INITIAL ASSESSMENT STUDY FOR NAS JACKSONVILLE FL
3/1/1983
FRED C. HART ASSOCIATES

INITIAL ASSESSMENT STUDY

NAVAL AIR STATION, JACKSONVILLE, FLORIDA

UIC NO. N00207

NAVAL FUEL DEPOT, JACKSONVILLE, FLORIDA

UIC NO. N62566

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Prepared for:

NAVY ASSESSMENT AND CONTROL OF INSTALLATION
POLLUTANTS (NACIP) DEPARTMENT

Naval Energy and Environmental Support Activity (NEESA)
Port Hueneme, California 93043

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NEPSS

Naval
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FOREWORD

The Navy initiated the Navy Assessment and Control of Installation Pollutants (NACIP) program in OPNAVNOTE 6240 ser 45/33503 of 11 September 1980. The purpose of the program is to systematically identify, assess, and control contamination of the environment resulting from past hazardous materials management operations.

An Initial Assessment Study (IAS) was performed at the Naval Air Station (including the Fuel Depot), Jacksonville, Florida by a team of specialists from the Fred C. Hart Associates, Inc., New York, New York. Further Confirmation Studies under the NACIP program were recommended at several areas at the activity. Discussions dealing with significant findings, conclusions, and recommendations are presented in the earlier sections of the report. The later technical sections provide more in-depth discussion on important aspects of the study.

Questions regarding the NACIP program should be referred to the NACIP Program Director, NEESA (Code 112N), Port Hueneme, CA 93043, AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351.

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ACKNOWLEDGEMENTS

The Initial Assessment Study Team commends the support, assistance and cooperation provided by personnel at Southern Division, Naval Facilities Engineering Command; Naval Energy and Environmental Support Activity; Naval Air Station, Jacksonville and Naval Fuel Depot, Jacksonville. In particular, the team acknowledges the effort provided by the following people, who participated in the successful completion of the study:

William Roche, Environmental Coordinator, Public Works (NAS)
Elizabeth B. Luecker, NEESA Contract Coordinator
Jeffery C. Heath, NEESA Engineer-in-charge

EXECUTIVE SUMMARY

The Initial Assessment Study (IAS) was performed for the Naval Air Station (NAS) Jacksonville, Florida and the Naval Fuel Depot (NFD) Jacksonville, Florida as part of the Navy Assessment and Control of Installation Pollutants (NACIP) program, which has the objective of identifying, assessing and controlling environmental contamination resulting from past hazardous materials management.

The environmental setting at NAS Jacksonville and NFD Jacksonville is characterized by geologic and hydrologic conditions favoring the movement of pollutants with groundwater and migration of pollutants to the St. Johns River. In areas adjacent to both bases, groundwater is extensively used for both public and private water supply.

Operations at NAS Jacksonville are primarily focused on providing services and materials to support operation of aviation activities. The operations generating significant quantities of hazardous wastes, in general, are confined to the Naval Air Rework Facility (NARF). Operations at NFD Jacksonville are focused on storage and supply of fuels. Hazardous waste generating operations are confined to tank cleaning.

Based on information from historical records, aerial photographs, field inspections and personnel interviews, a total of 43 potentially contaminated sites were identified by the IAS study team at NAS Jacksonville and NFD Jacksonville. These sites include landfill areas, past storage areas, and disposal sites. Each of the sites was evaluated with regard to contamination characteristics, migration pathways and pollutant receptors.

The study concludes that, while none of the sites pose an immediate threat to human health or the environment, 11 warrant further investigation under the NACIP Program, to assess potential long-term impacts. The sites recommended for further investigation have been listed because of potential impacts on groundwater or surface water quality and consequent potential effects on human health or aquatic life in the St. Johns River.

A Confirmation Study, involving actual sampling and monitoring of the 11 sites, is recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems that may exist. The results of the Confirmation Study will be used to evaluate the necessity of conducting mitigating actions or clean-up operations.

NAVY ASSESSMENT AND CONTROL
OF INSTALLATION POLLUTANTS:

Initial Assessment Study
of
Naval Air Station
Naval Fuel Depot
Jacksonville, Florida

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INITIAL ASSESSMENT STUDY
OF
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AND
NAVAL FUEL DEPOT, JACKSONVILLE, FLORIDA

SECTION 1
INTRODUCTION

1.1 PURPOSE OF INITIAL ASSESSMENT STUDY

As directed by the Chief of Naval Operations (CNO), the Naval Energy and Environmental Support Activity (NEESA), in conjunction with the Ordnance Environmental Support Office (OESO), conducts Initial Assessment Studies (IASs) to collect and evaluate evidence that indicates the existence of pollutants that may have contaminated a site and that pose a potential health hazard for people located on or off the installation. The IAS is the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) program. The objective of this program is to identify, assess and control environmental contamination from past hazardous materials storage, transfer, processing and disposal operations. The NACIP program was initiated by OPNAVNOTE 6240 ser 45/733503 of 11 September 1980 and Marine Corps Order 6280.1 of 30 January 1981.

1.2 SCOPE

The Jacksonville Naval Complex is comprised of several activities. The activities included in the scope of this IAS are the Naval Air Station (NAS) Jacksonville, and the Naval Fuel Depot (NFD) Jacksonville. The Naval activities located at the Naval Station Mayport and the NAS Cecil Field are not discussed in this IAS. Of the several tenants at the NAS Jacksonville only those that are believed to have engaged in activities that involve the past storage or disposal of hazardous materials have been included in this study. These tenants are the Naval Regional Medical Center (NRMC) and the Naval Air Rework Facility (NARF). The remaining tenants at NAS, Jacksonville such as the Armed Forces Reserve Center and the Naval Air Reserve Training Unit, are training groups that would not be expected to handle hazardous materials and therefore have not been included in this IAS.

1.3 SEQUENCE OF EVENTS

1. The NAS Jacksonville was designated for an IAS by CNO letter ser 451/397464 of 3 August 1981.

2. The Commanding Officer of NAS was notified via Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), by NEESA of the selection of NAS Jacksonville for an IAS. The NACIP Program Management Plan and Activity Support Requirements for the IAS were forwarded to the installation to outline assessment scope, provide guidelines to personnel, and request advance information for review by the IAS team.

3. NAS Jacksonville and NFD Jacksonville personnel were briefed by NEESA Environmental Engineer Jeffery C. Heath.

4. Various government agencies were contacted for documents pertinent to the IAS effort. Agencies contacted included:

a. NEESA Information Management Department

b. NEESA Information Services Department

c. NAVFAC Historian
Naval Construction Battalion Center (NCBC)
Port Hueneme, California

d. Southern Division Naval Facilities Engineering Command
Charleston, South Carolina

e. Federal Records Center, East Pt., Georgia

f. Mr. John Cannon
Jacksonville Area Planning Board
330 East Bay Street
Room 401, Courthouse
Jacksonville, Florida 32202

g. Mr. Jay R. Carver
State of Florida
Department of Environmental Regulation
St. Johns River Subdistrict
3426 Bills Road
Jacksonville, Florida 32207

h. Ms. Ann Shipiro
State of Florida
Game and Freshwater Fish Commission
Gainesville, Florida

i. Mr. W. E. Keeler
State of Florida
Department of Transportation
P.O. Box 1089
Lake City, Florida 32055

j. Northeast Florida Regional Planning Council
8641 Baypine Road
Deerwood Center
Jacksonville, Florida

5. The on-site phase of the IAS was conducted from 28 June to 2 July 1982. The information presented in this report is current as of the date of the on-site visit. The following personnel were assigned to the NACIP team and participated in the site visit:

Ms. Elizabeth B. Luecker, NEESA Contract Coordinator

Mr. Wayne K. Tusa, Project Director, Fred C. Hart Associates (FCHA),

Mr. Richard C. Dorrler, Team Leader, Hydrogeologist, FCHA

Mr. Steven D. Caretsky, Environmental Engineer, FCHA

Mr. W. Scott Butterfield, Biologist, FCHA

Mr. James E. Shirk, P.E., Environmental Engineer, FCHA

Dr. Barry North, Public Health Specialist, FCHA

Mr. William Hudgins, Technical Consultant, Naval Operations - NAS Jacksonville

6. In addition to record reviews, interviews were conducted with present long-term and former employees. Ground and aerial tours of the installation were made and photographs were taken. Where possible, information received from an interview was generally verified with one or more additional interviewers, or by comparison with documented data.

1.4 SUBSEQUENT NACIP STUDIES

The next phase of the NACIP Program is the Confirmation Study. During Confirmation Studies, extensive sampling and monitoring is conducted to confirm or refute the existance of suspected contamination at sites identified during an IAS. If significant contamination exists, the Confirmation Study recommends the types of remedial actions to be implemented. A Confirmation Study is conducted only if the IAS concludes that:

1. Sufficient evidence exists to suspect that the installation has contaminated areas, and

2. The potential contamination may present a danger to:

    a. The health of civilians in adjoining communities or personnel within the base fenceline, or to

    b. The environment within or outside the installation.

Further studies are not conducted under the NACIP program if these criteria are not met.

This section applys - background info.

SECTION 2

SIGNIFICANT FINDINGS

2.1 GENERAL

Significant findings relevant to potentially contaminated areas at Naval Air Station Jacksonville and Naval Fuel Depot Jacksonville have been catagorized as follows: (1) background conditions; (2) site operations; (3) waste disposal/spill sites; and (4) potential impacts.

2.2 BACKGROUND

The important background conditions with respect to hazardous waste management at NAS Jacksonville and NFD Jacksonville are summarized below in discussions of the following: (1) soils and geology; (2) water resources; (3) ecology; and (4) population and land use. More detailed information on these subjects can be found in Section 5 of this report.

2.2.1 Soils and Geology

The highly permeable nature of the sandy soils found at the NAS and the NFD allow contaminants to migrate rapidly to the groundwater. The groundwater of the shallow aquifer is found at a depth of less than 10 feet below most disposal sites.

A complex aquiclude, known as the Hawthorn Formation, acts as a confining bed to the deeper Floridan Aquifer and prevents downward percolation of contaminants from the shallow aquifer systems.

2.2.2 Water Resources

The principal source of water throughout the Jacksonville area is the Floridan Aquifer. Both the NAS and the NFD, as well as private and public water systems in the Jacksonville area, receive their potable water supplies from this deep artesian aquifer.

At the NAS and vicinity, both the surficial sand and the porous limestone portions of the shallow aquifer are tapped as sources of domestic water supply (i.e., outdoor and/or indoor water use). Due to use as a potable water supply in some residences immediately off-base, and potential for contamination, the shallow aquifer is considered the one of primary concern for the purpose of this initial assessment study.

At the NFD, the shallow aquifer is no longer utilized as a source of water. There are no known wells tapping the shallow aquifer, nor any residences in the vicinity of the NFD. For these reasons the shallow aquifer is not of concern at the NFD.

2.2.3 Ecology

The NAS and NFD at Jacksonville are both located in the "flatwoods" section of Duval County where the predominant natural vegetation is

Other site operations that were considered in this initial assessment study included vehicle maintenance shops, boiler and power plants, incinerators, defense property disposal, pest control shops and the activities of the Naval Regional Medical Center (NRMC). Additional information on these operations can be found in Sections 6.2, 6.3 and 6.4 of this report.

2.3.2 Naval Fuel Depot

The Government owns 149.88 acres at Jacksonville Navy Fuel Depot (NFD) and has a permanent easement on 30.88 acres. The NFD has 13 storage tanks ranging from 20,000 to 85,000 barrels with a total capacity of 880,000 barrels assigned as follows: JP-4, one 80,000 barrel; JP-5, five 80,000 barrels for a total of 400,000 barrels; DFM, one 80,000, two 85,000 and two 55,000 for a total of 360,000 barrels; JP-8, one 20,000 barrel; and waste oil, one 20,000 barrel. There is an anti-pollution "L" shaped fuel wharf with 34 feet of water capable of accomodating military and commercial tankers up to 38,000 dead weight tons while simultaneously performing barge operations on the opposite face of the pier. Also located on the station is a tank car loading rack with facilities for 12 cars and a 100 tank car classification yard. In addition, there are two truck loading racks. The administration buildings, warehouse, shops, tanks, pipelines, pumping stations, loading facilities, pier and railroad trackage are permanent structures. The remaining structures are temporary.

2.4 WASTE TYPES AND DISPOSAL SITES

2.4.1 Waste Types

Wastes from non-ordnance operations include waste solvents, oil and spilled fuel, paint wastes and aqueous wastes containing toxic heavy metals, acids and caustics, cyanide, paint stripper wastes containing chlorinated solvents and phenolics, metal scrap and other inert materials. Ordnance operations generate a relatively minor quantity of waste and include rags and gloves containing Otto fuel.

Aircraft repair and maintenance operations in the past generated low-level radioactive radium paint wastes. Vacuum tubes and other aircraft instrument parts with ionizing radiation sources and luminous instrument dials were also disposed. Wastes from current medical radiological programs include biological specimens contaminated with low levels of radioisotopes.

2.4.2 Disposal Sites

Two waste disposal sites were previously identified and investigated by NAS Jacksonville personnel (Sites 26 and 27). The NACIP Team has identified an additional 41 sites of concern (36 at NAS Jacksonville and 5 at NFD Jacksonville). Therefore a total of 43 sites have been identified through an extensive records search and interviews with station personnel and retirees. The histories of site use, the types of waste disposed, the methods of disposal, the magnitude of spill incidents, and other characteristics related to the 41 sites not previously studied were investigated in detail. A description of waste disposal activities at each site is presented in Section 6.6 and an evaluation of potential human health and environmental threats from contamination is presented in Section 3.3.

This section the parts on NFD

SECTION 3

CONCLUSIONS

3.1 GENERAL

The principal conclusion to be drawn from the review of records, interviews and site inspections by the NACIP Team is that the range of environmental problems at NAS Jacksonville and NFD Jacksonville is limited. The locations of the 43 sites identified during the IAS activities at the NAS and NFD are shown in Figures 3.1-1 and 3.1-2 respectively. There were a total of 38 sites identified at the NAS of which 10 are concluded to pose a potential threat to human health or the environment. Two sites (No. 26 and 27) were recommended for a Confirmation Study prior to this IAS and are in the process of clean-up. In addition, 5 sites were identified at the NFD of which 1 was concluded to pose a potential threat to human health and the environment.

3.2 WASTE DISPOSAL SITES

All known or suspected hazardous waste disposal sites identified by the IAS team were evaluated using a Confirmation Study Ranking System (CSRS) developed by NEESA for the NACIP program. The system is a two-step procedure for systematically evaluating a site's potential hazard to human health and the environment based on evidence collected during the IAS.

Step one of the system is a flowchart that eliminates innocuous sites from further consideration. Step two is a ranking model that assigns a numerical score, within a range of 0 to 100, to indicate the potential severity of a site. Scores are a reflection of the characteristics of the wastes disposed of at a site, contaminant migration pathways and potential contaminant receptors on and off the installation. CSRS scores and engineering judgment are then used to evaluate the need for a Confirmation Study based on the criteria stipulated in Section 1.3. CSRS scores assigned to sites recommended for Confirmation Studies also assist Navy managers to establish priorities for accomplishing the recommended actions.

A more detailed description of the Confirmation Study Ranking System is contained in NEESA Report 20.2-042.

3.3 SITES RECOMMENDED FOR CONFIRMATION

The sites discussed in this section, and listed on Table 3.2-1, have been recommended for confirmation based on the criteria presented in Section 1.4. These conclusions are based on the NACIP team's thorough evaluation of information obtained from a review of records, interviews and site inspections.

