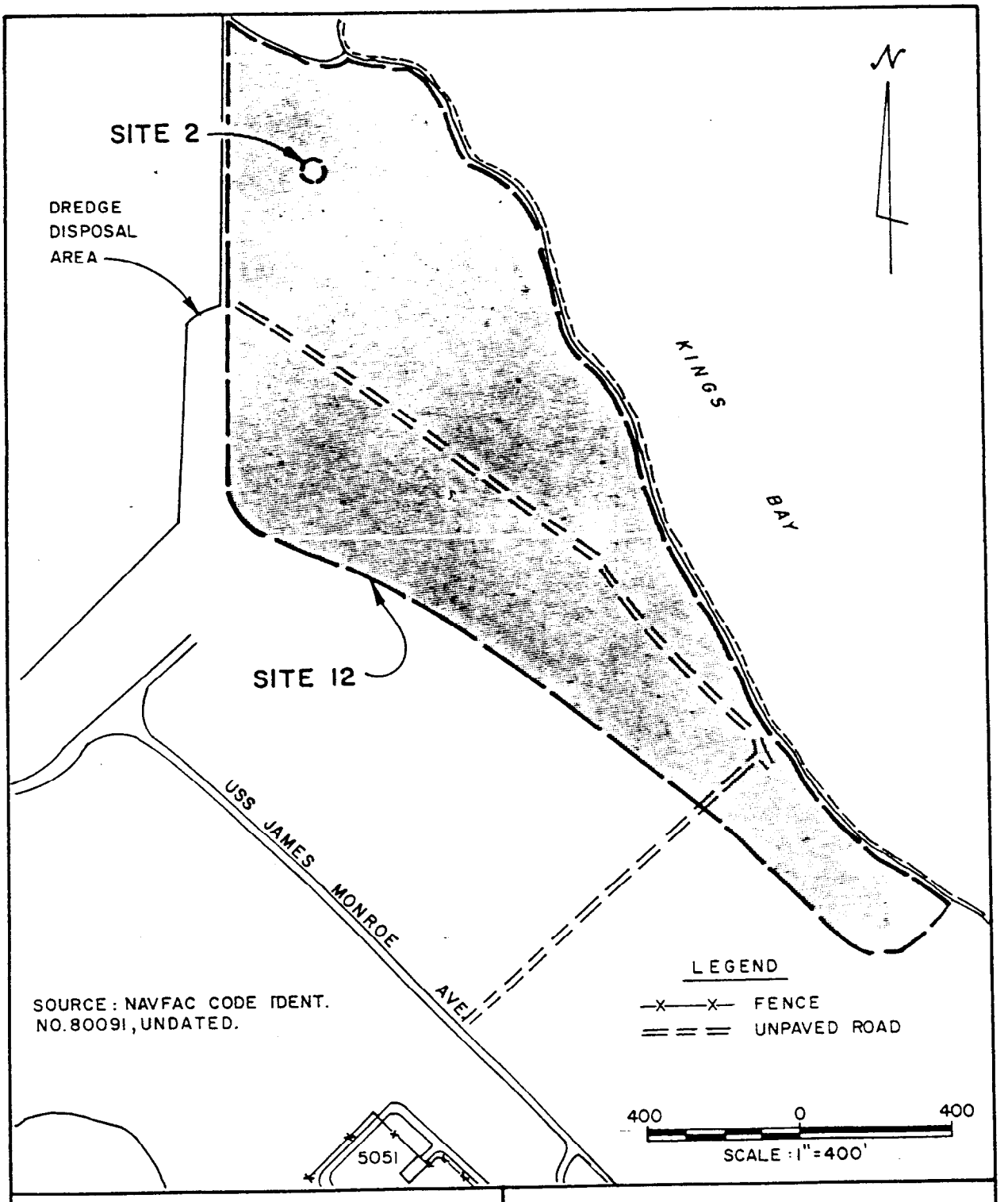


FIGURE 8 - 3
SITE 2 - FIRE FIGHTING PIT.
SITE 12 - ARMY RESERVE DISPOSAL AREA, FUTURE DRY DOCK.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

months by the fire department. Approximately 1500 gallons of waste oil and small amounts of diesel fuel, paints and paint thinners were reportedly burned between 1980 and 1981. At one time in 1980, an unknown quantity of hydrazine was also burned at Site 2. A soil core sample was taken from the pit in August 1980 and tested for EP toxicity. Lab results identified the materials to not exceed the maximum concentrations of contaminants for characteristic of EP toxicity. Therefore, the materials were not considered to be a hazardous waste (400 CFR, Part 261.24, Section 3001 of the Resource Convervation Act of 1976) (Technical Services, Inc., 1981). In 1982, approximately 100 cubic yards of contaminated soil were excavated from the pit and disposed of off base by a waste disposal contractor.

8.4 SITE 3, PCB TRANSFORMER STORAGE AREA NO. 2. Site 3 was a paved area used by a contractor to store an unknown number of transformers and construction materials and equipment from 1979 to 1982. The transformers, an unknown number of which contained polychlorinated biphenyls (PCB), were stored on a 120 square feet area near Building 5006 (see Figure 8-4) with plastic sheets above and below them and within earthen berms. Less than one gallon of transformer coolant (containing PCBs) leaked from the transformers onto soil adjacent to the pavement. Three samples were taken from this soil. The results indicated the presence of Aroclor 1260 (PCB) in concentrations of 47.5, 31.2 and 24.0 parts per million. No State or Federal standards exist for levels of PCB in soils. Soils in an area of approximately 14 feet by 15 feet and 4 inches deep were excavated and, along with the transformers, removed from the base by waste disposal contractor. The total volume of soil removed was 70 cubic feet. Results of the soil analysis are shown in Appendix F. No sampling was performed after excavation.

8.5 SITE 4, PCB TRANSFORMER STORAGE AREA NO. 3. Reportedly, in the early 1980s, a transformer with oil containing polychlorinated biphenyls was placed behind the standby water treatment plant at SUBASE Kings Bay (see Figure 8-5). In December, 1982 approximately one gallon of transformer coolant, determined to contain 63 percent PCB by weight by a laboratory at the Naval Air Station, Jacksonville, was spilled from a filler cap onto the adjacent soil. In January 1983, the transformer and 8 cubic feet of excavated soil were transferred to 55 gallon drums. Soil was excavated to a depth of approximately 11 inches in an area covering one square yard. On September 15, 1983, the drums containing the soil and the transformer were removed from the base by a waste disposal contractor.