3.3.1 <u>NAS Jacksonville</u>

3.3.1.1 <u>Site No. 4, Pine Tree Area</u>

This site is located approximately 200 feet southeast of the sewage treatment plant chemistry laboratory, Building No. 261L. From

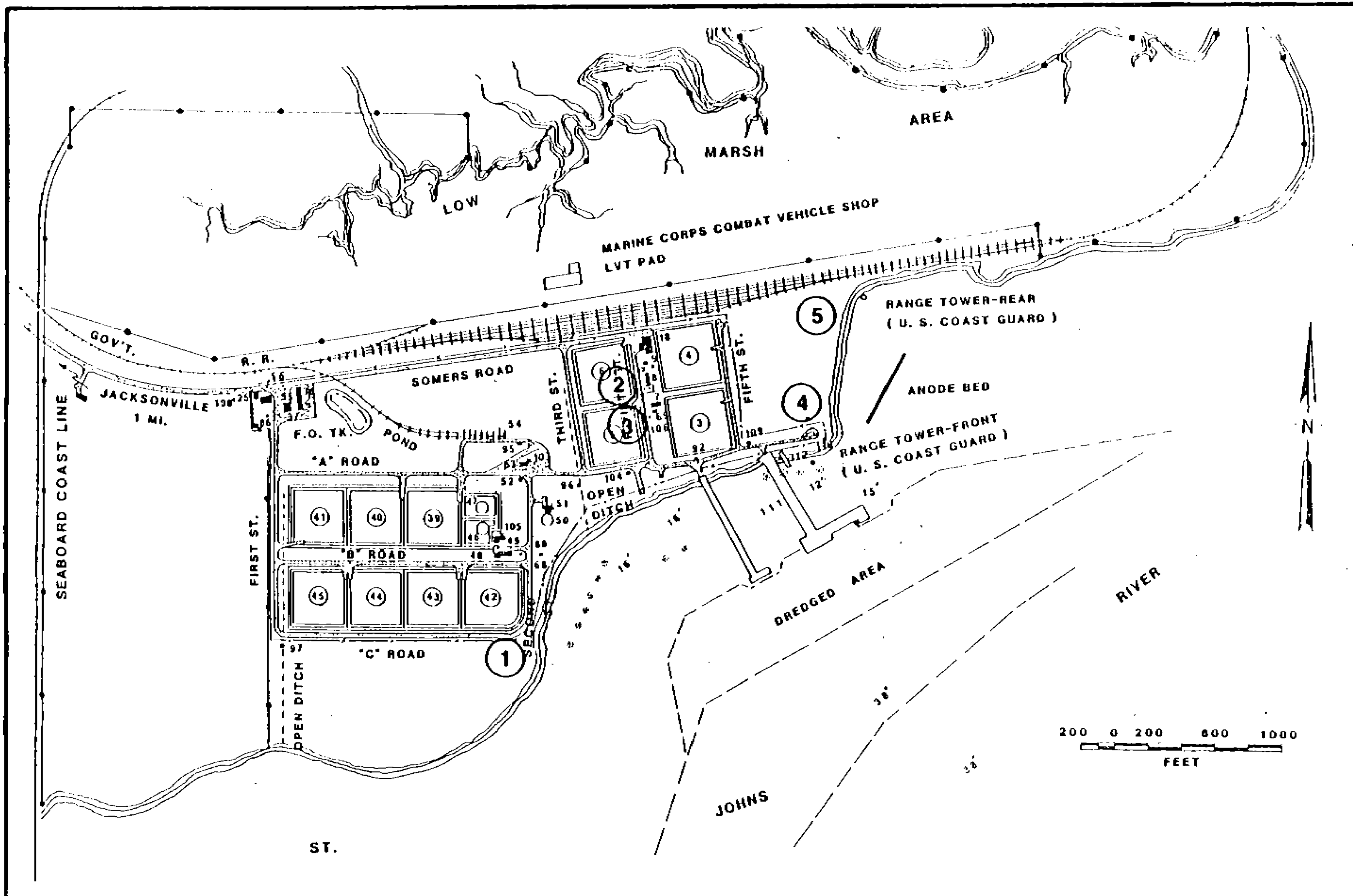

Figure 3.1-2 SPILL/DISPOSAL SITES IDENTIFIED BY IAS TEAM AT NFD JACKSONVILLE.	FCHA INITIAL ASSESSMENT STUDY NAVAL AIR STATION JACKSONVILLE, FLORIDA

dominated by pine trees. The natural vegetative communities on both sides have been significantly altered by past development and present forest management practices. Small but significant areas of wetlands occur on each site; freshwater tidal swamps and marshes on the NAS and salt marsh on the NFD.

Both sites provide relatively good habitat for small mammals, birds, reptiles and amphibians in the forest management and wetlands areas. In addition, a freshwater fishery is managed in two ponds on the NAS.

An active bald eagle (an endangered species) nest is located on the NAS at Dewey Park. Also, both sites are located adjacent to the St. Johns River which is classified as critical habitat for the Florida manatee (seen at NAS) and a known habitat for the shortnosed sturgeon, both endangered species. The American alligator, a threatened species, has been observed on the NAS and can be expected on the NFD.

2.2.4 Population and Land Use

The population of the City of Jacksonville in 1980 was listed as 584,100. This population and 766 square miles within the incorporated area of the city identifies it as the largest city in the state, and the 20th largest city in the nation. The consolidation of the Duval County governments in 1968 resulted in Jacksonville becoming the largest city in the nation in terms of land area.

The Jacksonville Standard Metropolitan Statistical Area (SMSA) includes Nassau, Duval, Clay and St. Johns counties. The population of the Jacksonville SMSA as reported in 1980 was 739,100 and the total area is 3,199 square miles.

The land use in the vicinity of NAS is predominantly residential while the land use in the vicinity of NFD is predominantly industrial.

2.3 SITE OPERATIONS

2.3.1 Naval Air Station

The principal mission of NAS Jacksonville is to maintain and operate facilities and provide services and material to support operations of aviation activities and units designated by the Chief of Naval Operations. This mission has remained unchanged, for the most part, since the construction of the NAS in 1940. Past and present site operations are the source of materials now recognized as hazardous. This initial assessment study considered past site operations falling into the following three categories: (1) ordnance operations; (2) non-ordnance operations; and (3) low level radiological operations.

One of NAS Jacksonville's tenant activities, the Naval Air Rework Facility (NARF), is the station's primary industrial operation, and consequently a major user of hazardous materials and generator of hazardous wastes.

Of the 43 sites identified as potential sources of contamination, 10 NAS Jacksonville sites and 1 NFD Jacksonville site satisfy the criteria listed in Section 1.3 and are therefore recommended for a Confirmation Study. These sites are listed in Table 3.3.1.

The NACIP Team found that sites recommended for Confirmation Studies were, in general, characterized by natural conditions conducive to migration of contaminants via groundwater and surface water, evidence indicating the potential for contamination and presence of a potential receptor population. Specifically, the permeable nature of the sandy soils found at NAS Jacksonville may permit contaminants to migrate to the groundwater. The groundwater is found at a depth of less than 10 feet at NAS Jacksonville. Many sites are within 1,000 feet of the St. Johns River or of storm drains that discharge into the river, which may provide a conduit for migration. Two endangered species are native to the area: the Florida manatee and the bald eagle.

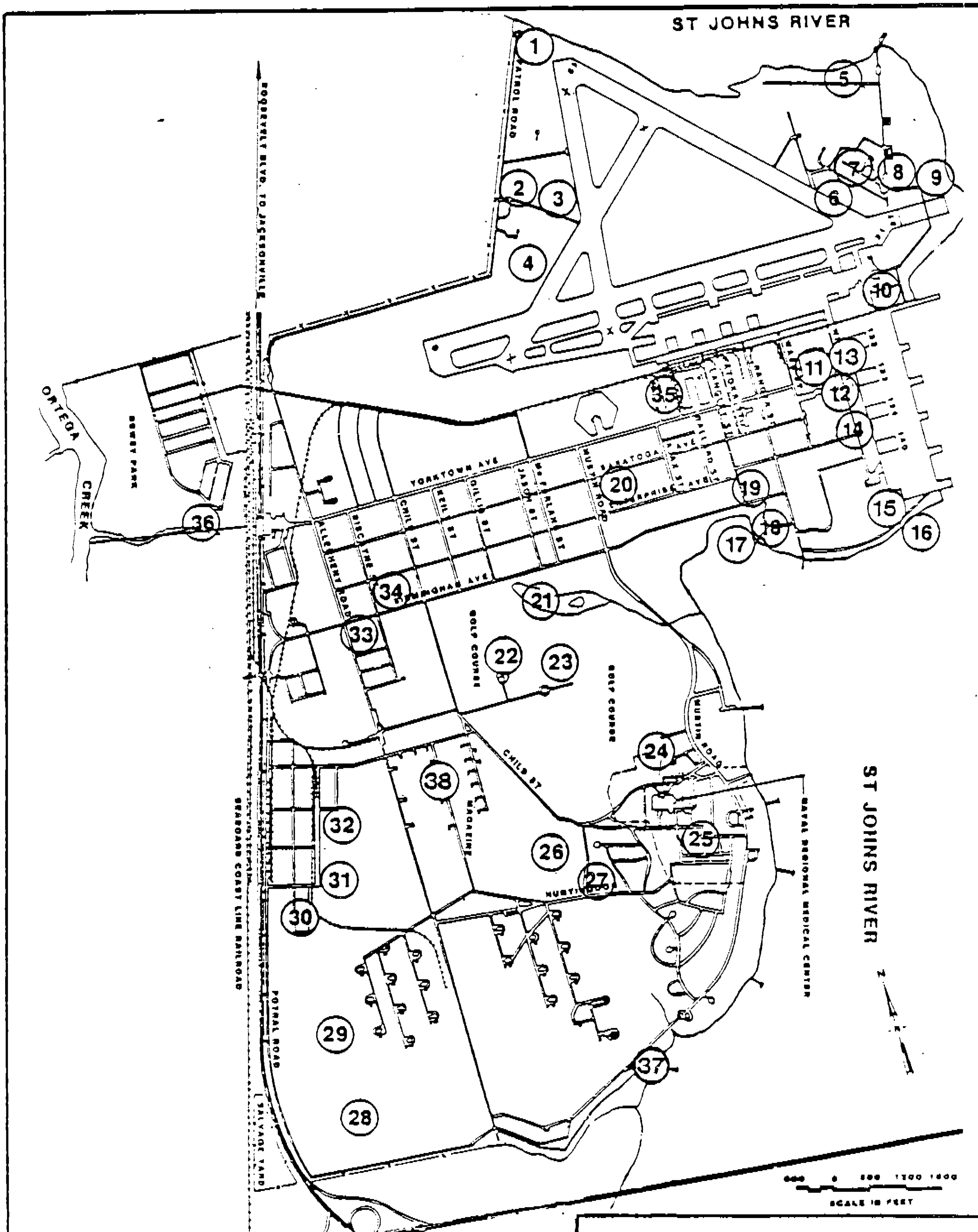

Figure 3.1-1 SPILL/DISPOSAL SITES IDENTIFIED BY IAS TEAM AT NAS JACKSONVILLE

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INITIAL ASSESSMENT STUDY
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TABLE 3.2-1

Sites for which a Confirmation Study is Recommended

Site No.	Description	Ranking Score
	NAS	
4	Pine Tree Area	16
9	Old Disposal Area (East of Fuel Farm)	14
11	Hangar Building 101	53
12	Old Test Cell Building	21
14	Battery Shop	21
15	Solvent and Paint Sludge Disposal Area (NARF)	48
16	Storm Sewer Discharge (Black Point)	*
17	Glass Bead Disposal Area	52
19	Old Gas Station	*
30	Old Drum Lot	8
	NFD	
5	Old Oil Pond and Land Spreading Area	10

* Recommended for confirmation by IAS Team (see Sec. 3 & 4)

approximately 1968 until 1975 this area was used for disposal of paint shavings and sewage sludge containing heavy metals, asbestos, oil and other petroleum products. Paint shavings were identified throughout the approximately 1 acre area. Sewage sludge was identified in an area approximately 100 feet long by 100 feet wide.

This site is characterized by hydrogeologic conditions that are conducive to migration towards the residential area to the northeast of the site. Leachate from this site may possibly contaminate potable water supplies.

3.3.1.2 Site No. 9, Old Disposal Area (East of Fuel Farm)

This site is located east of Catapult Road along the shoreline of the St. Johns River. This site contains garbage, construction debris and five 55-gallon drums. This material was disposed of for approximately one year during 1977 and 1978. Soil tests that were conducted by NAS personnel in this area have shown a high chromium level, indicating that industrial wastes (i.e., chromium sludge) may have been disposed of.

The concern at this site is the possible migration of metals into the St. Johns River.

3.3.1.3 Site No. 11, Hangar Building 101

Reportedly, waste solvents, oils and fuels have leaked beneath the floor boards of Hangar Building 101 for many years. Infiltration of waste solvents and other flammable liquids to the soils has also occurred. The potential for an explosion or fire and migration of solvents to the St. Johns River via storm sewers are the concerns at this site.

3.3.1.4 Site No. 12, Old Test Cell Building

Reportedly some interconnection of the storm, sanitary and industrial sewer system in the old test cell area, Building 101 k, has occured. In addition, numerous spills (one 55-gallon drum per week) of chemicals (waste oil, fuel and solvents) from ruptured or rusted drums were reported at this site. The concern at this site is the potential contamination of the St. Johns River due to migration of these hazardous materials into the storm sewer via infiltration/inflow or faulty connections. Specifically, wastes containing heavy metals may possibly contaminate the St. Johns River.

3.3.1.5 Site No. 14, Battery Shop

The battery shop is located in Building 125. The shop contains a seepage pit where waste acids from lead-acid batteries were disposed. Approximately 100 gallons of waste were disposed here for 23 years.

The concern at this site is the potential migration of wastes off-site resulting from the direct discharge of waste acid to the ground. Lead and sulfate in the waste may migrate to and impact the St. Johns River.

3.3.1.6 Site No. 15, Solvent and Paint Sludge Disposal Area (NARF)

This area, approximately 100 feet x 100 feet, is located northeast of Building 970. This area was used for the disposal of waste solvents and paints until 1978. Based on current operations, it is estimated that up to 2,000 gallons of these wastes were disposed of at this site annually for 10 years, bringing the total quantity disposed at this site to approximately 20,000 gallons.

The major concern at this site is the contamination of the soils with wastes, such as electroplating wastes and paint sludges, that contain toxic metals, and solvent wastes, which due to their mobility, may contaminate groundwater. Migration of these wastes to the St. Johns River poses a threat to fish, waterfowl and manatees (see 3.3.1.5).

3.3.1.7 Site No. 16, Storm Sewer Discharge -- Black Point

The storm sewer runs along Buildings 101, 50 and 795 discharges at Black Point. There is a recurring discharge of JP-5 fuel and oil that is believed to have come from the past disposal practices of a variety of sources in the NARF area. Waste oils and fuels that were spilled or discarded may be migrating via groundwater and infiltrating the storm sewer. An oil boom was installed at the outfall to contain the oil. Reportedly, over the years many chemical wastes from the NARF were disposed of by discharge into the storm sewer system. It is difficult to estimate the volume of material disposed of in this way, but it is likely that a variety of chemicals were discarded into the storm sewer at some time in the past. Given the type of operations conducted at the NARF, these chemicals were corrosive, and probably ate through the sewer line. From there, the chemicals were able to migrate into the groundwater. Now that chemicals are no longer in the sewer line, the chemicals in the groundwater may be migrating back into the storm sewer. This storm sewer would then act as a conduit for off-site migration of these hazardous materials in the groundwater. Migration of chemical wastes to the St. Johns River poses a threat to fish, waterfowl and manatees.

3.3.1.8 Site No. 17, Glass Bead Disposal Area

This area is located across from the marina and approximately 10-15 feet from the shoreline. The area was used for the disposal of spent glass beads used in the abrasive blasting operations conducted at the NARF. Disposal of the spent glass beads in this off-shore area occurred for a period of 16 years. There is visible evidence of a "glass bead bar" that has been created as a result of off-shore disposal.

NARF personnel report that approximately 400,000 lbs of the glass beads are used per year, and it can be expected that 80% (approximately 300,000 lbs) per year may have been disposed at this site. The glass beads contain cadmium, chromium, nickel and lead (Table 6.6-2). This site is characterized by the presence of abrasive blast grit that contains toxic metals.

3.3.1.9 Old Gas Station, Site No. 19

This site is currently the base garden center. The site contains abandoned underground gasoline tanks. The abandoned gasoline tanks are possibly leaking gasoline into the ground where conditions are conducive to migration. This possibility may pose a threat to human health and the environment from explosion potential and the potential effect on aquatic life in the St. Johns River (i.e. Florida manatee).

3.3.1.10 Site No. 30, Old Drum Lot

This site was used for the outdoor, unprotected storage of drums containing unused products. The drums were stored on Marsden Matting. Approximately 10,000 drums were stored at this site for 12 years. Although there is no visible evidence of environmental contamination at this site, reportedly, from time to time drums containing hazardous materials (i.e. PCB's, solvents, acids, paints, mineral spirits, pesticides) corroded or were damaged during handling and leaked their contents onto the ground.

This site is characterized by hydrogeological conditions conducive to migration. Therefore, the possibility of migration of spilled hazardous materials exists.

3.3.2 NFD Jacksonville

3.3.2.1 Site No. 5, Old Oil Pond and Land Spreading Area

This site is located due east of Fifth Street in the general vicinity of facilities 3 and 4. The old pond area was excavated and diked in the 1950's. Through 1967 approximately 8,000 bbls of fuel oil contaminated with water were disposed of in this area along with garbage, wood, etc. In 1965 the pond was filled with soil. In 1967 approximately 5,000 gallons of JP-5 fuel mixed with tetra ethyl lead sludge from cleaning tanks was disposed of in the old oil pond area. In 1971 the area was regraded and the oil/sludge contaminated soils were spread over a larger area.

This site located approximately 500 feet from the St. Johns River is characterized by hydrogeological conditions conducive to migration of oil and metals into the St. Johns River. Although uncontaminated waste oil is not considered hazardous by the state of Florida or USEPA the potential exists for the migration of oil and lead contaminants into the river.

This section (the parts on NFD)

SECTION 4

RECOMMENDATIONS

4.1 GENERAL

Based on the discussions in Sections 2 and 3, 14 individual sites at the NAS Jacksonville and 1 site at the NFD Jacksonville have been identified as potentially contaminated and pose a possible threat to human health or the environment, on or off the activity. The recommendations presented in this section are intended to be used as a guide in the development and implementation of the Confirmation Study. The recommendations outline the number of groundwater monitoring wells, types of samples to be taken, (i.e., soil, water, sediment) and suspected contaminants for which testing should be conducted. Generally the recommendations have been developed on a site by site basis. However, due to their close proximity, sites 11, 12, 14, 15 and 16 have been combined and considered as one area for Confirmation Studies. The recommendations are specific to the site conditions and types of waste disposed. It is also recommended that the groundwater monitoring program, including monitoring well installation, be conducted in accordance with the guidance provided in the Groundwater Monitoring Guide, NEESA 20.2-031 of March 1981. The number of groundwater monitoring wells recommended reflects the number of wells that are considered to be required to determine both the groundwater level and direction of flow and will provide groundwater samples for initial screening for contaminants. The location of each of these sites at NAS Jacksonville and NFD Jacksonville are shown on Figures 4.1-1 and 4.1-2, respectively.

In addition to these site specific recommendations the following are general recommendations with respect to the activity:

1. It is recommended that NAS complete the identification and inventory of the wells on the activity. Ideally, this well search should be completed prior to the start of any Confirmation Studies proposed in this report.

2. All the wells that are not in use at this time should be inspected and identified as suitable for future service or unusable. The wells that are unusable should be cemented and abandoned properly, and the wells that are deemed suitable for future service should be capped securely during the interim period that they are not in use. It is also recommended that the NAS contact the Jacksonville Department of Health, Welfare and Bio-Environmental Services (DHWBES) for proper abandonment techniques and to ensure compliance with all applicable laws and regulations.

3. During the confirmation level phase of the NACIP program the USGS should be consulted regarding the impacts to Drummond Creek from the City of Jacksonville landfill (Section 5.3.6.5).

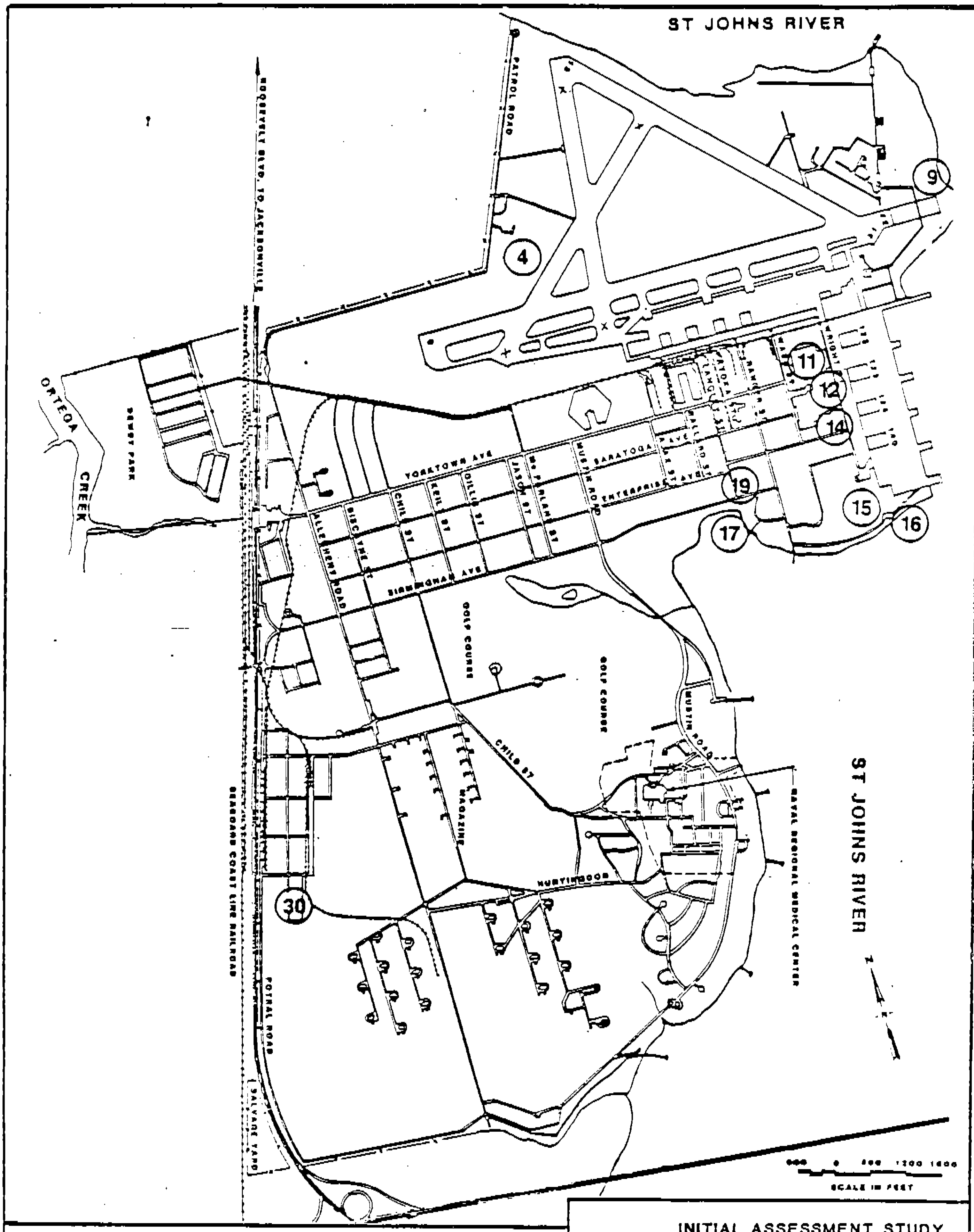

Figure 4.1-1 SPILL/DISPOSAL SITES RECOMMENDED FOR CONFIRMATION STUDY AT NAS JACKSONVILLE.

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NAVAL AIR STATION
JACKSONVILLE, FLORIDA

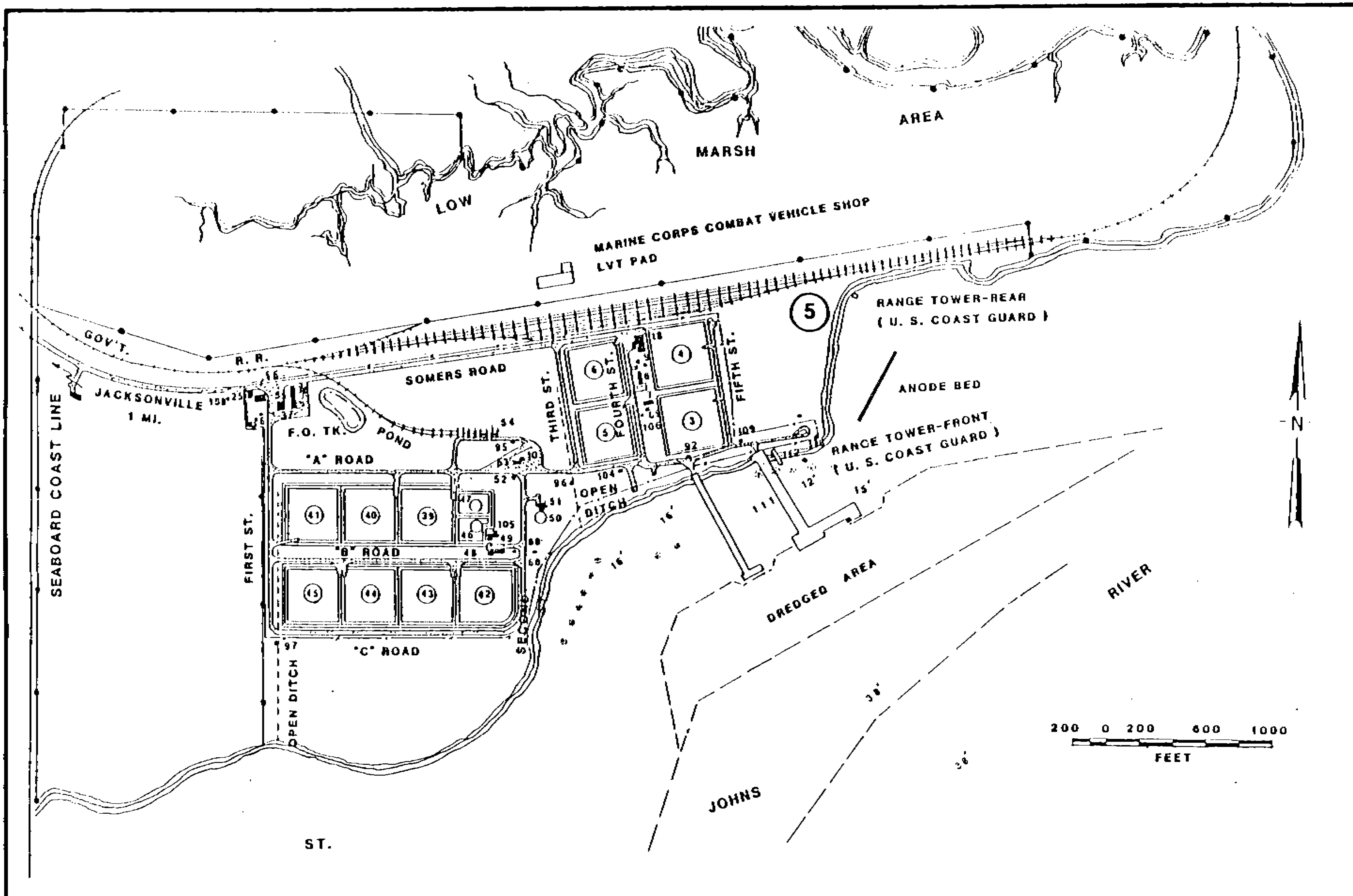

Figure 4.1-2 SPILL/DISPOSAL SITES RECOMMENDED FOR CONFIRMATION STUDY AT NFD JACKSONVILLE.

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4.2 CONFIRMATION STUDY

A Confirmation Study should be conducted at the following sites:

NAS JACKSONVILLE

Site No. 4 - Pine Tree Area
Site No. 9 - Old Disposal Area (East of Fuel Farm)
Site No. 11 - Hangar Building 101
Site No. 12 - Old Test Cell Building
Site No. 14 - Battery Shop
Site No. 15 - Solvent and Paint Sludge Disposal Area (NARF)
Site No. 16 - Storm Sewer Discharge (Black Point)
Site No. 17 - Glass Bead Disposal Area
Site No. 19 - Old Gas Station
Site No. 30 - Old Drum Lot

NFD JACKSONVILLE

Site No. 5 - Old Oil Pond and Land Spreading Area

4.2.1 NAS Jacksonville

4.2.1.1 Confirmation Site No. 4, Pine Tree Area

Groundwater monitoring wells: Four shallow wells, 4" Polyvinyl Chloride (PVC), screened to a depth of 20 feet below the water level.

Type of samples: Groundwater

Number of samples: Four

Testing parameters: Chromium (Cr), Cadmium (Cd), Lead (Pb), Cyanide (CN^-), Nickel (Ni), water level measurement, Total Organic Carbon (TOC), Total Organic Halogens (TOX), pH, specific conductance (SC), temperature.

Frequency: Quarterly for 1 year

Remarks: If contamination is detected in the sample, additional monitoring wells may be required to determine the contaminant concentrations and the extent and rate of migration of the plume.

4.2.1.2 Confirmation Site No. 9, Old Disposal Area (East of Fuel Farm)

Groundwater monitoring wells: Three shallow wells, 4" PVC, screened to a depth of 20 feet below the water level.

Types of samples: Groundwater

Number of samples:	Three
Frequency:	One time sampling
Testing parameters:	pH, Total Organic Carbon (TOC), Total Dissolved Solids (TDS), Cr, Cd, Pb, CN^-, oils and grease, water level measurement, SC, temperature, TOX.

4.2.1.3 <u>Confirmation Study Area "A" (Includes Site Nos. 11, 12, 14, 15, and 16)</u>

- Site No. 11, Hangar Building 101
- Site No. 12, Old Test Cell Building
- Site No. 14, Battery Shop
- Site No. 15, Solvent and Paint Sludge Disposal Area (NARF)
- Site No. 16, Storm Sewer Discharge (Black Point)

Sites 11, 12, 14, 15, and 16 are located within the boundaries of the NARF. The close proximity of the sites, similarity in types of hazardous materials used in the operations, past disposal practices, potential pathways of migration between these sites (i.e., sewer system, surface runoff and air) and similar hydrogeological conditions in the area make it practical from an environmental, engineering and economic standpoint to consider the NARF area as a single site for the purpose of conducting a Confirmation Study. The quantity of hazardous materials used there, the conditions of the buildings and sewer systems and past disposal practices all contribute to the potential human health threat (i.e., explosion, direct contact and inhalation of toxic vapors). Furthermore, the hydrogeological conditions are conducive to migration, posing a threat to potable water supplies and aquatic life in the St. Johns River.

The Confirmation Study in Area A should be conducted as a three phase program with each phase contingent upon the results of the proceeding phase.

Phase I:	Type of Samples:	Air quality
	Number of Samples:	Sampling to be conducted in basements of NARF buildings, (Hangar 101) adjacent to foundations, and in parking area
	Test Parameters:	Organic vapors
	Frequency:	One time sampling using portable survey equipment (organic vapor analyzer, photoionization detector)
	Remarks:	If organic vapors are detected during Phase I of the program additional air samples should be taken to identify specific contaminants. The results of this survey will be used in the design and implementation of Phase II.

Phase II: Type of Samples: Storm water, sample storm sewer from outfall, back through NARF to determine area where contaminants are entering. Samples should be taken during periods of low flow in order to get an indication of contamination in base flow (i.e., groundwater contribution).

Number of Samples: One at each selected manhole

Testing Parameters: Cr, Ni, Cd, Pb, oils and grease, pH, TOC, TOX, SC

Frequency: One time sampling

Remarks: If contaminants are detected in the storm sewer, Phase III should be implemented.

Phase III: Groundwater Monitoring Wells: Four shallow wells, 4" PVC, screened to a depth of 20 feet below the water level.

Type of Samples: Groundwater

Number of Samples: Four

Testing Parameters: Cr, Cd, Ni, Pb, CN^-, pH, water level measurement, TOX, TOC, SC, temperature

Frequency: Quarterly for 1 year

Remarks: If contamination is detected in the wells during the initial screening, additional monitoring wells should be installed to determine the contaminant concentrations in the plume and the extent and rate of migration.

4.2.1.4 Confirmation Site No. 17, Glass Bead Disposal Area

Type of Samples: Sediment

Number of Samples: Five samples spaced approximately 50 feet apart extending from the shoreline into the St. Johns River

Frequency: One time sampling

Testing Parameters: Total metals, EP toxicity

Remarks: If contamination is detected during the initial screening, additional samples may be taken (over a wider area and at greater depths) to determine the boundaries of the contaminated area.

4.2.1.5 Confirmation Site No.19, Old Gas Station

The old gas station area should be surveyed using metal detectors to determine if the underground storage tanks have been removed. If the tanks have not been removed they should be tested for contents, (e.g. diesel fuel, gasoline).

Phase I:

Types of samples: Liquid

Number of samples: One per tank

Frequency: One time sampling

Testing Parameters: Tetraethyl lead, oils and grease

Remarks: If the tanks have been abandoned full of gasoline, leaks may have occurred. Phase II should be implemented.

Phase II:

Groundwater monitoring wells: Three shallow wells, 4" PVC, screened to a depth of 20 feet below the water level.

Type of Samples: Groundwater

Number of samples: Three

Testing Parameters: Oils and grease, tetraethyl lead

Frequency: One time sampling

Remarks: If contamination is detected in the wells during the initial screening additional monitoring wells should be installed to determine the contaminant concentrations in the plume and the extent and rate of migration.

4.2.1.6 Confirmation Site No. 30, Old Drum Lot

Groundwater monitoring wells: Three shallow wells, 4" PVC, screened to a depth of 20 feet below the water level

Type of samples: Groundwater

Number of samples: Three

Testing Parameters: TOX, SC, pH, TOC, water level measurement, temperature

Frequency: Quarterly for 1 year

Remarks: If contamination is detected in the wells during the initial screening additional monitoring wells should be installed to determine the contaminant concentrations in the plume and the extent and rate of migration.

4.2.2 NFD Jacksonville

4.2.2.1 Confirmation Site No. 5, Old Oil Pond and Land Disposal Area

Groundwater monitoring wells: Three shallow wells, 4" PVC, screened to a depth of 20 feet below the water level.

Type of samples: Soil and groundwater

Number of samples: Three

Testing Parameters: Oil and grease, tetraethyl lead, water level measurement, pH, SC, temperature

Frequency: Quarterly for 1 year

Remarks: If contamination is detected in the wells during the initial screening, additional monitoring wells should be installed to determine the extent and rate of migration.

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SECTION 5

BACKGROUND

5.1 GENERAL

5.1.1 Location and Organization

Several major naval activities comprise the Jacksonville Florida Naval Complex. The two areas that are the subject of this IAS are the Naval Air Station (NAS) Jacksonville, which includes the Naval Regional Medical Center (NRMC) and the Naval Air Rework Facility (NARF), and the Naval Fuel Depot (NFD) Jacksonville. The Naval Activities located at the Naval Station Mayport and the NAS Cecil Field are not discussed in this IAS.

Both the NAS and the NFD are located in Duval County and are within the limits of the city of Jacksonville, Florida. Jacksonville is located in northeastern Florida, approximately 15 miles from the Atlantic Ocean and along the St. Johns River (Figure 5.1-1).