8.6 SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL. This disposal site was used by the Army Reserve from approximately 1969 to 1974. The site covers an area of approximately 8.5 acres located on both sides of Towhee Trail where the road makes a sharp turn to the northwest (see

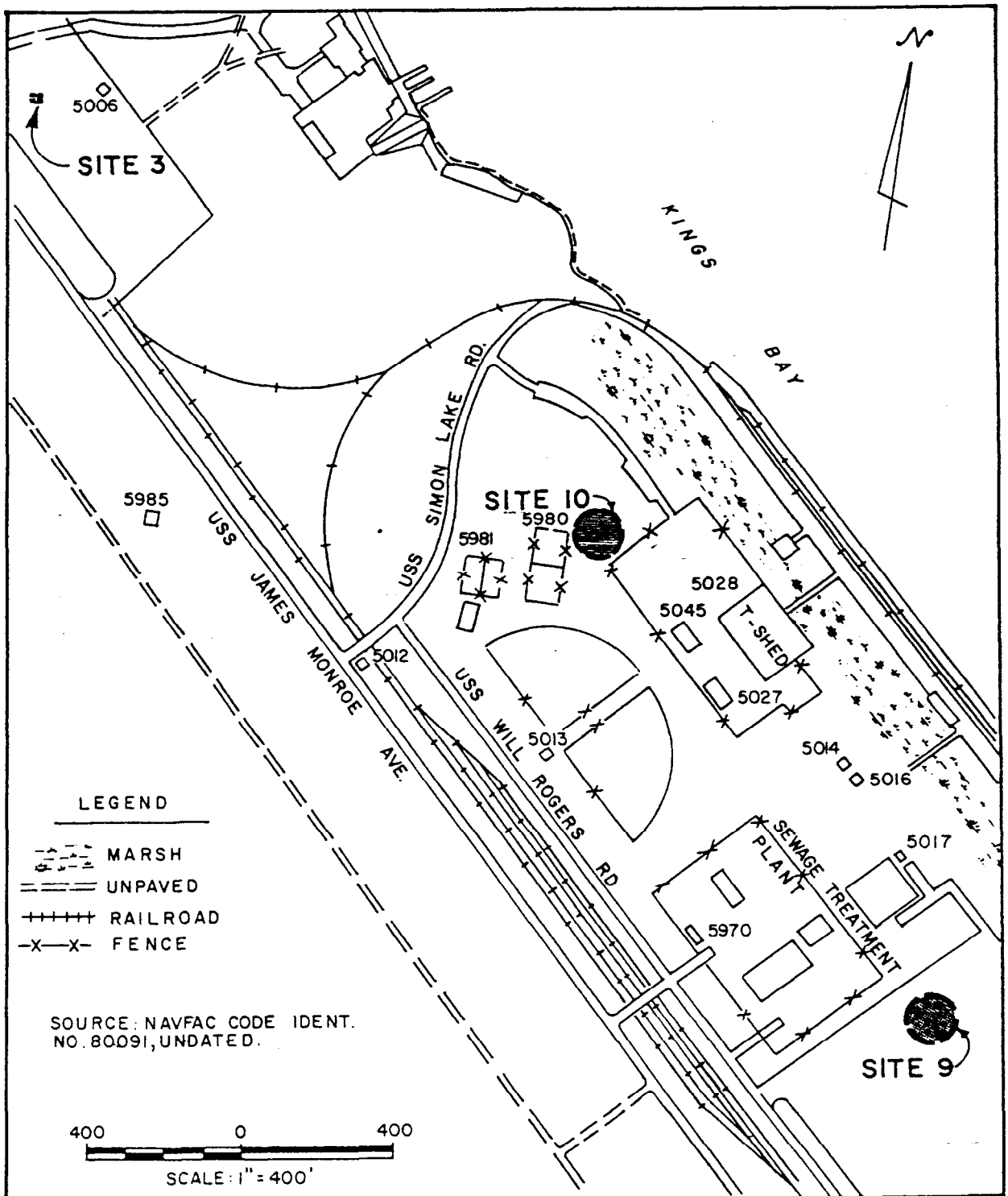


FIGURE 8-4
SITE 3 - PCB TRANSFORMER STORAGE AREA NO. 2.
SITE 9 - BLUE STAR SHIPPING DISPOSAL AREA, PARKING LOT.
SITE 10 - BLUE STAR SHIPPING DISPOSAL AREA, T-SHED.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

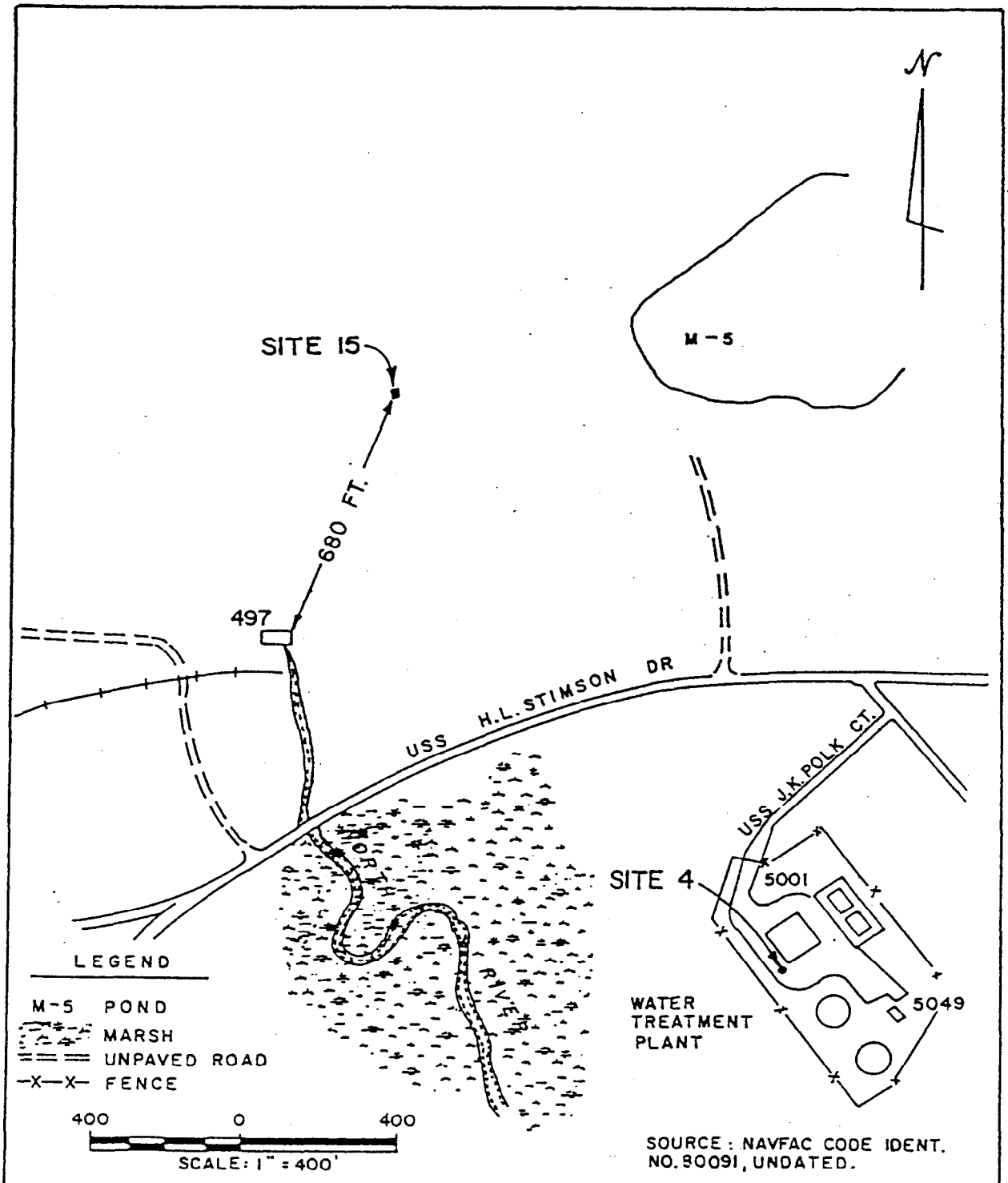


FIGURE 8-5
SITE 4 - PCB TRANSFORMER STORAGE AREA NO. 3
SITE 15 - ARMY RESERVE DISPOSAL AREA NEAR THE WATER TREATMENT PLANT, STIMSON DRIVE.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Figure 8-6). The area on the west side of the road was reportedly about 7 acres in size while that on the east side was about 1.5 acres. The areas were both excavated to a depth of five feet before wastes were disposed in them. Wastes disposed in the site included tree stumps, wooden pallets, metal ammo boxes (some empty and some filled with concrete) aluminum sheeting, concrete blocks and some kitchen waste. There was also a large pile of dredge spoil (from stream cleanings due to erosion and sedimentation) and gravel from abandoned railroad tracks stored over most of the western area to a depth of about two feet. Burning took place twice a year at the end of reserve training on the western side of the road. A total of approximately 30 to 40 gallons of diesel fuel and waste oil were used to ignite the wastes. Therefore, over the 5 years that the site was in use a total of 300 to 400 gallons of waste oil and fuel were burned. Quantities of wastes disposed are approximated at 69,000 cubic yards based on the reported dimensions of the site.