The NAS Jacksonville is located in southern Duval County approximately 10 miles south of the central business district of the city of Jacksonville. The station occupies approximately 3,800 acres of land on the west bank of the St. Johns River upstream from Jacksonville. The operating portion of the NAS lies between Highway 17 and the St. Johns River; however, the station also occupies 515 acres west of Highway 17. Within the physical boundaries of the station are several separate naval tenant commands.

The NFD Jacksonville is also located in Duval County and is approximately 7 miles north of the Jacksonville Central Business District and about 1 mile east of the intersection of Interstate 95 and State Highway 105. This activity encompasses 181 acres on the west bank of the St. Johns River downstream from Jacksonville. The NFD is located on the northern (western) bank of the St. Johns River at river mile 16. A 38-foot channel provides access to the Atlantic Ocean, and to the Atlantic Intracoastal Waterway. The depot consists of 149.88 acres of government owned land and 30.88 acres on permanent easement. There are 13 fuel storage tanks within the depot ranging form 20,000 to 85,000 barrels with a total capacity of 880,000 barrels. Additionally, the depot includes a fueling wharf, tank car loading rack and other support buildings, both permanent and temporary. The NFD became a department of the Naval Supply Center (NSC), an activity located at the NAS, when the NSC was established in October 1982.

5.1.2 Command and Tenant Command Relationships and Missions

The NAS Jacksonville has the primary mission function of "maintaining and operating facilities and providing services and material to support operations of aviation activities and units designated by the Chief of Naval Operations." As the hub of several major naval activities within the Jacksonville, Florida Naval Complex, the NAS has a multitude of assigned missions and several tenants. Two of these tenants, the NRMC and the NARF, are believed to have engaged in activities that involved the storage, transfer, processing or disposal of hazardous materials and have therefore been

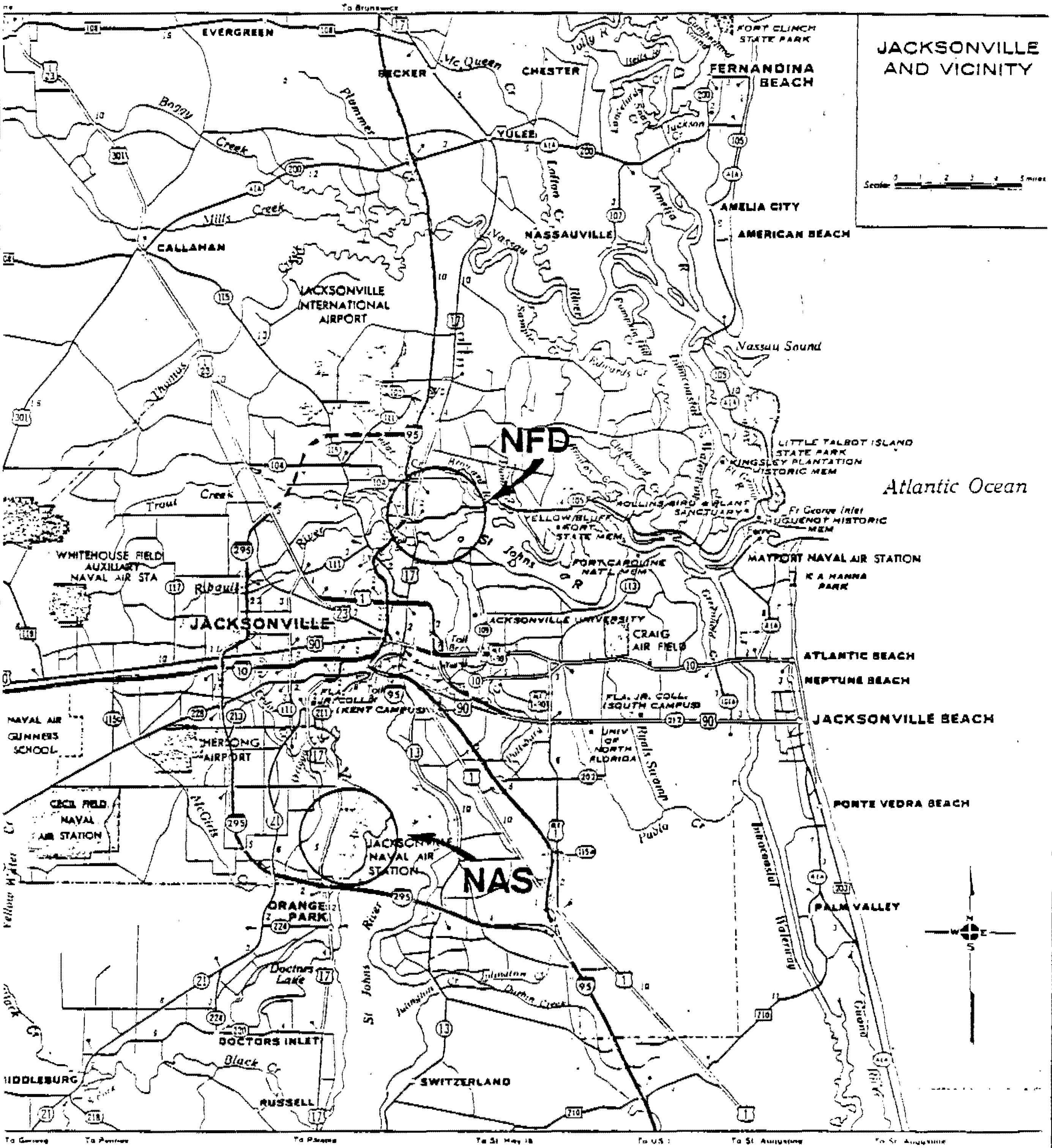

Figure 5.1-1 FACILITIES LOCATION.

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included as part of this IAS. The remaining tenants, such as the Armed Forces Reserve Center and the Naval Air Reserve Training Unit, are training divisions that would not be expected to handle hazardous materials and thus have not been included in this IAS.

The primary mission of the NFD is to receive, store and distribute petroleum products required for the support of assigned fleet units and shore activities, and to furnish necessary administrative services and maintenance functions incidental to these operations. There are no tenants within the physical boundaries of the NFD property.

Naval Regional Medical Center

Although almost completely surrounded by the NAS, the NRMC exists as an entirely separate command. The mission assigned to the NRMC is to provide general clinical and hospitalization services for active duty military personnel and their dependents; to cooperate with military and civil authorities in matters pertaining to health, sanitation, local disaster and other emergencies; and to fulfill a number of other specific functions. The mission is achieved through services provided at a 400-bed hospital and support buildings on 73.6 acres.

Naval Air Rework Facility

The NARF is a major command within NAS Jacksonville. The mission assigned to NARF is to maintain and operate facilities; perform a complete range of depot-level rework operations on designated naval aircraft, engines, their components and accessories, and equipment; provide engineering services in the development of changes in hardware design; and furnish technical services on aircraft maintenance and logistic problems. The NARF consists of a total of 45 buildings.

5.2 HISTORY

The idea for a NAS Jacksonville was originally conceived by the Hepburn Board in 1938. It was primarily planned for seaplane support. This operational requirement largely determined its final location; adjoining a two- to three-mile wide stretch of the St. Johns River at Black Point, just south of Jacksonville. Officials of Duval County offered to donate the land required for the station and, upon acceptance by the Navy Department, county bonds were marketed and the land was acquired. Additional usable land was acquired by the hydraulic fill of marshes along the St. Johns River in the northeastern part of the area.

When conceived, the concept for the station included facilities for pilot training and a Navy Aviation Trades School (NAT) for ground crewmen. The NAS was commissioned on 15 October 1940. With the advent of World War II, the physical size of the facility was more than doubled, and military functions were geared to supporting the war effort. During 1942, the primary training of pilots was phased out and the station became the headquarters for the Chief of Naval Operational Training (CNAOPTRA), the final training phase before fleet assignment. The NAT School became the Naval Air Technical Training Center (NATTC) under the Chief of Naval Air Technical Training, NAS Memphis. The operational areas of the station still maintained coastal protection with seaplanes (PBY's). The facility reached a peak of 42,000 naval personnel and 11,000 civilians by 1946.

At the end of World War II NAS Jacksonville was devoted entirely to aviation training. In 1945 CNAOPTRA was redesignated Chief Naval Air Advanced Training (CNAVANTRA) but this mission, and that of the station, remained basically the same. In July 1946 the Seventh Naval District was transferred from Miami, Florida to NAS Jacksonville, as a joint command with CNAVANTRA. On 5 April 1948 the transfer of CNAVANTRA, and all training facilities, to NAS Corpus Christi, Texas was announced and the move was completed on 15 November 1948. The NATTC Jacksonville was transferred and consolidated with the NATTC at NAS Memphis.

Due to this relocation there was some doubt as to the continued requirement for NAS Jacksonville. The Office of the Chief of Naval Operations (CNO) however, made the decision to return to the originally planned concept as a Fleet Air Operational Support Base at that time. Therefore, as CNAVANTRA activities moved to NAS Corpus Christi, operational squadrons replaced them. By January 1949, the station was devoted to support of operational carrier squadrons with fleet squadrons assigned to Commander, Naval Air Bases, Sixth District (Now COMSEABAS EDASWWINGSLANT) and patrol squadrons assigned to Combat Patrol Wing (COMPATWING) Eleven. On 1 January 1951, the NATTC and Marine Air Division (MAD) activities were reactivated in support of the Korean build-up of facilities. This joint operational and training status continues to this time.

The NARF, a tenant of NAS Jacksonville, has been a major part of the activity since 1940. It was originally the NAS Assembly and Repair Department. Its mission has been the maintenance, repair and inspection of aircraft and aircraft components. Peak workload at the NARF occurred in 1945 when 7,300 employees, including 3,500 military personnel were on board. In 1965 the NARF became the East Coast designated overhaul port for 3 attack-type aircraft, the A-4 Skyhawk, the A-5 Vigilante and the A-7 Corsair. As of 1 April 1967 the Assembly and Repair Department (NAS Jacksonville) became a separate command, the NARF. The facility includes 45 buildings occupying approximately 33 acres.

The NFD was originally constructed on approximately 142 acres by the Army during World War II as the terminus of a pipeline from the Gulf of Mexico. It was to be used to barge fuel north along the intracoastal waterway. The purpose of the plan was to avoid shipping by tanker along the Atlantic Coast due to the presence of enemy submarines. The war ended before the pipeline was completed and, in 1947, the NFD was transferred to the Reconstruction Finance Corporation for disposal. The Navy Department acquired it in 1949 to provide AVGAS storage for the NAS Jacksonville and as a Fleet Refueling Unit. The pipeline, meanwhile, was dismantled and sold as surplus material.

From 1949 to 1951, the NFD operated as part of the NAS Jacksonville, and consisted of four tanks with a capacity of 280,000 barrels. On 26 April 1951, the NFD was established as an independent activity under the management control of Naval Supply Systems Command (NAVSUP) and the military command of Commanding Officer, NAS Jacksonville. An additional 300 acres of land was acquired, and in 1951 the first increment of an expansion program was completed. This expansion added seven 80,000 barrel floating roof tanks and two 20,000 barrel tanks to the NFD's storage, bringing the capacity to its current total of 880,000 barrels. The four original tanks were converted to NSFO to support fleet units at Naval Station, Mayport, and the new tanks were used for aviation fuels in support of NAS Jacksonville. The second increment of the plan, providing for 690,000 barrels of additional storage, was subsequently cancelled when it became apparent that the storage facilities were adequate to meet the existing requirements in the area.

In 1967, 181 acres were declared in excess of the requirements of the Navy, and were transferred to the U.S. Marine Corps Reserve. An additional 90 acres were sold to commercial interests in 1973.

Effective 1 April 1967, the military control was redelegated to Naval Supply Systems Command. On 1 March 1976, the NFD was designated as a DFSC Terminal and included the accountability of fuel stored at Naval Station, Mayport. A highlight in the history of the NFD occurred in September 1978 when it was awarded the 1977 Secretary of the Navy Environmental Protection Award for a small shore activity. This achievement was culminated with NFD being chosen to represent the entire Navy for the prestigious Secretary of Defense Environmental Protection Award. On 1 July 1980, NFD acquired the Mayport Fuel Division as a functional transfer from the Naval Station, Mayport. On 1 October 1982 NFD became a department of the newly established NSC Jacksonville.

5.3 PHYSICAL FEATURES

5.3.1 General

The entire state of Florida is located within the Coastal Plain physiographic province. The ground surface relief is very moderate with topographic highs rarely exceeding 200 feet above sea level. The Coastal Plain groundwater region, coinciding with the Coastal Plain physiographic province, contains abundant supplies of both surface and groundwater. Areally extensive deposits of sands, gravels and permeable limestones of considerable thickness are found in the region. Large amounts of groundwater can be obtained from individual wells throughout the entire region.

5.3.2 Climatology

The climate of the Jacksonville area is humid subtropical. Typically the summers are long, hot and humid and the winters are short and mild, with occasional frost from November through February. The Atlantic Ocean and the Gulf Stream have a moderating influence on both the minimum and maximum temperatures. The average annual temperature is approximately 70 degrees ranging from the mid 50's in January to the low 80's in July. The area has an average annual rainfall of approximately 53 inches with half the annual precipition falling between June and September (see Table 5.3-1). Most of the summer rain comes from short duration thunderstorms that occur almost every other day. These showers are often extremely heavy and can cause localized flooding and runoff problems. The area is also subjected to tornadoes each year.

TABLE 5.3-1

Climatic Data
Jacksonville, Florida

	Air Temperatures			Precipitation		Humidity		Wind Speed (Knots)			Mean Number Days			
	Normal		Avg.	Normal	24 Hr			Mean	Prevail	Max Speed/		Ptly		
Month	Max	Min	Monthly	Total	Max	7 am	1 am	Speed	Dir.	Dir.	Clear	Cldy	Cldy	Fog
January	67	45	56	2.45	3.02	87	56	7.5	NW	34S	9	9	13	5
February	69	47	57	2.91	3.84	86	52	8.6	WSW	45NE	9	7	12	4
March	73	51	62	3.49	3.21	85	49	8.5	NW	38W	9	10	12	3
April	80	58	69	3.55	4.88	84	47	8.3	SE	42SW	10	10	10	2
May	86	65	76	3.47	5.09	83	48	7.8	WSW	44E	10	12	9	2
June	91	71	81	6.33	5.93	85	55	7.6	SW	66NE	6	12	12	1
July	92	73	83	7.68	10.09	87	57	7.0	SW	43SW	4	15	12	1
August	91	73	82	6.85	7.93	90	59	6.7	SW	39NE	5	16	10	1
September	88	71	79	7.56	10.17	90	62	7.8	NE	71N	5	11	14	1
October	80	62	71	5.16	6.66	90	57	7.8	NE	63E	11	8	12	3
November	72	51	62	1.69	4.21	88	55	7.5	NW	52S	12	8	10	5
December	67	45	56	2.22	2.51	88	57	7.2	NW	54N	9	9	13	5

The entire Gulf and East Coast of the United States are subject to tropical hurricanes, but major hurricanes are relatively rare events at any location. Most occur in August, September and October, but the six-month period after 1 June to 30 November is considered the Atlantic hurricane season. On the average, six Atlantic hurricanes occur each year, but there have been significant deviations from the average.

In August 1964 hurricane Dora entered the Florida coast between St. Augustine and Jacksonville. St. Augustine recorded winds of 125 miles per hour and total damage exceeded $50 million. Dora was the first hurricane on record to move inland from the east over northeastern Florida.

In September 1979 hurricane David claimed 1,200 lives in the Caribbean and property and crops damage in excess of $1.5 billion. When it arrived in the U.S. it had lost much of its power, but swept the Atlantic coast from Florida to Maine, claiming 19 lives and causing more than $500 million in damages. This storm passed over the Jacksonville area from the south.

Passing hurricanes and tropical storms have their greatest impact through prolonged rains and high tides causing flooding problems that are usually considered equivalent to 100-year storm events (see Figures 5.3-1 and 5.3-2). The immediate river shoreline is most affected by such storms due to the exposure to the maximum effect of winds from the northeast and southeast. Under flooding conditions, hazardous materials stored or disposed in low areas (approximately below elevation 6 feet above mean sea level [msl]), adjacent to shoreline of the St. Johns River, would be subject to migration by floating or washing away to other areas off property and spreading of contaminants on property due to damaged or leaking container systems. As is indicated on Figure 5.3-3, the 1-year 24-hour rainfall for the Jacksonville area would be 4 inches.

5.3.3 Topography

The topography in northeast Florida is mostly low, gentle to flat, and composed of a series of ancient marine terraces. These terraces were formed in the Pleistocene (glacial period) when the sea was relatively stationary at various higher levels than the present sea level. When the sea dropped to a lower level, the sea floor emerged as a level plain or terrace and the landward edge of each terrace became an abandoned shoreline, which is generally marked by low scarp.

The highest altitude in Duval County is about 190 feet above msl in the extreme southwest corner of the county, along the eastern slope of a prominent topographic feature known as "Trail Ridge." Trail Ridge is a remnant of the highest ancient marine terrace (Cohaire) in Duval County. The terraces parallel the present Atlantic shoreline and become progressively lower from west to east (Fairchild, R.W., 1972).

Surface drainage in the area is primarily controlled by the terrace. Each terrace is bounded along its east seaward edge by remnants of a beach ridge parallel to the ancient shore line. These ridges direct runoff so that the streams flow parallel to the ancient shorelines, e.g., St. Johns River at the NAS (Figure 5.3-4). A feature of this topography in the flat

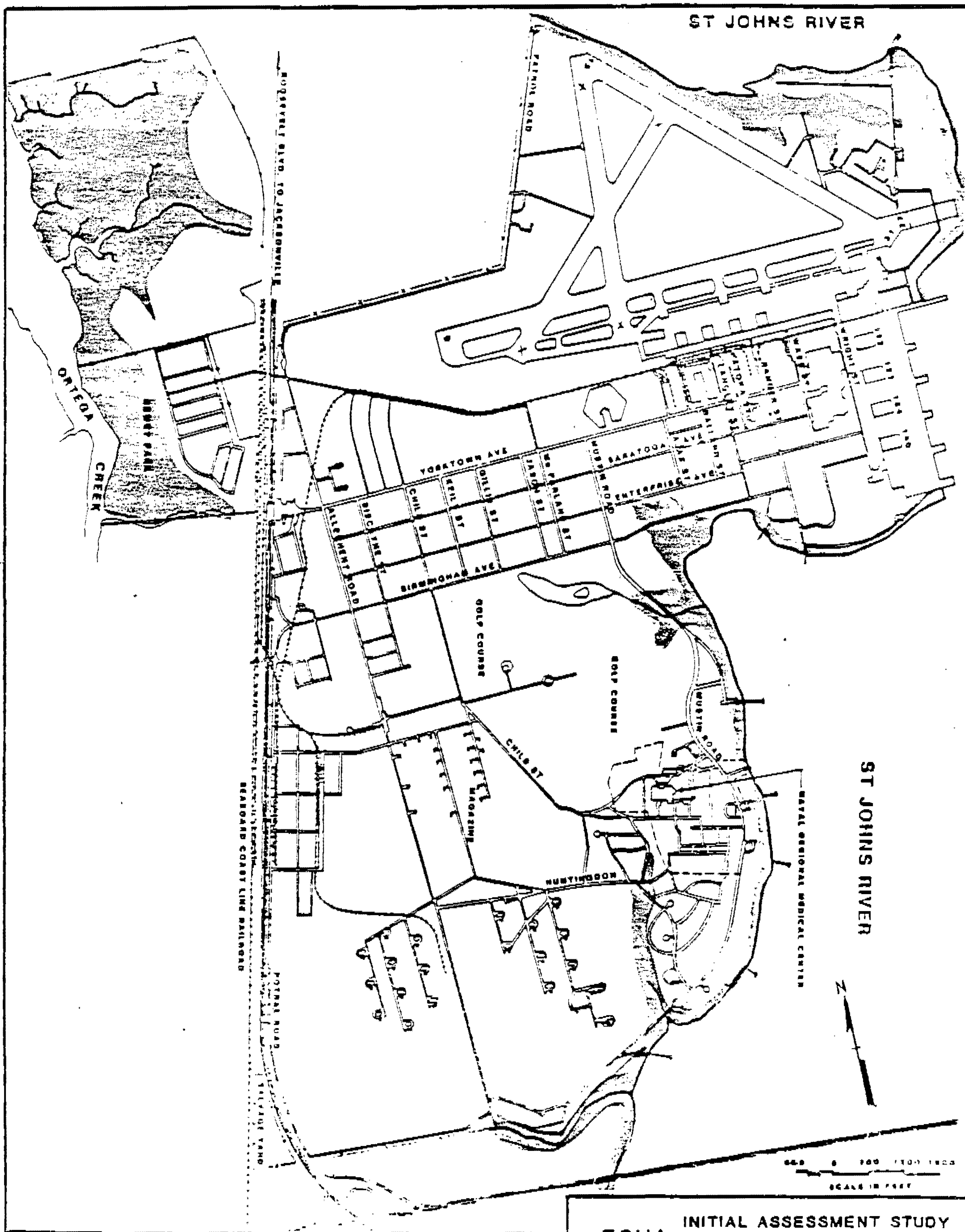
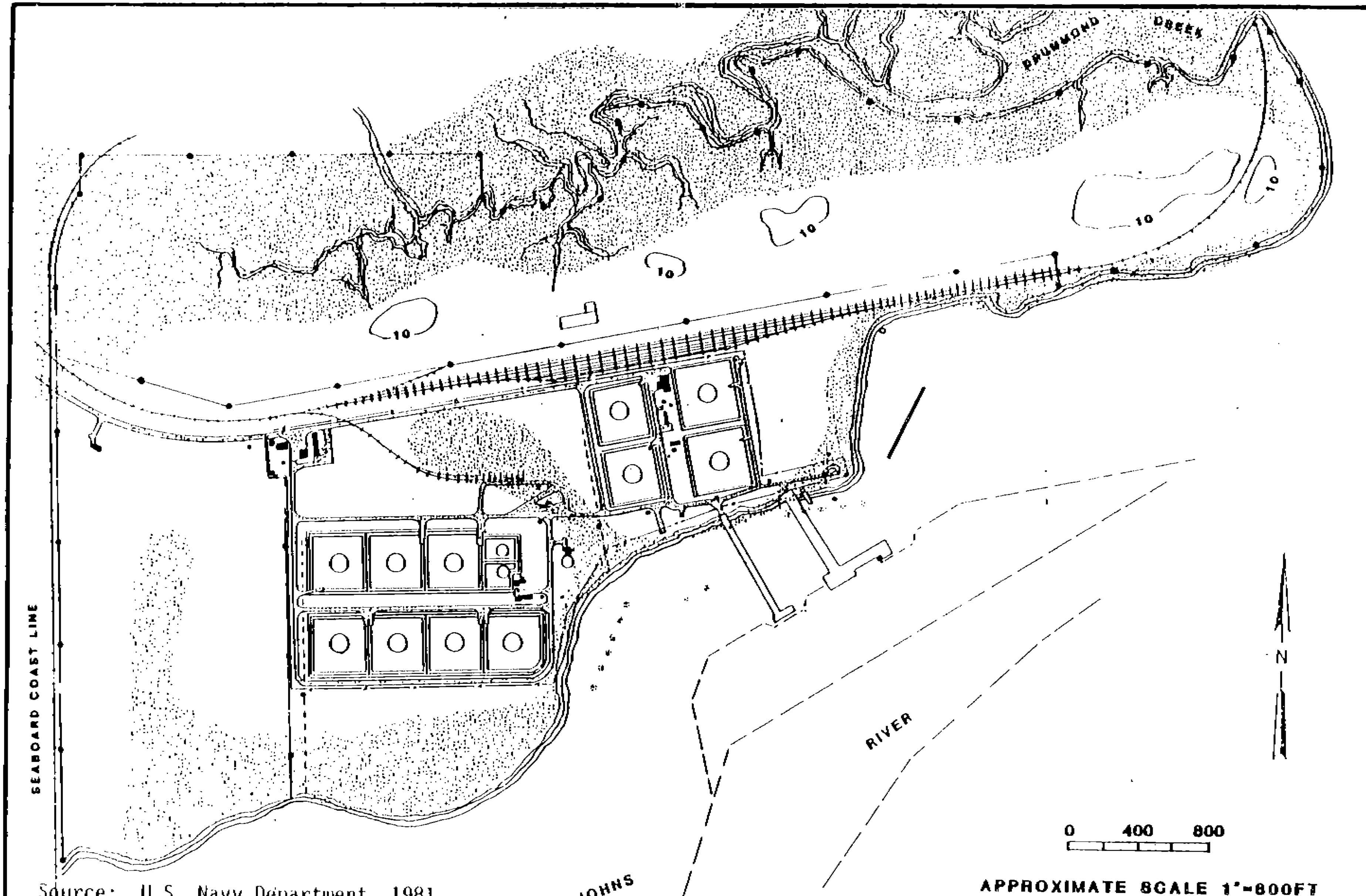


Figure 5.3-1 FLOOD ZONES NAS JACKSONVILLE.	FCHA INITIAL ASSESSMENT STUDY NAVAL AIR STATION JACKSONVILLE, FLORIDA



Source: U.S. Navy Department, 1981

Figure 5.3-2 FLOOD ZONES NFD JACKSONVILLE

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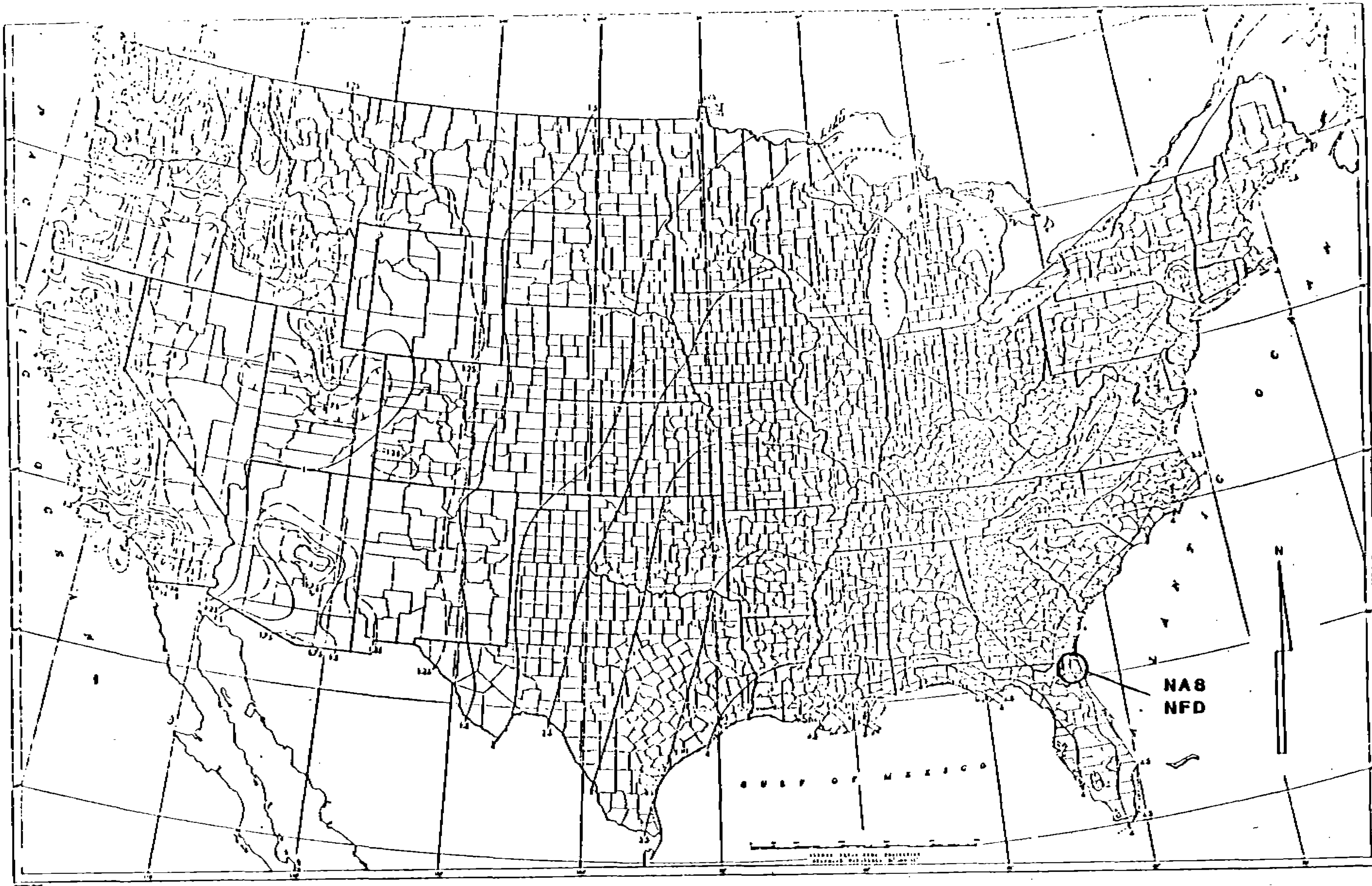

Source: U.S. Department of Commerce, 1963

Figure 5.3-3 1-YEAR 24-HOUR RAINFALL (INCHES)

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Old Drum Lot (Site No. 30)

Findings and Recommendations

Resampling of soils at the Old Drum Lot, as recommended in the verification study, indicates that 2 of the six soil samples contained cadmium slightly exceeding the EP toxicity limit of 1.0 ppm Cd. Sample Nos. 3 and 4 contained 1.04 and 1.18 ppm Cd, respectively (Figure 9 and Appendix C, Section 3). Lead content of all samples was relatively low and within acceptable limits. Although contaminated soils had been removed from the site prior to sampling, it appears that some contaminated soil remains.

Water-level elevations determined on September 19, 1985, are also given in this illustration. As indicated, the highest water-table elevation (20.8 ft) was determined at 30-5. Lithologic logs for 30-4 and 30-5 are given in Table 3; chemical analyses in Appendix C, Section 3.

Monitor well NAS 30-1 was resampled, as recommended, and found to be free of VOCs and heavy metals. Samples from the newly installed monitor well 30-4 were also free of VOCs and heavy metals. Well 30-5, however, contained a total of 29 ug/l VOCs, chiefly toluene (11 ug/l) and TCE (7 ug/l). The metal content of the sample was low and below drinking water standards.