8.7 SITE 6, ARMY RESERVE DISPOSAL AREA NO. A. This site, located east of Proteus Boulevard just north of Calhoun Drive, is adjacent to the wetlands bordering Marianna Creek (see Figure 8-6). The site is a 0.25 acre area that the Army Reserve used prior to 1975 until 1979 for trash and garbage disposal during their six week summer training camps. Pits, approximately five feet in diameter and five to six feet deep, were dug for the disposal of office wastes and garbage and were then covered with one to two feet of soil. Waste quantity is estimated at 1,600 cubic yards. Coniferous trees were abundant at the site.

8.8 SITE 7, ARMY RESERVE DISPOSAL AREA NO. B. Site 7 was used by the Army Reserve during summer training camp (6 weeks out of the year) for the disposal of kitchen garbage. The disposal occurred between 1971 and 1977. The site is located east of Proteus Boulevard just south of Teal Trail, and covers an area of approximately 0.5 acre (see Figure 8-6).

The pits were dug to a depth of eight feet and were approximately five feet in diameter. Based on the dimension of the disposal area, approximately 6,500 cubic yards of garbage were buried in this site.

8.9 SITE 8, ARMY RESERVE DISPOSAL AREA NO. C. Site 8 is located at the southern end of Proteus Boulevard adjacent to the dredge disposal area (see Figure 8-7). The site was used by the Army Reserve for their six week summer training camps between 1973 and 1974. The site area is about 100 feet by 14 feet by five to eight feet deep, and was used for the disposal of general household wastes such as paper, wood and kitchen garbage. During the IAS on-site visit, a depression was noticed in the area and a totally corroded and unlabeled 55-gallon drum was seen off to one side toward USS Proteus Boulevard. The drum appeared to be empty with no sign of spillage. Approximately 350 cubic yards of waste are estimated to have been buried at Site 8.