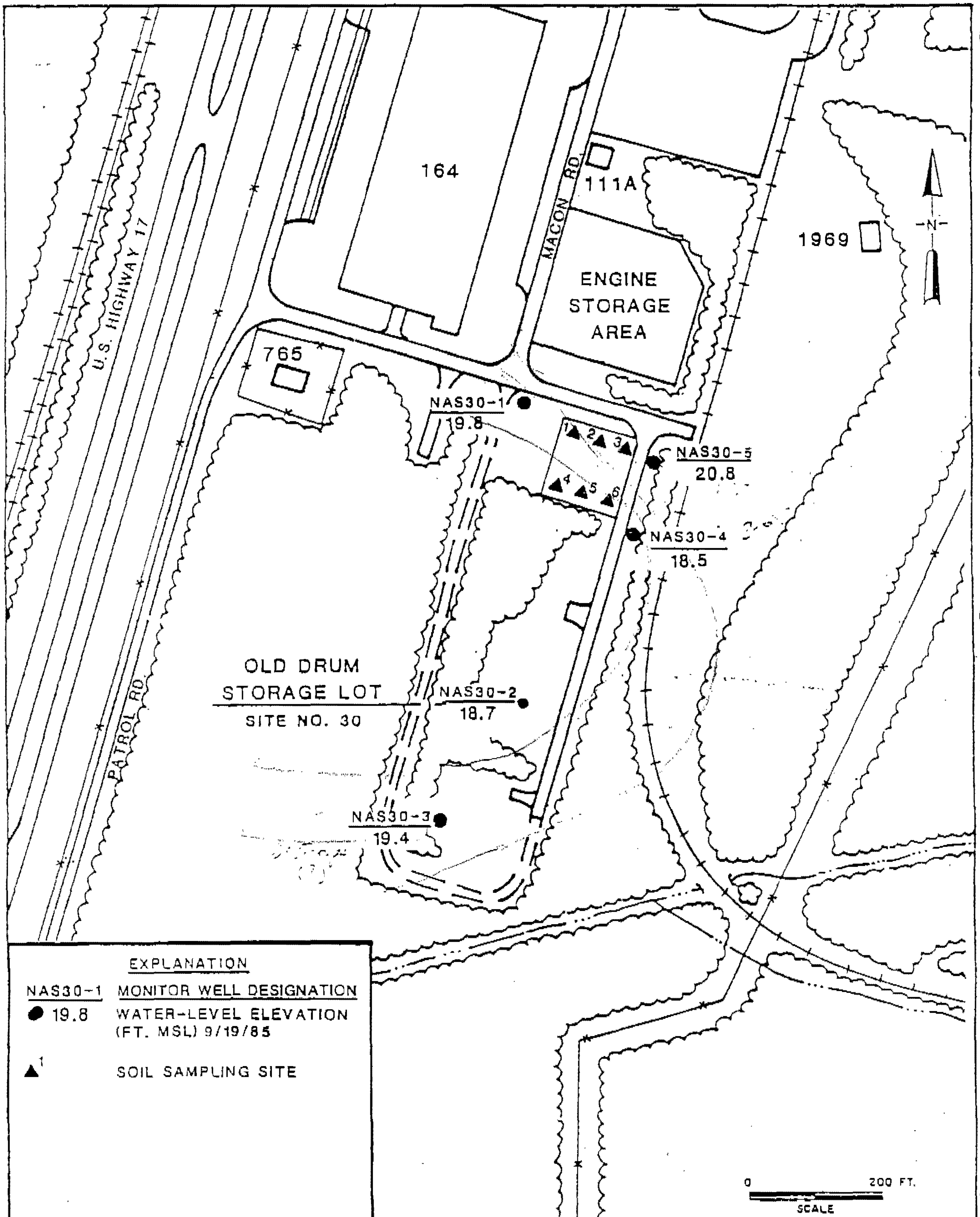

Figure 9. Location of Wells and Sampling Sites, NAS Site No. 30

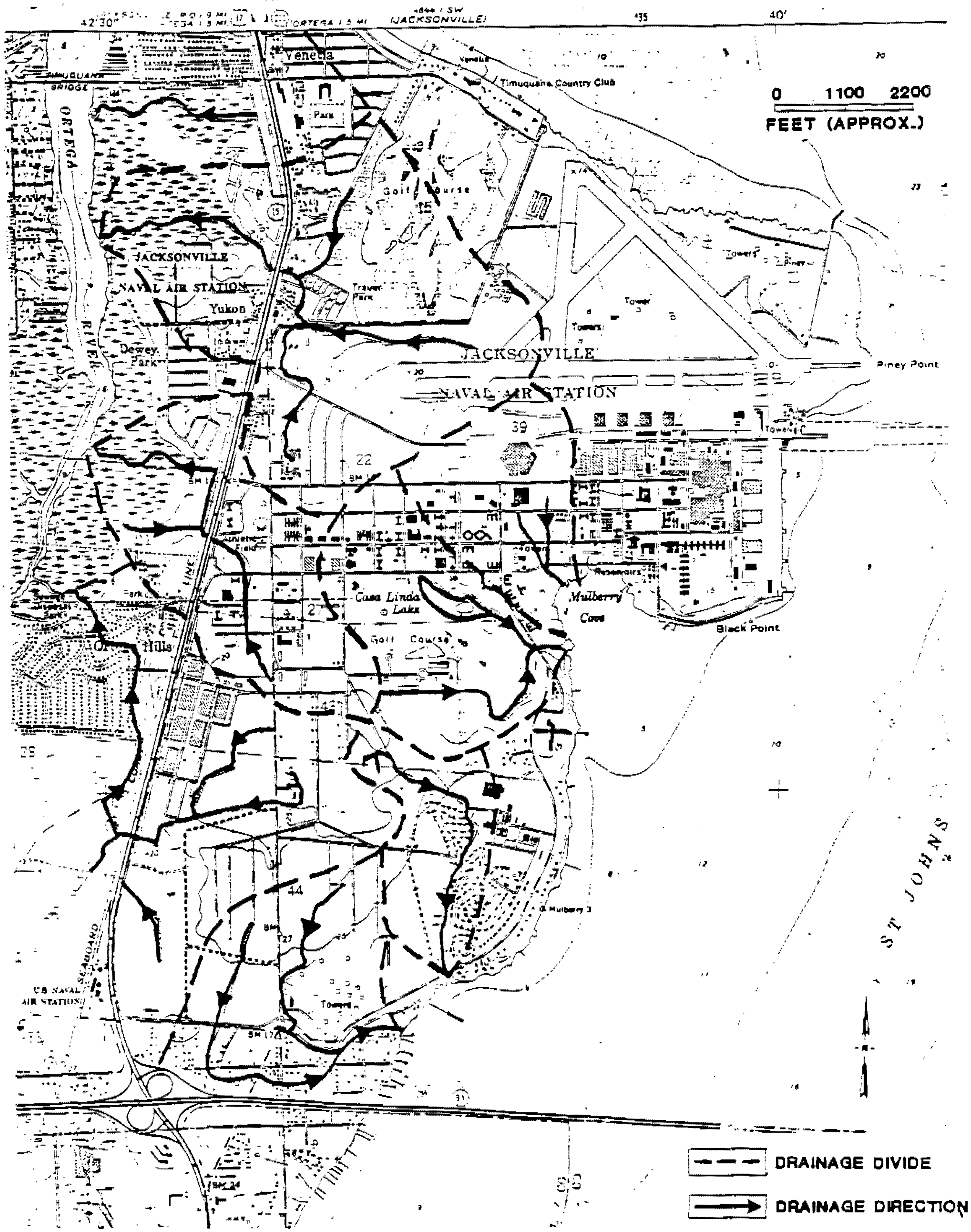

Figure 5.3-4 TOPOGRAPHY AND DRAINAGE MAP NAS JACKSONVILLE.

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marshy areas northeast of Jacksonville, and in the vicinity of the NFD, is that drainage is more sluggish and the streams often form a dentritic pattern (Figure 5.3-5). Because of the low relief over much of the area, drainage divides are often difficult or impossible to define. The terraces also play a significant role in determining the configuration of the potentiometric surface of the shallow aquifer system. The potentiometric surface, based on water levels in wells that penetrate the shallow aquifer system, roughly follows the contour of the land surface. As a result, the potentiometric surface is highest where the terraces are highest and lowest where they are lowest. This topic is discussed in greater detail in Section 5.3.7.1.

The elevation of the land surface at the NAS varies from a high of about 35 feet msl near the center of the southern portion of the base (at the former registered disposal site), to a low of 0 feet msl at the St. Johns River. This topographic high forms an elongated ridge oriented in a northeast-southwest direction (see Figure 5.3-4). The land slopes gradually away from the topographic high in all directions with the greatest relief occurring to the east-southeast.

5.3.4 Geology

In the Jacksonville area, supplies of fresh water are obtained entirely from wells drilled into the soil and rock formations that comprise the aquifer systems. In order to assess the potential for contamination of these groundwater supplies it is first necessary to differentiate the various geologic formations and to determine their water bearing properties.

The geologic formations are fairly well defined throughout the Jacksonville area due to the many deep wells and the diligence of the state and oil company geologists who provided detailed geologic logs and stratigraphic interpretations. Examples of geologic logs of wells (W-27, W-514 and W-661) at and near the NAS, obtained from the Florida Bureau of Geology, Tallahassee, Florida, are provided in Appendix A. Geologic logs such as these allow the construction of detailed geologic cross sections and thus provide the basis for evaluating subsurface conditions at the NAS and NFD.

The majority of the Florida Peninsula is made up of Eocene and Oligocene aged limestones and dolomites. These carbonate rocks, which form the Floridan Aquifer, were deposited in an environment similar to today's Bahama Boulas. Except for the more central and western portions of Florida, these older carbonate rocks were covered by Miocene and more recent aged phosphate sandy clays, coarse to fine sand, shell and friable limestone beds. As indicated on Table 5.3-2, these more recent unconsolidated deposits form the aquicludes and shallow aquifer systems in Duval County, including the NAS and NFD. The areal distribution of the various aged formations throughout the Florida Peninusla is shown on the Generalized Geologic Map (Figure 5.3-6).

In most areas of northeastern Florida the top of the Ocala Group generally corresponds to the top of the Floridan Aquifer. Thus the structure contours for the top of the Ocala Group, shown in Figure 5.3-7, also approximately represent the top of the Floridan Aquifer. As shown in Figure 5.3-7, the Ocala Group is exposed at the surface (approximately 100 feet

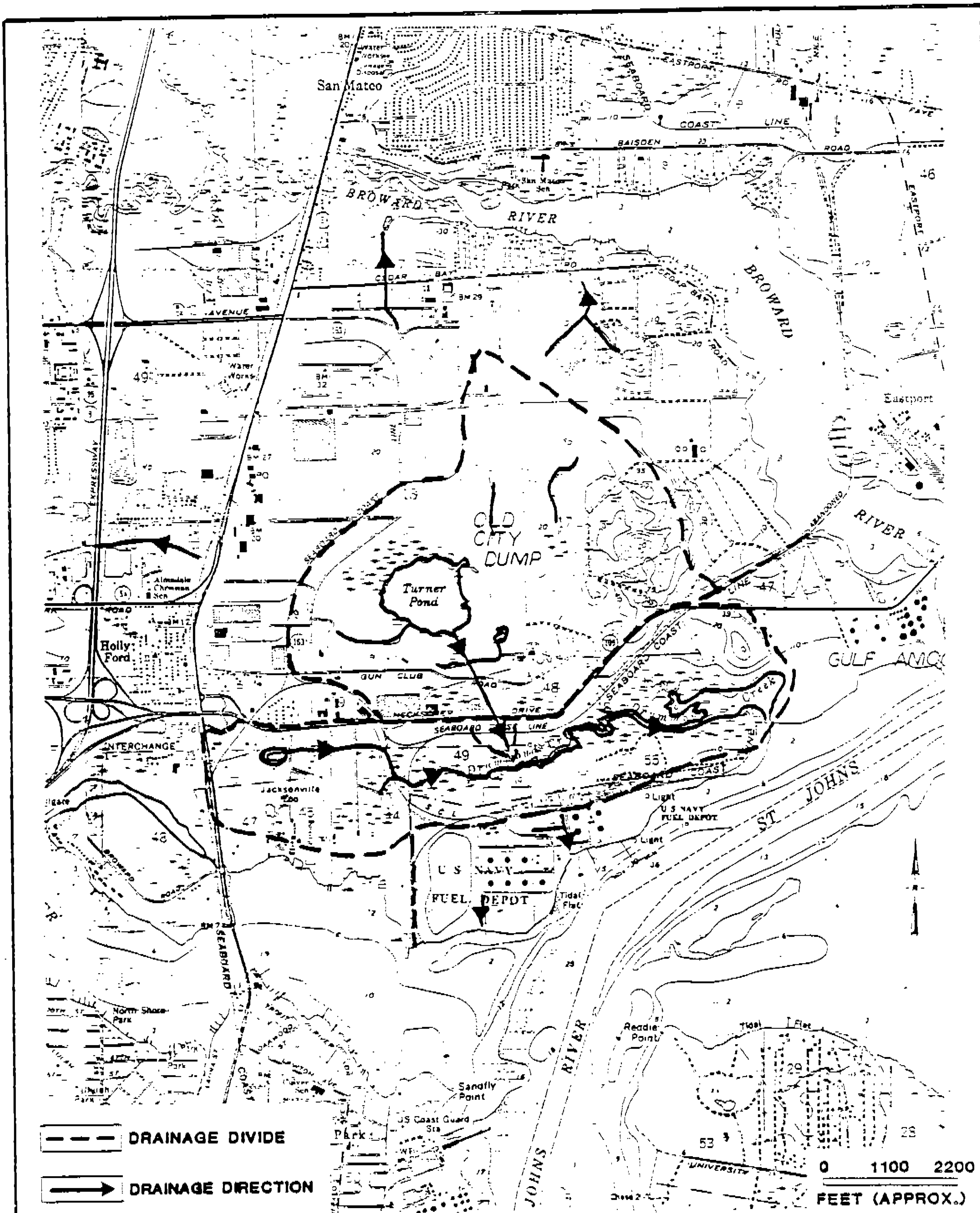


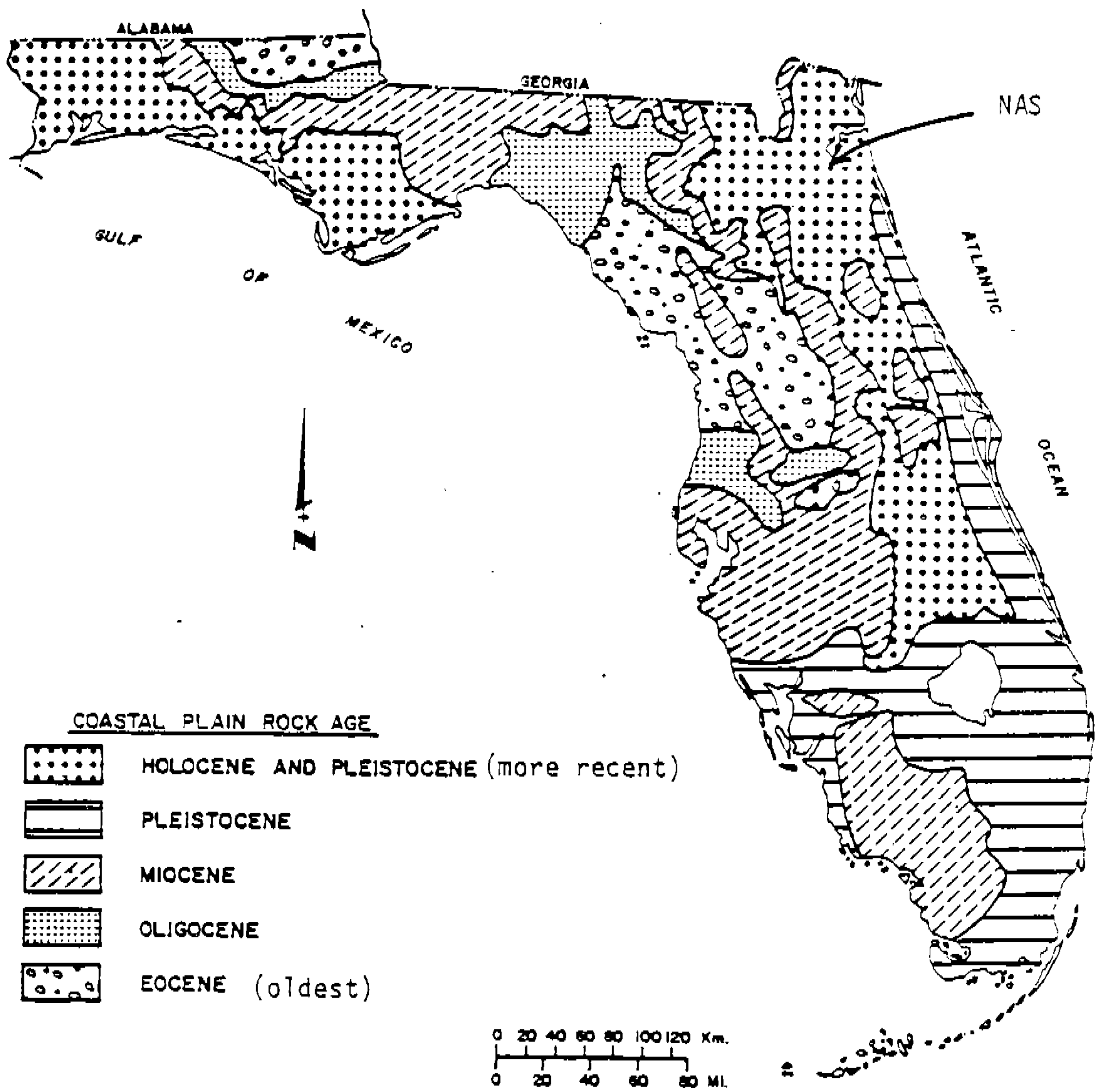
Figure 5.3-5 TOPOGRAPHY AND DRAINAGE MAP NFD JACKSONVILLE.	FCHA INITIAL ASSESSMENT STUDY NAVAL AIR STATION JACKSONVILLE, FLORIDA

TABLE 5.3-2

Stratigraphic Units and Aquifer Systems in Duval, Nassau, and Baker Counties

Geologic age	Stratigraphic unit		Approximate thickness (feet)	Lithologic character	Aquifer systems		Water-bearing properties
Recent and Pleistocene	Recent and Pleistocene deposits		0-150	Soil, muck, coarse to fine sand, shell, and some clayey sand	Shallow aquifer system		Surficial sand yields small amounts of water. Sand and shell bed along coast yields moderate quantities.
Pliocene?	Pliocene or Upper Miocene deposits		20-110	Gray-green calcareous, silty clay and clayey sand; contains shell beds and white soft, friable limestone beds	Shallow aquifer system		Limestone, sand, and shell bed near base of deposits yield moderate to (locally) large amounts.
Miocene	Hawthorn Formation		260-490	Gray to blue-green calcareous phosphatic, sandy clays and clayey sands; contains fine to medium phosphatic sand lenses and limestone and dolomite beds, particularly near the base of the formation.	Aquiclude		Relatively impermeable clays and marls in both the late Miocene or Pliocene deposits and the Hawthorn Formation confines the artesian water in the Eocene limestone and in the limestone and shell beds above the Eocene limestone. Yields small to moderate supplies.
Eocene	Ocala Group	Crystal River Formation	50-300	White to cream chalk, massive fossiliferous marine limestone.	Floridan aquifer system		Marine limestone foamrtions utilized as the primary source of water in the area.
	Ocala Group	Williston Formation	20-100	Tan to buff granular, marine limestone	Floridan aquifer system		
	Ocala Group	Inglis Formation	40-120	Tan to buff granular, calcitic, marine limestone; contains thin dolomite lenses and zones of Miliolidae foraminiferal coquina	Floridan aquifer system		
	Avon Park Limestone		50-250	Alternating beds of brown to tan hard, massive dolomite, brown finely crystalline dolomite, and granular calcitic limestone	Floridan aquifer system	Aquiclude	Massive dolomite beds restrict vertical movement of water.
	Lake City Limestone		425-500+	White to brown, purple-tinted lignitic, granular limestone and gray hard, massive dolomite; contains lignite beds and zones of Valvulinidae foraminiferal coquina	Floridan aquifer system		Limestone and porous dolomite beds yield large to very large quantities of water. Hard dolomite and limestone beds restrict vertical movement of water within certain zones. Potentially the greatest source of water in the area.
	Oldsmar Limestone		846	Cream to brown massive to chalky, granular limestone and tan to brown massive to finely crystalline dolomite	Floridan aquifer system		

Source: Leve, 1966



Source: Miller, 1977

Figure 5.3-6 GENERALIZED GEOLOGIC MAP OF FLORIDA.

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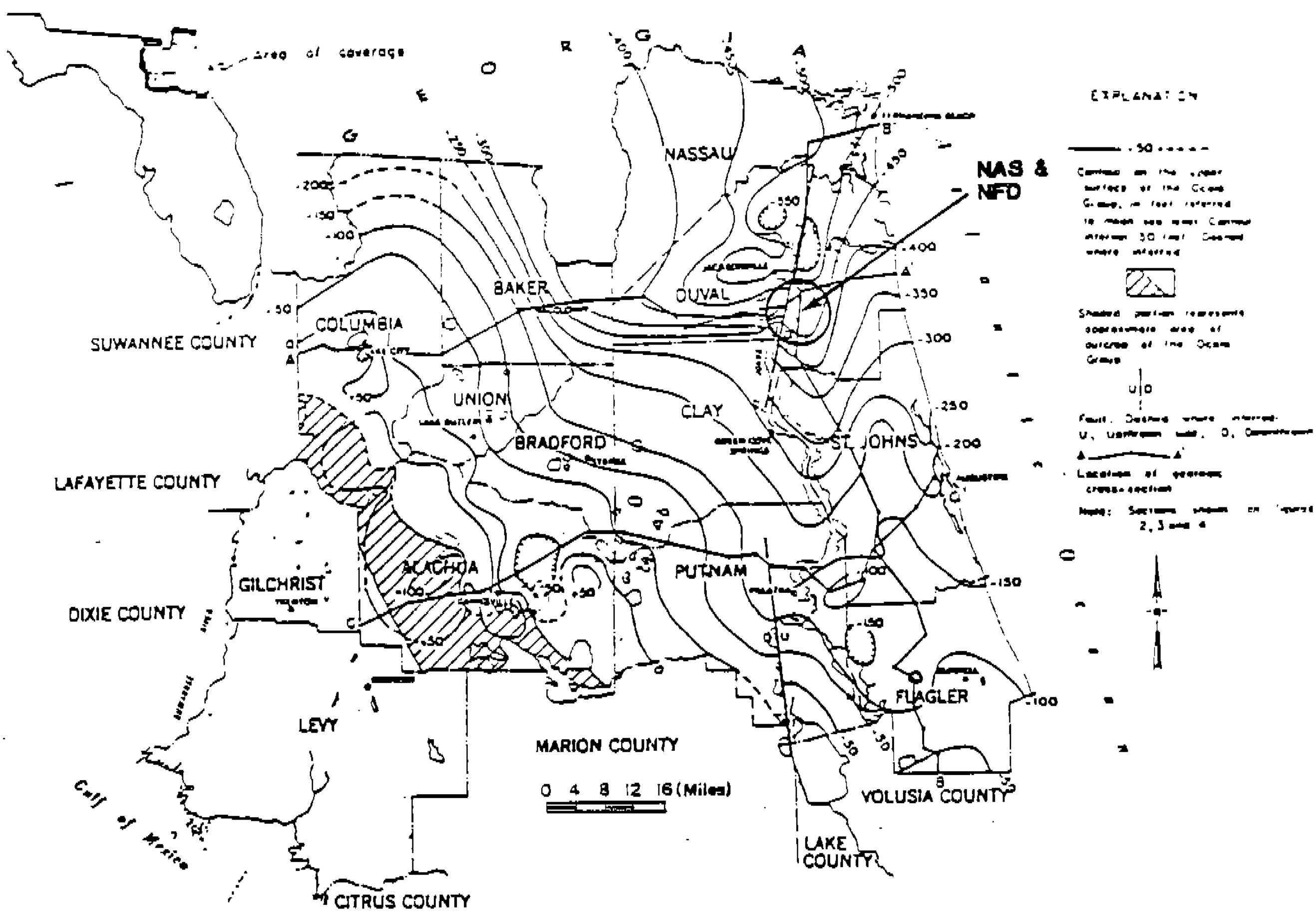

Source: Leve, 1968.

Figure 5.3-7 MAP OF NORTHEAST FLORIDA SHOWING THE ALTITUDE AND CONFIGURATION OF THE TOP OF THE OCALA GROUP.

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above msl) in western Alochua County (approximately 30 miles southwest of Jacksonville). In the vicinity of the NAS the top of the Ocala Group is at a depth of approximately 300 feet (elevation of 300 below msl). The top of the Ocala Group generally dips to the northeast forming a wide basin in Duval County.

The many irregularities in the surface of this aquifer were formed by erosion before the younger Miocene sediments were deposited and some irregularities were formed by collapse as a result of solution of rock material by circulating groundwater (Leve, 1968). Although sinkholes are fairly common to the central and western part of northeastern Florida none have been reported near the NAS or NFD.

As shown in Figure 5.3-7, a fault occurs in the vicinity of the NAS, beneath the St. Johns River. As shown in Figure 5.3-8 the top of the Ocala Group is displaced about 100 feet along this fault plane. As indicated in the geologic cross section A-A' (Figure 5-3.8) this fault could not be traced through the Hawthorn Formation or into the Pleistocene deposits and therefore would be considered inactive, at least prior to the Pleistocene (greater than 20,000 years ago). This fault would not be expected to have any significance to potential contaminant migration, as it apparently is discontinuous through the Hawthorn Formation which is considered an aquiclude in this area (see section 5.3.7.1).

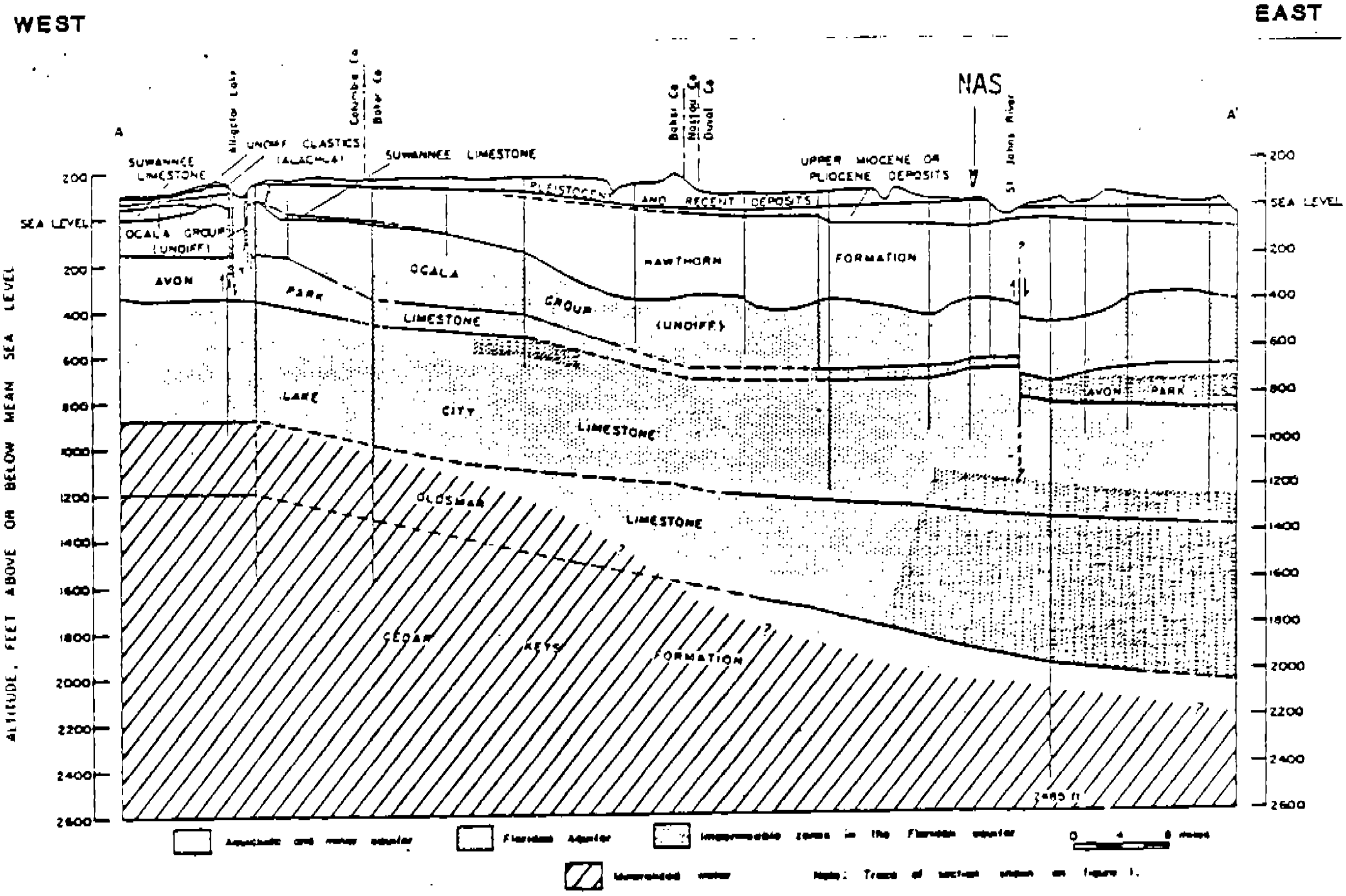
5.3.5 Soils

According to the 2005 Comprehensive Plan, there are 38 different soils found in Duval County and they can generally be characterized as being either sand, organic or man-made (Jacksonville Area Planning Board [JAPB], 1979). The sandy soils are the most common. In terms of total acreage a major portion of this county is composed of soils that are broad, sandy, very strongly acid, very poorly drained and have an organic stained pan within 42 inches of the surface. These soils are considered poor for septic tank use and fair for developments such as building foundations, highways and airports.

Fresh water swamps are located mainly along the tributaries of the St. Johns River. These areas are poorly suited for development due to excessive wetness and flooding potential. The salt marshes located in the northeastern part of the county, along the St. Johns River, have very low development potential, due to excessive wetness, flooding, high shrink-swell potential, low soil strength and high corrosivity (JAPB, 1979).

Test borings were drilled in several areas at the NAS and NFD to provide information on the bearing capacity, contaminant migration potential, etc. of the shallow soils.

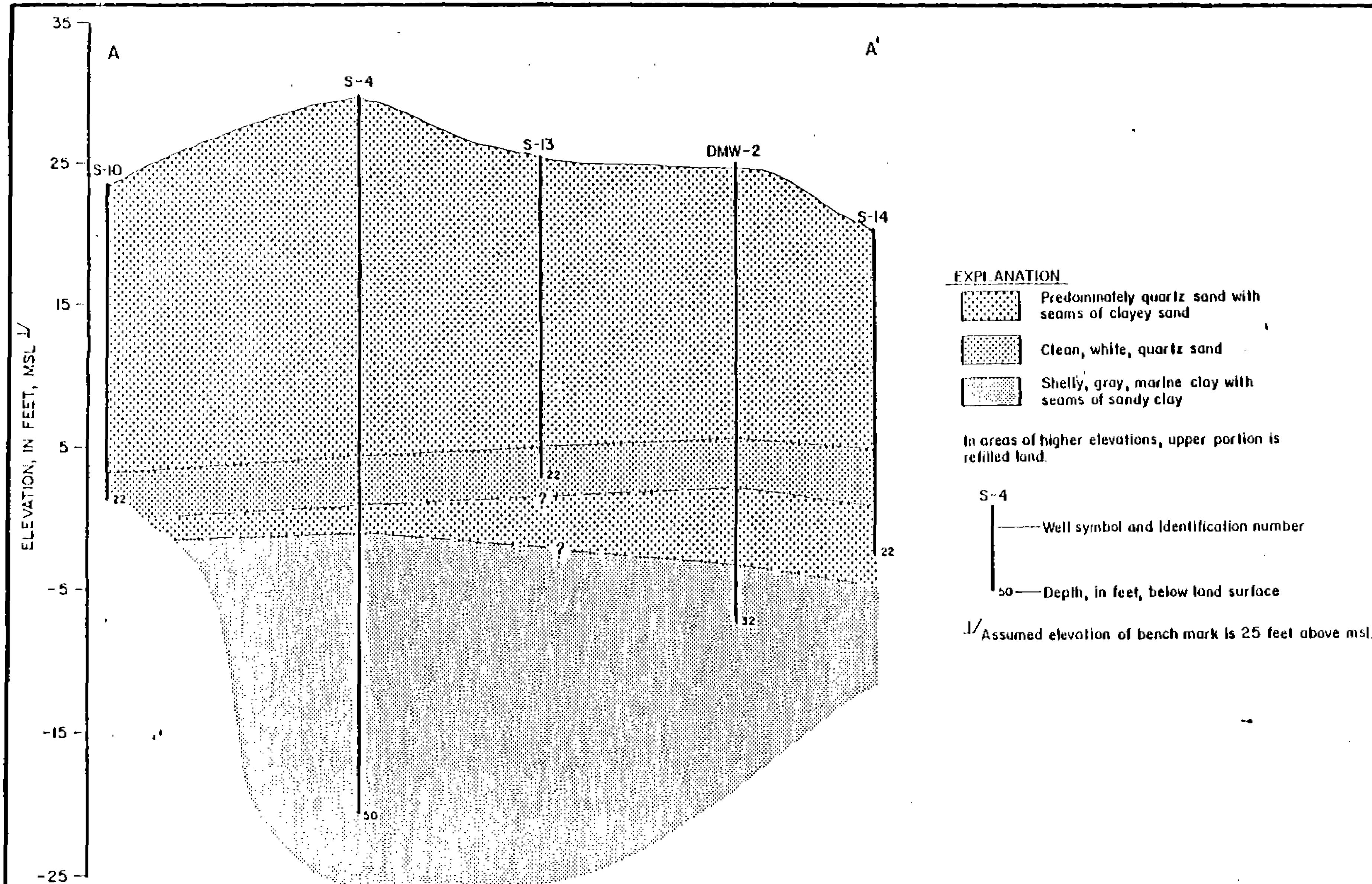
At Site No. 26 (at the NAS), borings indicated that the site is underlain by approximately 20 to 30 feet of unconsolidated very fine to medium grained quartz sand that contains lenses of clayed fine sand (Geraghty and Miller, May 1980). This unconsolidated sequence contains the water table aquifer. A north-south and east-west geologic cross-section of the surficial sediment underlying the site is shown in Figures 5.3-9 and 5.3-10 (see Figure 5.3-11, for cross-section location). At borings DPW-1,



NOTE: FOR LOCATION OF SUBSURFACE SECTION A-A' SEE FIGURE 5.3-7

Source: Leve, 1968

Figure 5.3-8 GEOLOGIC CROSS SECTION A-A' FROM WEST OF LAKE CITY TO THE ATLANTIC OCEAN, SHOWING FORMATIONS PENETRATED BY WATER WELLS.	FCHA INITIAL ASSESSMENT STUDY NAVAL AIR STATION JACKSONVILLE, FLORIDA



Source: Geraghty & Miller, 1980

Figure 5.3-9 GEOLOGIC CROSS SECTION A-A'.

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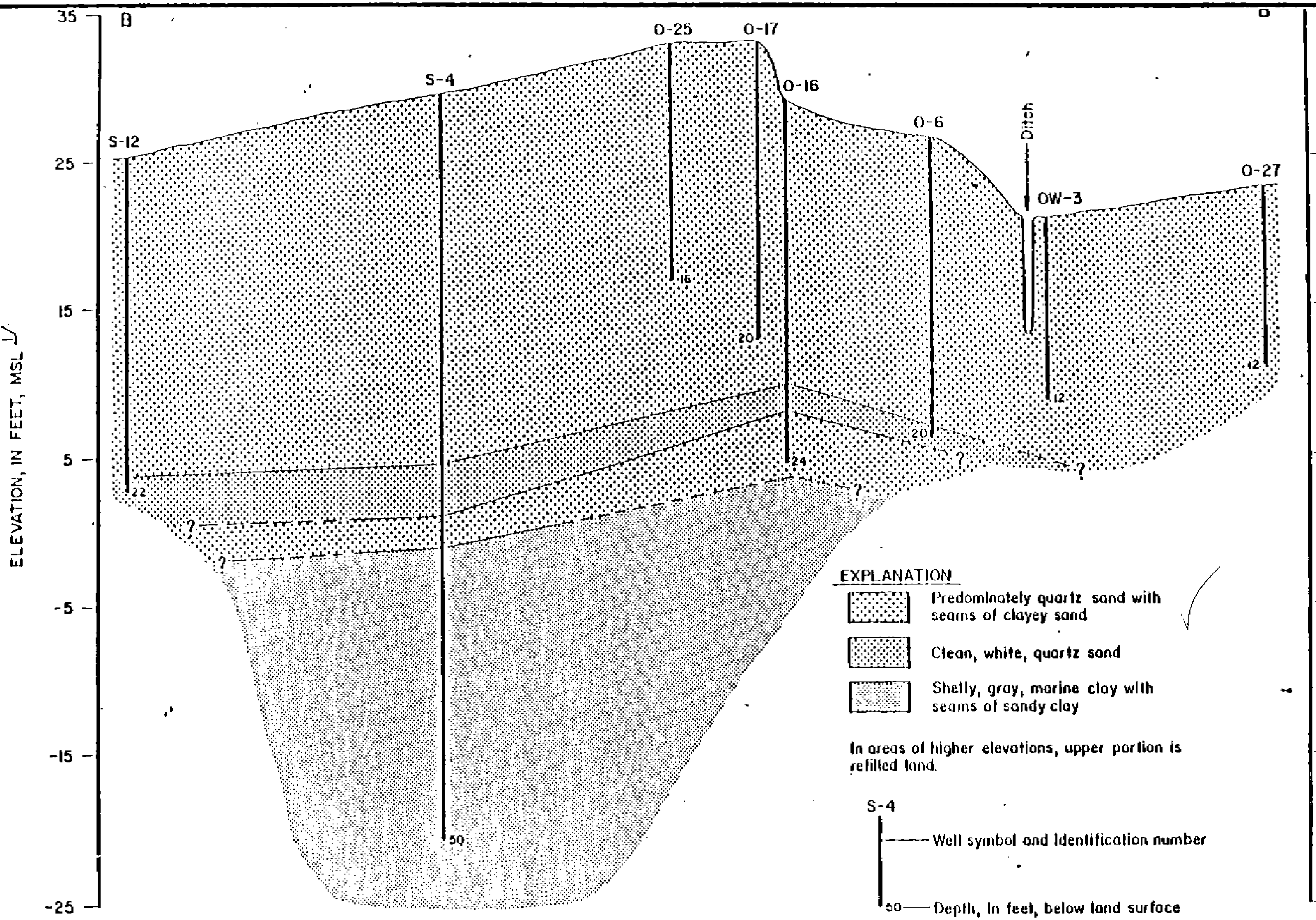

1/ Assumed elevation of bench mark is 25 feet above msl.