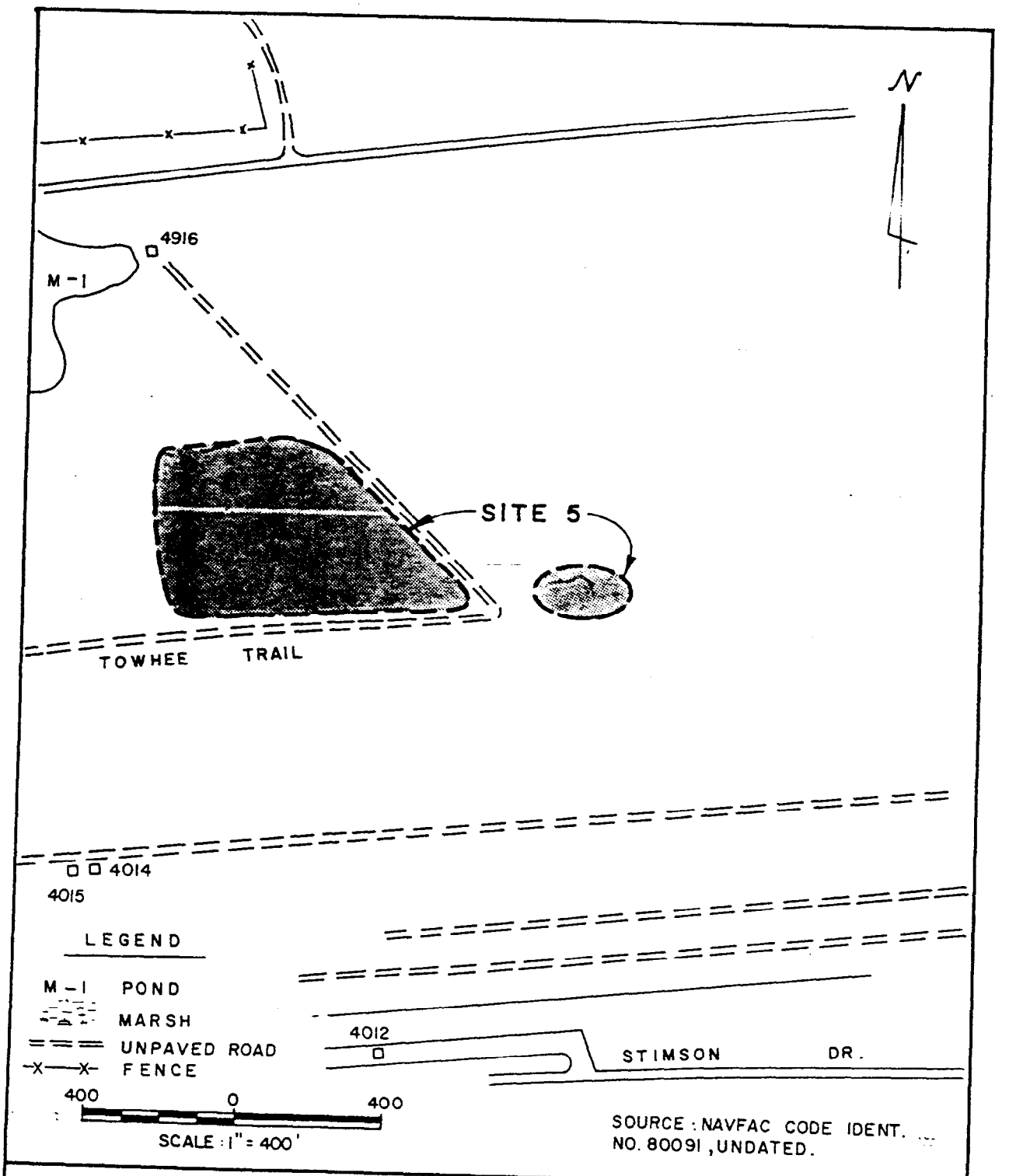


FIGURE 8-6
SITE 5 - ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

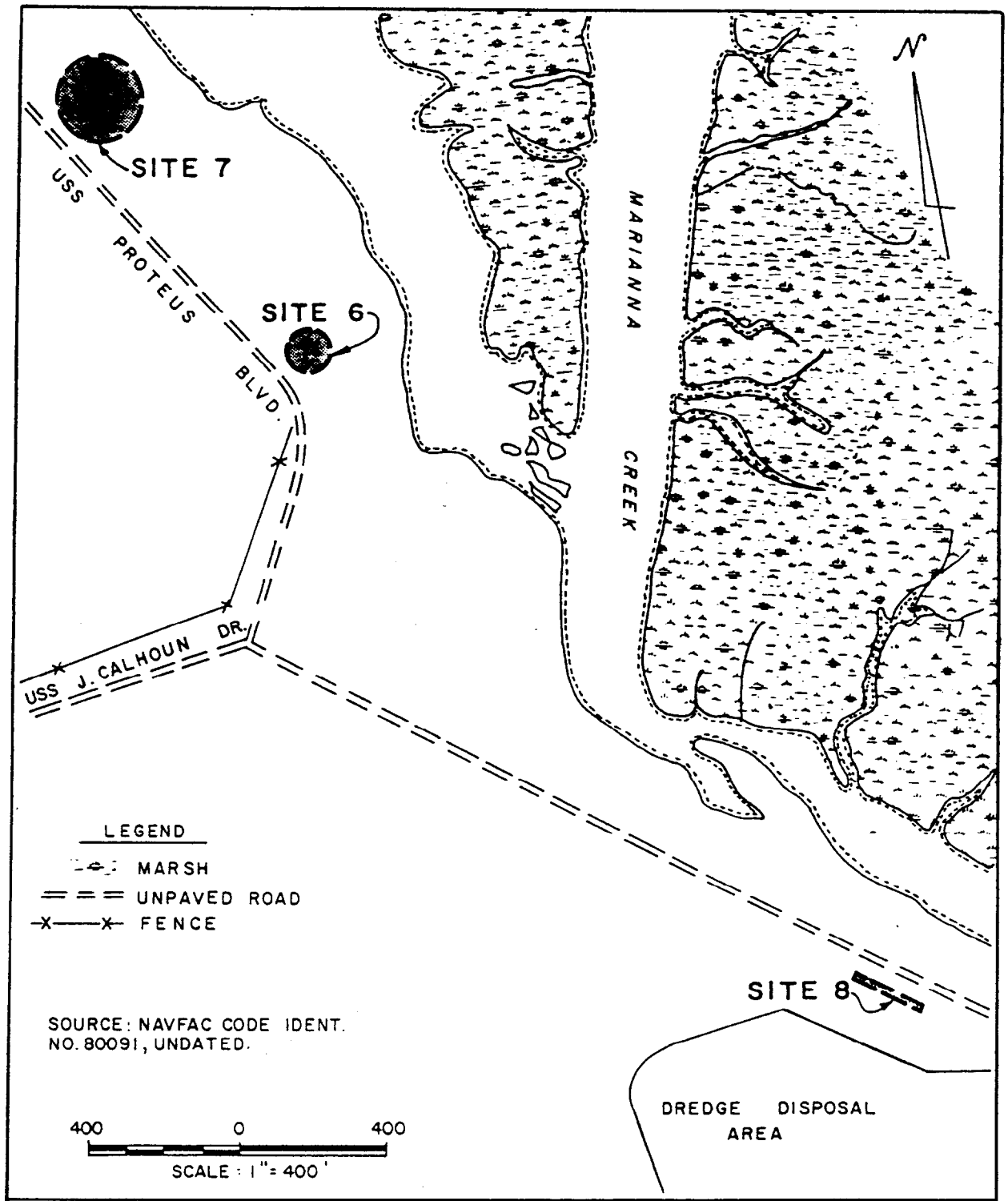


FIGURE 8-7
SITE 6 - ARMY RESERVE DISPOSAL AREA NO. A
SITE 7 - ARMY RESERVE DISPOSAL AREA NO. B
SITE 8 - ARMY RESERVE DISPOSAL AREA NO. C

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

8.10 SITE 9, BLUE STAR SHIPPING DISPOSAL AREA, PARKING LOT. The Blue Star Shipping Company operated this site from 1959 to 1974. The site was located under the present parking lot next to the water front sewage treatment plant (see Figure 8-3). The burn and burial site was 0.25 acre and three to four feet deep. It is unknown how often wastes were burned or if any fuel was used to ignite the wastes. Wastes included pallets, paper, dunnage, and an unknown quantity of sticks of dynamite. The waste quantity is estimated at 1400 cubic yards. The area was completely excavated during the construction of adjacent buildings and a parking lot in the late 1970s.

8.11 SITE 10, BLUE STAR SHIPPING DISPOSAL AREA, T-SHED. Site 10 was used from 1974 to 1979 by the Blue Star Shipping Company as a disposal area similar to Site 9. The site was located east of Building 5080 near the T-shed fence line (see Figure 8-3). Wastes were burned at the site and included pallets, paper, dunnage and old dynamite. It is unknown how often waste were burned or if any fuel was used to ignite the wastes. The area of the site is approximately 0.25 acre and three to four feet deep. Based on the dimensions of the site approximately 1400 cubic yards of waste were buried here. This area was completely excavated during construction of the T-shed parking lot. It is believed that the T-shed parking lot was constructed in the early 1980s. During the IAS on-site visit, this site could not be distinguished from the surrounding area.

8.12 SITE 11, OLD CAMDEN COUNTY LANDFILL. Located in the far western area of the activity (see Figure 8-8), this 35 acres landfill was operated by Camden County from 1974 to October 1981 (Knowlton, 1981). Reportedly, hazardous wastes were not accepted at the landfill. Domestic wastes were accepted from the following sources:

Source	Percentage of Total Waste
Camden County	60%
SUBASE Kings Bay	20-30%
Blue Star Shipping Co.	5-10%
Gilman Paper Co.	5-10%

Wastes, including general household and office wastes, scrap paper, wood and sludge and grit from the base sewage treatment plants, were brought to the site by truck. On the average, about 12 truck loads per day of wastes were disposed of at the site. It was reported that for a three month period in 1974 or 1975, the Gilman Paper Co. sent about seven truck loads of scrap paper (seven or eight bales per truck) to the landfill. The landfill was a trench and fill operation with trenches oriented in an east-west direction across the landfill (approximately 800 feet long by 20 feet wide by 12 feet deep). Excavation was into the water table which is four to eight feet below the surface in this area. Burning of wastes took place once per week during 1974, but did not occur after 1974. Each day the wastes, including ashes in 1974, were compacted and covered with at least six inches of soil. Upon closure, a final soil cover of two feet was placed on the landfill. Estimated waste quantity is 500,000 cubic yards.

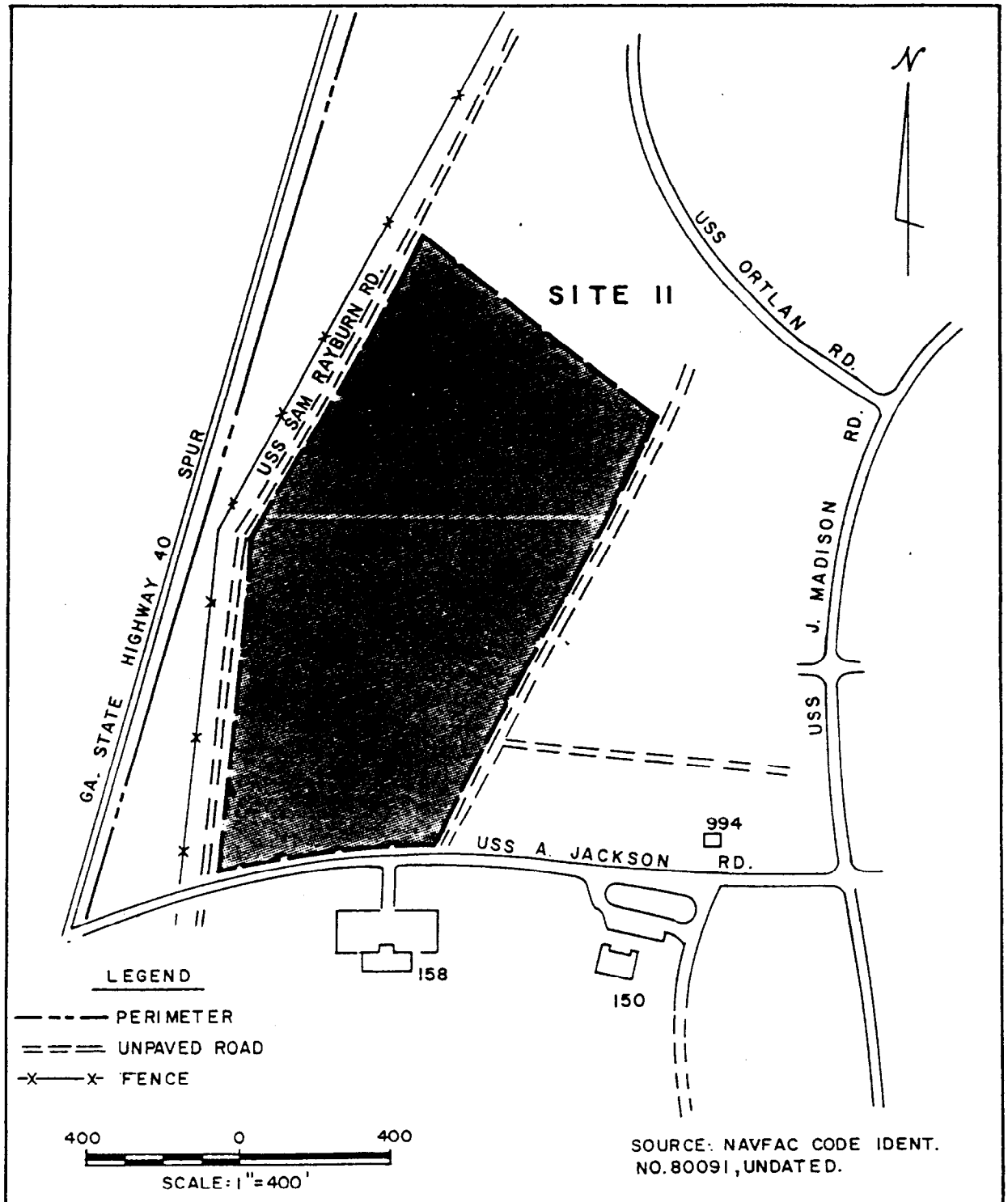


FIGURE 8-8
SITE II - OLD CAMDEN COUNTY LANDFILL.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

8.13 SITE 12, ARMY RESERVE DISPOSAL AREA. Site 12 is located along Kings Bay in the future dry dock area (see Figure 8-3) and was used by the Army for amphibious ship-to-shore materials loading and off-loading training operations from 1974 to 1978. The size of the disposal area is approximately 41 acres. Wastes included empty wooden and metal ammo boxes, concrete slabs, dummy cargo, and six to eight 55-gallon drums of waste engine oil. The site was used by the Army Reserve during their six week summer training camps. Twenty-five to 30 tractor trailer loads of cargo were brought to the base during the training operations with the majority of the materials leaving at the end of the six week period. However about five percent was left behind as waste and buried in pits six to eight feet deep. In 1983, a contractor operating a backhoe in the area uncovered six to eight 55-gallon drums of waste oil. One of the drums was punctured by the backhoe, causing a spill. The stained sediments and drums were removed for off-site disposal. This entire area was excavated in 1983 and the soil buried in the dredge spoil area. Waste quantity was estimated at 467,000 cubic yards.

8.14 SITE 13, OLD DPDO YARD. The Old DPDO yard was located east of Polaris Lane across USS James Monroe Avenue (see Figure 8-9). The size of the yard was reportedly 450 feet by 75 feet. The fenced and asphalt paved area was used from 1979 to 1983 for storage of waste materials. Materials stored here include:

Type	Percentage of Total Materials
Paints (including polyamide paints)	60-70%
Solvents (including methyl ethyl ketone, methyl isobutyl ketone)	10%
Monomethanol Amine	5%
Antifreeze (ethylene glycol)	5%
2190 Lubricating Oil (used on ships and submarines)	1%
Waste Oil and small amounts of unidentified materials	10%

Reportedly, two old transformers were stored at the site. Some types of waste materials were stored on metal pallets. It was reported that during operation of the site, between one and five 55 gallon drums of the unknown types of materials were spilled onto the asphalt paved area but were cleaned up by Public Works personnel soon after they occurred. Corroded and dented drums and cans of materials were generally repacked, sealed and labelled for off-base disposal. When final cleanup of the site was undertaken in 1984, useable materials were sent to the Naval Air Station, Jacksonville and the remaining hazardous materials were hauled off station by contract waste haulers. Empty drums were sent to a contractor for triple rinse. The site is now covered by more than 5 feet of compacted soil as a part of the on-going construction of SUBASE Kings Bay.

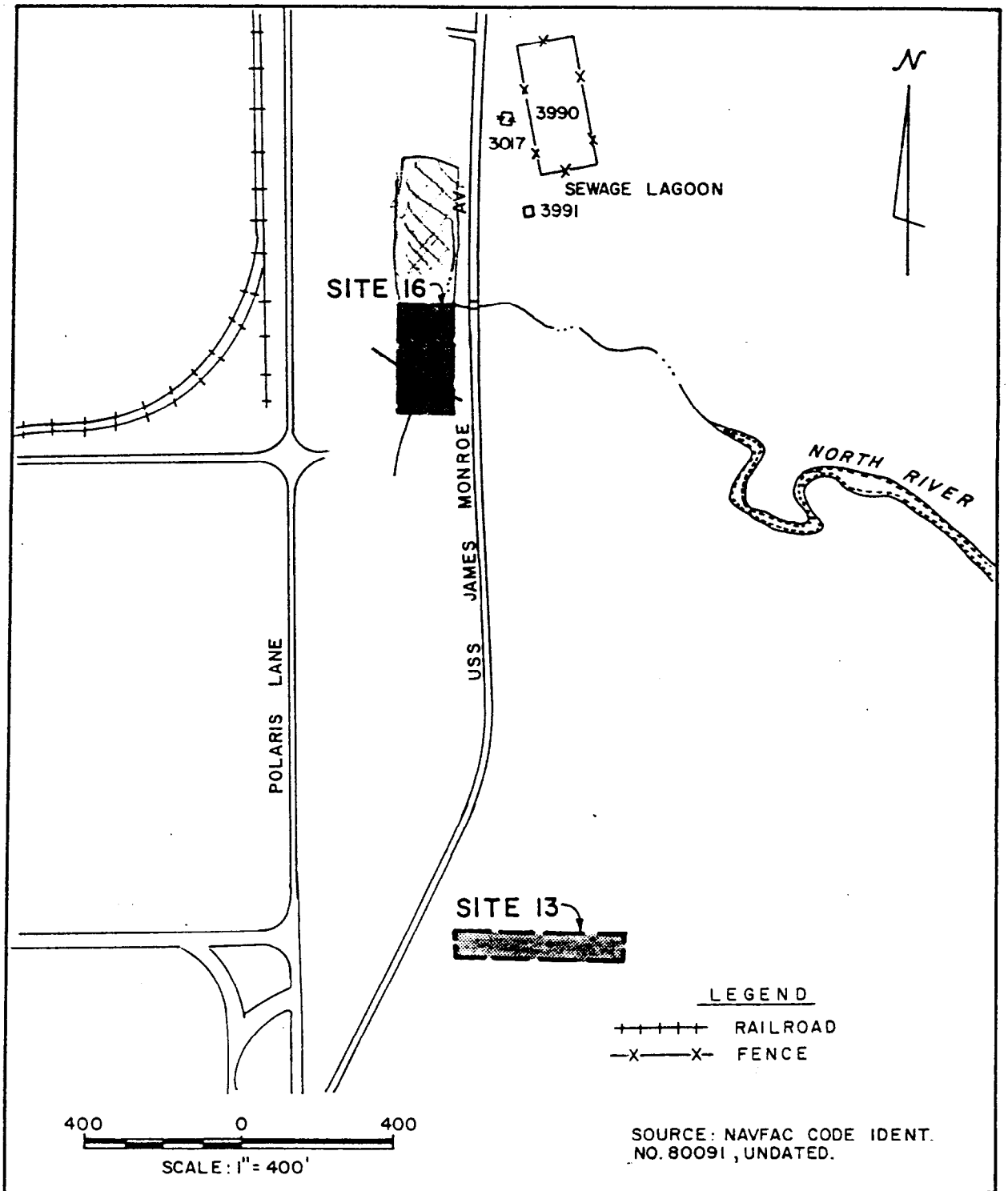


FIGURE 8-9
SITE 13- OLD DPDO YARD.
SITE 16 - ARMY RESERVE DISPOSAL AREA NEAR OLD SEWAGE LAGOON 3990

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

8.15 SITE 14, ARMY RESERVE DISPOSAL AREA, KAMEHAMEHA AVENUE. Site 14 is an area approximately 1500 square feet (60 feet x 25 feet) located west of Kamehameha Avenue (see Figure 8-10). Surface waste disposal was first observed at the site in 1978. The period of operation is estimated to be between 1958 and 1978. Presently, the area is overgrown with forest vegetation. During IAS on-site visit, the following labelled drums were found lying on the ground: 3, 55-gallon drums marked "lube oil" (each drum partially full); 1, 55-gallon drum marked "diesel" (partially full); 1 severely corroded 55-gallon drum with no visible marking (empty); and 1, 5-gallon can of white paint (full). Evidence of oil leakage from several of the drums was apparent on the area immediately surrounding the drums. The estimated spill quantity of the above materials is 100 to 200 gallons.

The site is located approximately 500 feet from a wetland along the North River. Contaminants from the site would reach the river via the surrounding wetlands.

8.16 SITE 15, ARMY RESERVE DISPOSAL AREA NEAR WATER TREATMENT PLANT, STIMSON DRIVE. This site is located north of Stimson Drive near the water treatment plant (see Figure 8-5). The surface waste disposal area is about 10 feet by 5 feet and was reportedly used from 1970 to 1971 by the Army Reserve. During the IAS on-site visit, two 55-gallon drums were observed at the site. One was almost completely corroded but no evidence of leakage was apparent. The other drum was marked "Methanol Tech Grade A" (Phipps Product, Boston, Mass., Stock No. 6810-221-8355, expiration date 9/71) and was partially full. The area is presently wooded. The estimated spill quantity of methanol is 50 to 100 gallons.

Surface water drainage is towards the North River and surrounding wetlands.

8.17 SITE 16, ARMY RESERVE DISPOSAL AREA NEAR OLD SEWAGE LAGOON 3990. Site 16 located west of Woodrow Wilson Avenue and south of old sewage lagoon 3990 (see Figure 8-9), was used every 6 months by the Army Reserve from 1958 to 1964. The site covered an area of one acre and was excavated to a depth of three to five feet. Wastes disposed of included food, wood, trash, scrap metal, tree limbs and empty paint and solvent cans (about one or two 1 gallon cans per month). The waste quantity is estimated at approximately 4000 cubic yards. Reportedly, burning of wastes took place at this location. It is unknown how often burning took place or if any fuel was used to ignite the wastes. The site was covered with soil upon closure by the Army.

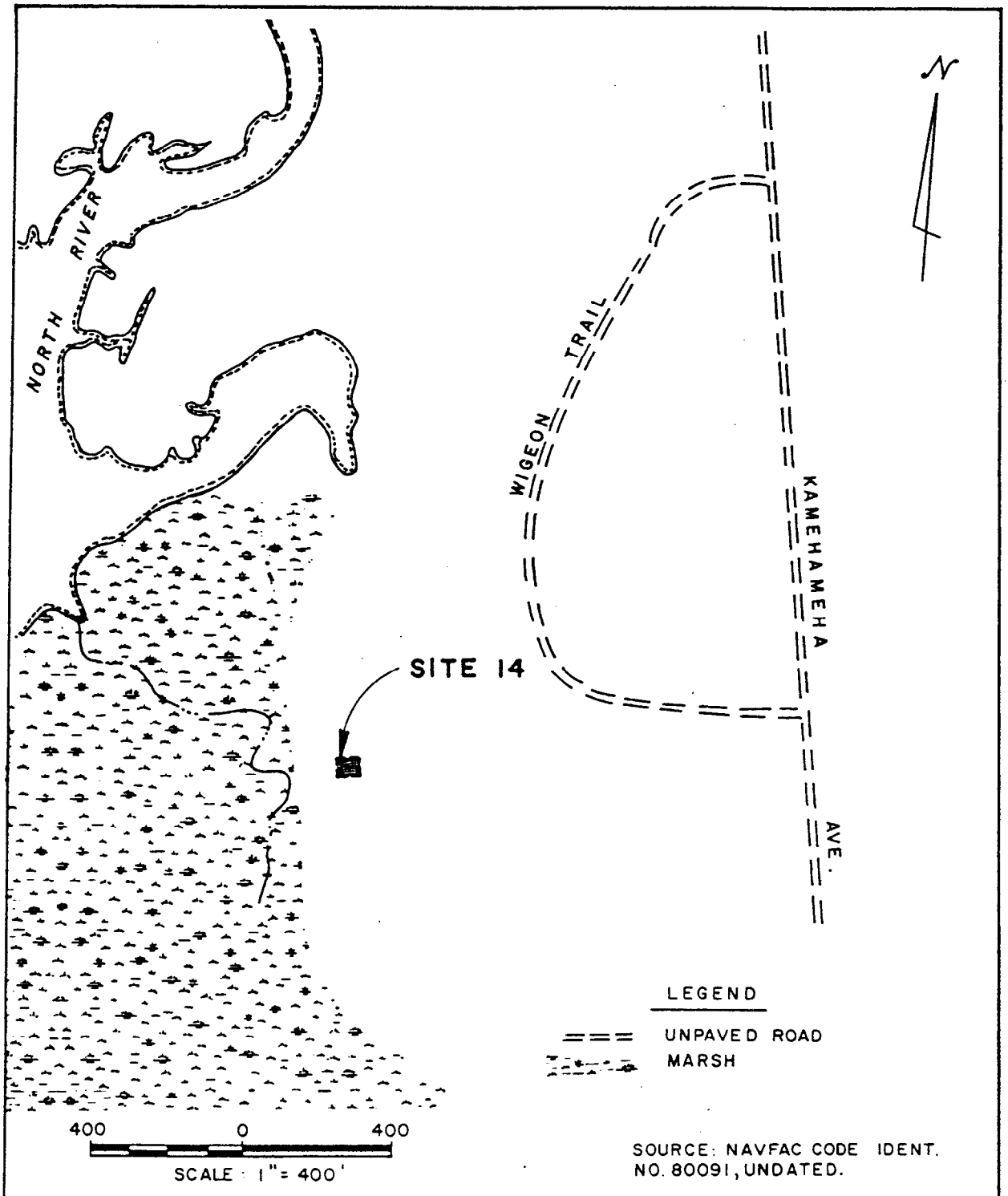


FIGURE 8-10
SITE 14 - ARMY RESERVE DISPOSAL AREA, KAMEHAMEHA AVE.

INITIAL ASSESSMENT STUDY
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

APPENDIX A

AGENCIES CONTACTED DURING THE IAS

1. U.S. Army Sunny Point Military Ocean Terminal, Wilmington, North Carolina
2. Army Military Traffic Management Command, Staff Historian, Washington, D.C.
3. NEESA Information Management Department
4. Naval Facilities Engineering Command Historian, Naval Construction Battalion Center, Port Hueneme, California
5. Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina including:
   (a) Control of Hazardous and Industrial Pollutants Section
   (b) Water Resources Management Section
   (c) Applied Biology Section
   (d) Natural Resources Section
6. Naval Facilities Engineering Command, Headquarters, Alexandria, Virginia
7. Naval Historical Center, Washington Navy Yard, Washington, D.C.
8. Naval Sea Systems Command, Alexandria, Virginia
9. Commandant of the Marine Corps, Navy Department, Washington, D.C.
10. Marine Corps History Office, Washington Navy yard, Washington, D.C.
11. Ordnance Environmental Support Office, Indian Head, Maryland
12. DOD Explosives Safety Board, Alexandria, Virginia
13. National Archives, Washington, D.C. and Suitland, Maryland
    (a) Cartographic Branch
    (b) Navy and Old Army Branch
14. Washington National Records Center, Suitland, Maryland
15. Federal Archives and Record Center, East Point, Georgia
16. U.S. Geological Survey, Public Inquiries Office, Reston, Virginia

17. U.S. Geological Survey, Water Resources Division, Tallahasee, Florida

18. Florida Bureau of Geology, Tallahassee, Florida

APPENDIX B

Endangered, Threatened, and Unusual Flora Occurring or Possibly Occurring in the Vicinity of Kings Bay

Scientific Name	Common Name	State*	Counties in Which Recorded	Distance to Nearest Known Population from Kings Bay	Expected in Camden and Adjoining Count (Duncan, 197
Asplenium heteroresiliens	Blackstem Spleenwort	Threatened	Camden	Directly across Spur 40 from main entrance to NSSB	X
Baptisa arachnifera†	Hairy Wild-Indigo	Endangered	Brantley	35	
Bumelia thornei	Buckthorn	Endangered			
Cacalia diversifolia	Indian Plaintain	Threatened			
Croomia pauciflora	Croomia	Threatened			
Elliottia racemosa	Elliottia	Endangered			
Fimbristylis perpusilla	Fimbristylis	Endangered			
Fothergilla gardenii	Witch-Alder	Threatened			
Hartwrightia floridana	Hartwrightia	Threatened			X
Hymenocallis coronarea	Spider Lily	Endangered			X
Litsea aestivalis	Pond Spice	Threatened			X
Lythrum curtissii	Loose Strife	Endangered			X
Myriophyllum laxum	Water-Milfoil	Threatened			X
Nestronia umbellula	Nestronia	Threatened			X
Oxypolis canbyi	Oxypolis	Threatened			X
Physostegia veroniciformis	Physostegia	Threatened			X
Rhododendron pruniforlium	Plumleaf Azalea	Threatened			
Salix floridana	Florida Willow	Endangered			X
Sarracenia minor	Hooded Pitcher-Plant	Threatened	Camden Glynn Brantley Charlton	Occurs on NSSB	X

APPENDIX B (Continued)

Endangered, Threatened, and Unusual Flora Occurring or Possibly Occurring in the Vicinity of Kings Bay (Continued, page 2 of 2)

Scientific Name	Common Name	State*	Counties in Which Recorded	Distance to Nearest Known Population from Kings Bay	Expected in Camden and Adjoining Counties (Duncan, 1977)
Sarracenia psittacina	Parrot Pitcher-Plant	Threatened	Charlton	--	X
Sarracenia purpurea	Flytrap Pitcher-Plant	Endangered			
Sarracenia rubra	Sweet Pitcher-Plant	Endangered			X
Schizaechyrium niveum	Schizaechyrium	Threatened			X
Thalictrum debile	Meadow Rue	Threatened			

* Georgia Department of Natural Resources, Georgia's Protected Plants, 1977.

† Baptisa arachnifera is a federally recognized endangered species, protected by law as listed by U.S. Fish and Wildlife Service, 1978-1979, List of Endangered and Threatened Wildlife and Plants (In: Environmental Reporter, Federal Register, Vol. 1, 101:1519-1522).

Source: Environmental Science and Engineering, Inc., 1979.

APPENDIX C

Endangered or Threatened Terrestrial Fauna Occurring or Possibly Occurring in the Vicinity of Kings Bay

KEY: T= Threatened; E = Endangered

Species		Federal* Status	State† Status	Likelihood of Occurrence
	MAMMALS			
Felis concolor coryi	Florida Panther	E	E	Low
Geomys colonus	Colonial Pocket Gopher	-	E	Present
Trichechus manatus	Florida Manatee	E	E	Low
Balaenoptera musculus	Bluewhale	E	-	Low
Balaenoptera physalus	Finback Whale	E	-	Low
Megaptera novaeangliae	Humpback Whale	E	E	Low
Balaenoptera borealis	Sei Whale	E	-	Low
Physeter catodon	Sperm Whale	E	-	Low
	BIRDS			
Haliaeetus leucocephalus leucocephalus	Southern Bald Eagle	E	E	Present
Falco peregrinus tundrius	Arctic Peregrine Falcon	E	E	Present
Pelecanus occidentalis carolinensis	Eastern Brown Pelican	E	E	Present
Campephilis principalis	Ivory-billed Woodpecker	E	E	Very Low
Dendrocopus borealis	Red-cockaded Woodpecker	E	E	Low
Vermivora bachmanii	Bachman's Warbler	E	E	Very Low
Dendroica kirtlandii	Kirtland's Warbler	E	E	Very Low
	AMPHIBIANS AND REPTILES			
Alligator mississippiensis	American Alligator	T	E	Present
Lepidochelys olivacea kempii	Atlantic Ridley Turtle	E	E	Moderate
Eretmochelys imbricata	Hawksbill Turtle	E	E	Moderate

APPENDIX C (Continued)

Endangered or Threatened Terrestrial Fauna Occurring or Possibly Occurring in the Vicinity of Kings Bay (Continued, page 2 of 2)

KEY: T= Threatened; E = Endangered

Species		Federal* Status	State† Status	Likelihood of Occurrence
	AMPHIBIANS AND REPTILES (continued)			
Dermochelys coriacea	Leatherback Turtle	E	E	Moderate
Caretta caretta	Loggerhead Turtle	T	-	Present
Chelonia mydas	Green Turtle	T	-	Moderate
Drymarchon corais couperi	Eastern Indigo Snake	T	T	Present
	FISH			
Acipenser brevirostrum	Shortnose Sturgeon	E	E	Low

* U.S. Fish and Wildlife Service, 1979.
† Georgia Department of Natural Resources (1976), Allen (1977).

Source: Environmental Science and Engineering, Inc., 1979.

APPENDIX D

[illegible]

September 22, 1982

POLYCHLORINATED BIPHENYLS ANALYSIS

For

KINGS BAY SUPPORT PROJECT

SITE 1, PCB TRANSFORMER STORAGE AREA NO. 1

One (1) soil sample as received was analyzed using the method specified in the May 31, 1979 Federal Register. (Part VI, Volume 44, Number 106, pages 315 - 38.)

The results are as follows:

Sample I.D.	Date Sampled	Polychlorinated Biphenyls Concentration (mg/l) ppm	Polychlorinated Biphenyls Type
Site #2 - #1	9/14/82	9.2 ppm	1260

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
105 STOCKTON STREET — P.O. BOX 52329
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 41658 August 20, 19 81

Sample of Sludge

Date Received July 14, 1981

For Commanding Officer, Southern Division
Naval Facilities Engineering Command
Marks: P. O. Box 10068, Charleston, S.C. 29411

CERTIFICATE OF ANALYSIS OR TESTS

Naval Submarine Support Base, Kings Bay, Ga.
Taken at Firefighting Training Pit - 6 July 1981
Contract No. N62467-80-C-0464

E.P. EXTRACTION PROCEDURE TOXICITY TESTS

Arsenic, mg/l	0.017
Barium, mg/l	0.2
Cadmium, mg/l	<0.002
Chromium, mg/l	0.014
Lead, mg/l	0.057
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.01
Silver, mg/l	0.005
Endrin, mg/l	<0.0005
Lindane, mg/l	<0.0005
Methoxychlor, mg/l	<0.001
Toxaphene, mg/l	<0.005
2,4-D, mg/l	<0.05
2,4-5 TP Silvex, mg/l	<0.001

CC: Dept. of the Navy
Naval Support Base
Kings Bay, Ga 31547
ATTN: Code N5211

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY James C. Gray, Jr.

APPENDIX F

[redacted]

September 22, 1982

POLYCHLORINATED BIPHENYLS ANALYSIS

For

KINGS BAY SUPPORT PROJECT

SITE 3, PCB TRANSFORMER STORAGE AREA NO. 2

Three (3) soil samples as received were analyzed using the method specified in the May 31, 1979 Federal Register. (Part VI, Volume 44, Number 106, pages 315-38.)

The results are as follows:

Sample I.D.	Date Sampled	Polychlorinated Biphenyls Concentration (mg/l) ppm	Polychlorinated Biphenyls Type
Pole #1 - 141	9/14/82	47.5 ppm	1260
Pole #1 - 150	9/14/82	31.2 ppm	1260
Pole #1 - 166	9/14/82	24.0 ppm	1260

REFERENCES

Anderson, Michael. 1981. Memorandum Concerning Waste Paint Cleanup, ARDM Parking Lot. Naval Submarine Base, Kings Bay, Georgia.

Applied Engineering and Science with Brown and Caldwell. 1984. Hazardous Materials and Hazardous Waste Management Survey, Contract No. N62467-82-C-0383. Chamblee, Georgia.

Commanding Officer, Naval Submarine Base, Kings Bay, Georgia. 1980. Disposal Site Fact Form. Kings Bay, Georgia.

EDAW, Inc. 1981. Base Master Plan Naval Submarine Base Kings Bay, Georgia. Alexandria, Virginia.

Environmental Science and Engineering, Inc. 1980. Draft Supplement to the Environmental Impact Statement for Preferred Alternative Location for a Fleet Ballistic Missile Submarine Support Base Kings Bay, Georgia. Gainesville, Florida.

Environmental Science and Engineering, Inc. 1975. Draft Environmental Impact Statement for Preferred Alternative Location for a Fleet Ballistic Missile (FBM) Submarine Support Base Kings Bay, Georgia. Gainesville, Florida.

Florida Department of Environmental Regulation. 1979. Rules of the DER, Chapter 17-3: Pollution of Waters; Chapter 17-4: Permits; Chapter 17-5: Open Burning and Frost Protection Fires. In: Regulations of the State of Florida, Published by Secretary of State, Tallahassee, Florida.

Georgia Department of Natural Resources. 1980. Rules and Regulations for Water Quality Control, Chapter 391-3-6. Environmental Protection Division. Atlanta, Georgia.

Georgia Department of Natural Resources. Environmental Protection Division. Water Quality Control Section. 1978. Georgia Water Quality Control Regulations and Water-Use Classifications, Chapter 391-3-6-.03. In: Environmental Reporter, State Water Laws Vol. 1: 751:0501-751:0523.

Georgia Department of Natural Resources. Game and Fish Division. 1976. Rules and Regulations for the Protection of Endangered, Threatened, Rare, or Unusual Species. Atlanta, Georgia.

Holley Electric Corp. 1982. Polychlorinated Biphenyls Analysis for Kings Bay Suport Project, Site #2 and #3. Jacksonville, Florida.

Knowlton, C.J. 1981. Letter concerning Closure Inspection of Kings Bay Solid Waste Disposal Site. Georgia Department of Natural Resources. Atlanta, Georgia.

Metcalf & Eddy, Inc. 1984. A Study of Industrial Waste Collection and Pretreatment, Naval Submarine Base, Kings Bay, Georgia. Metcalf & Eddy, Inc. Atlanta, Georgia.

Michael Anderson. 1981. Memorandum concering Waste Paint Clean-Up, ARDM Parking Lot, May 4, 1981.

Naval Facilities Engineering Command. 1984. Part B Permit Application, Naval Submarine Base, Kings Bay, Georgia. Southern Division Naval Facilities Engineering Command. Charleston, South Carolina.

Naval Facilities Engineering Command. 1983. Oil Spill Prevention, Control and Countermeasure Plan, Naval Submarine Base, Kings Bay, Georgia. Southern Division Naval Facilities Engineering Command. Charleston, South Carolina.

Naval Submarine Base, Kings Bay. 1981. Telephone conversation between Michael Anderson and Craig Root, Camden County Admininstrator. September, 1981.

Russell and Axon. 1979. Sanitary Sewage and Industrial Waste Disposal and Water Supply, Treatment, and Distribution, Fleet Ballistic (FBM) Submarine Support Base, Kings Bay, Kingsland, Georgia. Final Report--Phase I. [Prepared for] Department of Navy, Southern Division, Naval Facilities Engineering Command (NAVFAC), Charleston, South Carolina. Daytona Beach, Florida.

Simons, W.J. 1983. Memorandum concerning PCB Spill Incident during December 1982. Naval Submarine Base, Kings Bay, Georgia.

Supply Department, SUBASE, Kings Bay. 1980. Hazardous Materials Management Survey, SUBASE, Kings Bay. Kings Bay, Georgia.

Technical Services, Inc. 1981. Certificate of Analysis (for fire fighting pit sludge), Laboratory No. 4658.

U.S. Soil Conservation Service. 1980. Soil Survey of Camden and Glynn Counties, Georgia. Washington, D.C.