Source: Geraghty & Miller, 1980

Figure 5.3-10 GEOLOGIC CROSS SECTION B-B'

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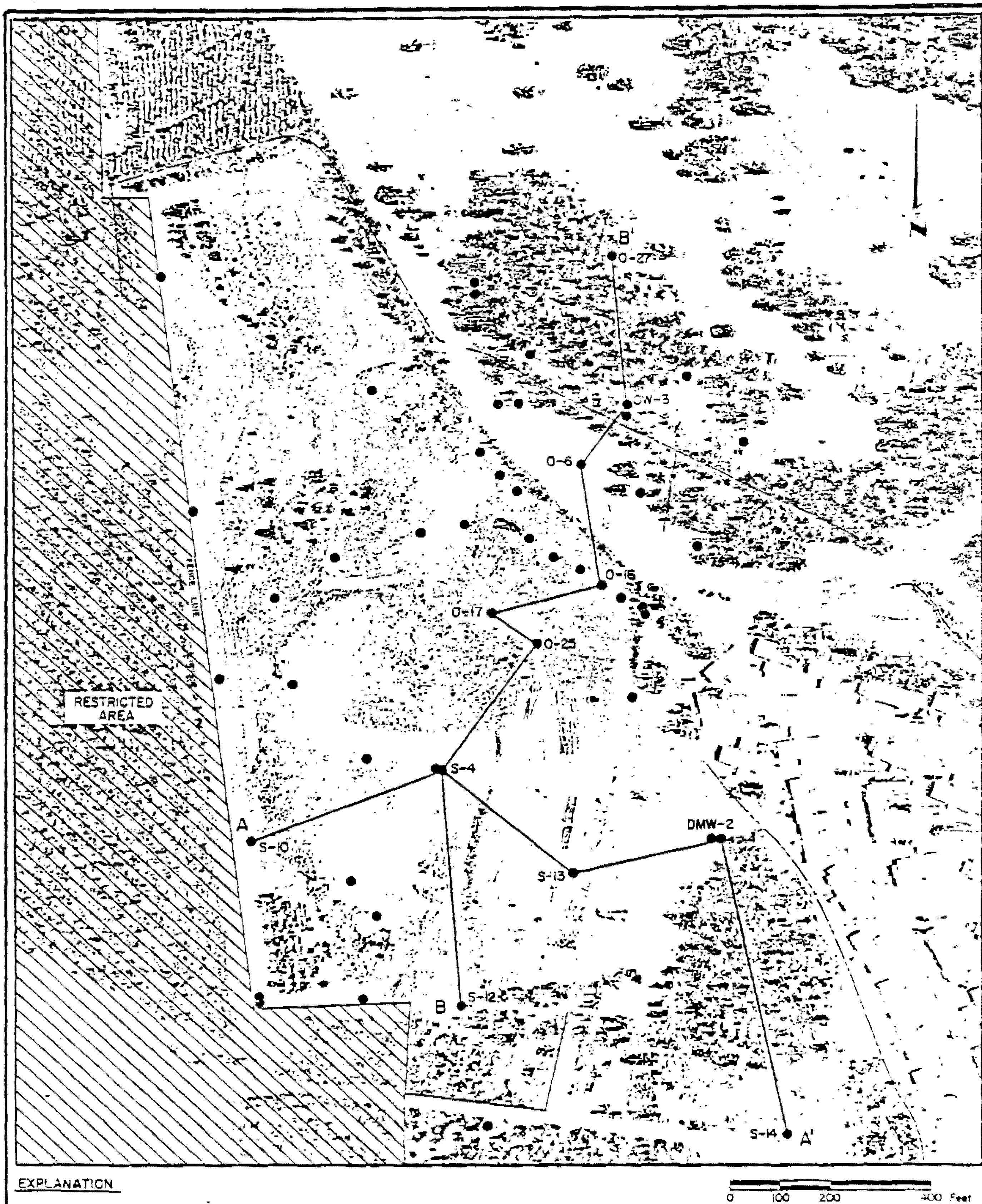

Source: Geraghty & Miller, 1980

Figure 5.3-11 MAP SHOWING THE LOCATION OF GEOLOGIC CROSS SECTIONS A-A' and B-B'.

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DPW-2, and S-4, the base of the water table aquifer was approximately located at depths of 22, 28 and 30 feet, respectively. The confining material underlying the aquifer was found to vary from a gray, sandy clay to a white marl and green clay (Geraghty and Miller, Inc., May 1980).

At the northern end of the NAS, borings drilled for the Plating and Cleaning Facility indicated that there was considerally more sand (i.e. at greater depths). The report by Burns and McDonnell, July 1981 (Appendix B) indicated that the soils at this location (NARF) consist primarily of loose to very dense sand with some silt and clay. Generally these soils are classified as SP to SM materials according to the Unified Soils Classification System. However, some silty clays and clayey sands, classified as SC and CL materials, were encountered. Bedrock was not encountered in any of the borings observed by the Burns and McDonnell engineer, including B-7 which penetrated to a depth of 70 feet. Water level measurements at the completion of drilling were taken in each of the eight borings. The groundwater in these borings varied from 5.8 to 17.4 feet (Burns and McDonnell, July 1981).

Shallow test borings drilled at the NFD, by Brevard Engineering, dated 20 May 1975 (Appendix A) indicate the primary soil type to consist of a light brown fine to coarse sand (SW to SP). This material is to be expected as much of the NFD is hydraulic fill or material dredged from the St. Johns River. Figure 5.3-12 is a photograph of one stage of the hydraulic fill operation in 1951.

5.3.6 Surface Water Resources

5.3.6.1 General

At the NAS Jacksonville two principal waterways are located in the immediate vicinity: the St. Johns River and its tributary, the Ortega River. The St. Johns River forms the eastern boundary of the station, while the Ortega River is located approximately ½ mile west of the station. At the NFD three principal waterways are of interest: the St. Johns River, the Trout River, and Drummond Creek. The NFD is located on the northwest bank of the confluence of the St. Johns River and the Trout River, while Drummond Creek is located several hundred feet north of the NFD. Figure 5.3-4 and 5.3-5 depict the locations of these principal waterways in relation to the NAS and the NFD sites. The physical characteristics of the four principal waterways are discussed below.

5.3.6.2 St. Johns River

The St. Johns River is the largest of the waterways of interest to this study. The Trout River, Ortega River and Drummond Creek are all tributaries of the St. Johns. The river originates in a marsh near Fort Pierce, Florida, 312 miles to the south from its mouth near Mayport, Florida. At Mayport, the river discharges to the Atlantic Ocean. The St. Johns River drains an area of 9,430 square miles, nearly one sixth of the land area of Florida (Anderson and Goolsby, 1973). The portion of the St. Johns from Lake George (106 miles upstream from the ocean) to the Atlantic Ocean is under the influence of tides and salt water flow from the ocean, and is therefore considered an estuary. Occasionally, tidal effects are noted as far as 161 miles upstream (Anderson and Goolsby, 1973).

Jacksonville is situated on the St. Johns River approximately 21 miles upstream from the ocean. At the Main Street Bridge in Jacksonville the river is about 1,250 feet in width, between Jacksonville and the ocean the river becomes as wide as 2 miles. At low water, open water areas of the river total more than 300 square miles.

Flow records for the St. Johns River in the Jacksonville area are obtained at stage monitoring stations at Main Street Bridge in Jacksonville, at the NAS 8.2 miles upstream from the Main Street Bridge, and at the U.S. Army Corps of Engineers Dredge Depot 4.8 miles downstream from the Main Street Bridge. The channel of the St. Johns estuary above Jacksonville is capable of storing huge amounts of water, and rising tides force large amounts of water upstream past Jacksonville. As the tide falls, much of the water flows back past Jacksonville as tidal flows, averaging 87,000 cfs with peak flows commonly exceeding 150,000 cfs. The average tidal flow is more than seven times the average freshwater flow (Anderson and Goolby, 1973). Wide variations in the volume of flow at Jacksonville are therefore experienced. Table 5.3-3 shows selected flow statistics for the St. Johns River at Jacksonville. The period of record covers 4,597 days, during which 8,883 tidal cycles occurred. As can be seen from this table, flow conditions are extremely variable. The average net downstream discharge of the St. Johns River is 5,883 cfs with daily net flow in the downstream direction occurring on about 70 percent of the days of record, and net daily upstream flow occurring on about 30 percent of the days of record. The greatest number of consecutive days during the period of record that the net flow upstream was zero was 14 days. Although tides exert the greatest influence on the flow regime of the St. Johns River at Jacksonville, a number of other nontidal factors, such as wind, runoff, channel storage, rainfall, and evapotranspiration can affect flow volumes in the St. Johns (Anderson and Goolsby, 1973). Typically, these factors can superimpose their combined effect on the tidal flow regime, moderating and augmenting the net tidal effect.

5.3.6.3 Water Quality of the St. Johns River

The quality of water in the St. Johns River (and its tributaries) depends to a large extent on the flow characteristics of the watercourse (as described in the previous section). According to Fairchild and Leve (1973), the ability of the St. Johns River system to transport and discharge polluted water is hampered significantly by daily tidal fluctuations. Wastewater that enters the river may remain in the vicinity of the outfall for prolonged periods of time due to the changing direction and velocity of the current. The situation is compounded further by the effects of northeastern winds. At times, strong northeastern winds, accompanied by high tides, may push wastewater upstream a considerable distance from its point of outfall.

The St. Johns River is rated by the Florida Department of Regulation as a Class III waterbody, designated for fish and wildlife propagation, and body contact recreational uses. According to a recent Draft Environmental Impact Statement prepared by the Florida Department of Transportation (1982), the water quality of the St. Johns River in the Jacksonville area has shown significant improvement over the past decade. The U. S. Geological Survey (USGS) maintains a continuous monitor station at the Main Street Bridge in Jacksonville. Water quality in the St. Johns River is electronically monitored at 30 minute intervals for temperature, dissolved oxygen,

TABLE 5.3-3

Selected Flow Statistics for the
St. Johns River at Jacksonville

Statistic	Direction of Flow	
	Downstream	Upstream
Average discharge, cfs	46,419	40,536
Average net discharge, cfs	5,883	
Maximum daily net flow, cfs	87,000	-
Minimum daily net flow, cfs	-	51,500
Average volume per tidal cycle, mcf	2,075.5	1,812.4
Average net volume per tidal cycle, mcf	263.1	
Maximum volume per tidal cycle, mcf	5,280	4,410
Minimum volume per tidal cycle, mcf	0	0

Source: Anderson and Goolsby, 1973.

pH, and specific conductance. According to the Florida Department of Transportation EIS (1982), the river generally meets State of Florida Class III Standards, with the exception of occasional dissolved oxygen and total coliform violations. The river appears to have naturally occurring iron levels exceeding state standards.

The tidal effects on the St. Johns River allow a high degree of mixing between fresh water and salt water in the river. The salinity of the river at Jacksonville can range from relatively fresh water to a mixture of fresh and marine water consisting of more than 60 percent sea water. The USGS has developed a relationship which relates the specific conductance of the river to the concentration of several major chemical constituents comprising the dissolved solids load. Figure 5.3-13 graphically delineates this relationship, as prepared by Anderson & Gollsby (1973). Table 5.3-4 denotes the results of chemical analyses of St. Johns River water samples (at Main Street Bridge) conducted over a one year period during the development of the conductance relationship (Anderson & Goolsby, 1973). As can be seen from this table, there is an extreme variability in the concentration levels of the major constituents and changes in specific conductance of as much as 12,000 micromhos during a single tidal cycle are common (Anderson & Goolsby, 1973).

Additional data exemplary of the water quality in the St. Johns River have been compiled by Fairchild and Leve (1973). These data are shown in Table 5.3-5. Again, as with the data assembled by Anderson and Goolsby (1973), it is readily apparent that the quality of the river is highly influenced by sea water interactions.

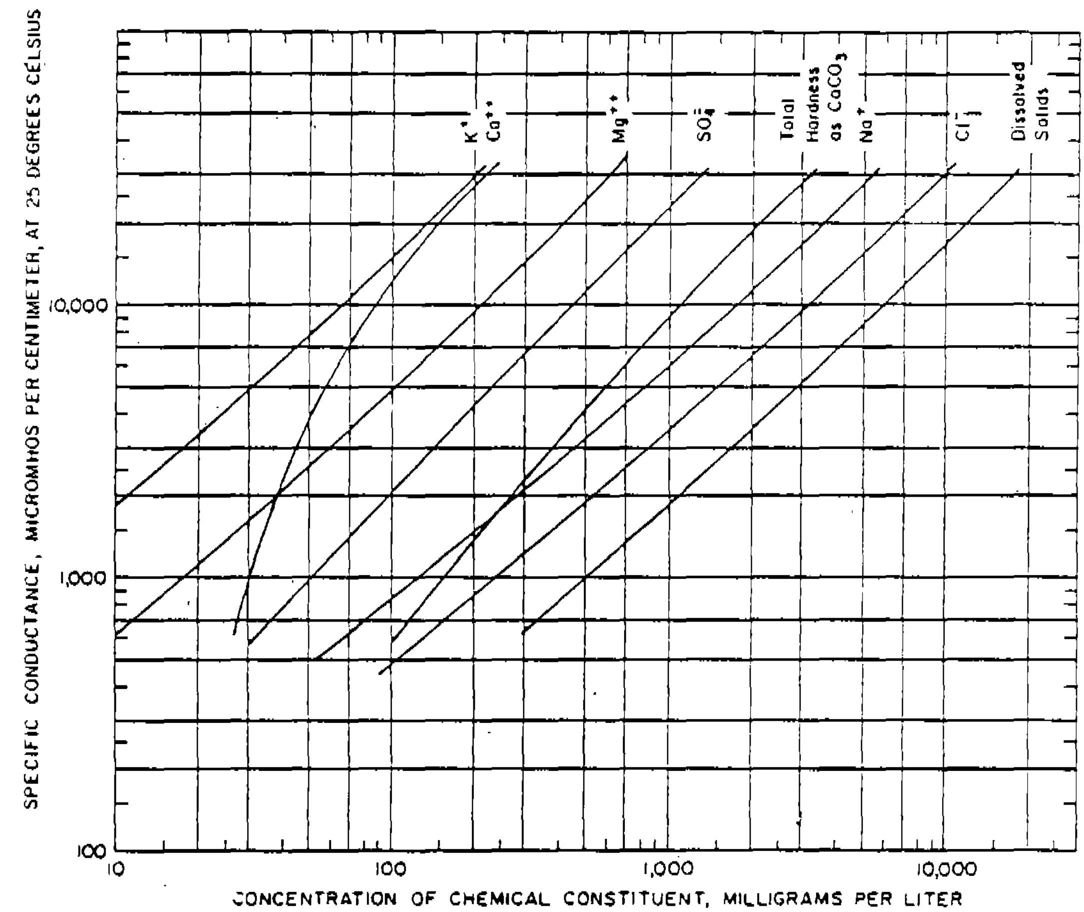
5.3.6.4 Floodplains

The Florida Department of Transportation EIS (1982) outlines the 100-year flood information for the Jacksonville area, based on a Flood Insurance Study for the City of Jacksonville by the Federal Insurance Administration. The 100-year flood elevation in the area is 6 feet above msl and would be the result of hurricane surge flooding. Figures 5.3-2 and 5.3-3 delineate 100-year storm events for the NAS and NFD, respectively.

The Master Plan for the NAS Jacksonville reports that the 100-year flood level for the NAS is 5 feet above msl. Therefore, on the basis of the above information, the NAS would experience a 100-year flood elevation of 5 feet above msl, and the NFD would experience a 100-year flood elevation of 6 feet above msl.

5.3.6.5 Ortega River, Trout River, Drummond Creek

These three tributary drainages to the St. Johns River are of interest because they occur in the immediate proximity of the NAS and the NFD. The Ortega River is located to the west of the NAS, and the Trout River and Drummond Creek are in close proximity to the NFD. Both the Ortega River and the Trout River are gauged by the USGS, while Drummond Creek is not. The available information on the physical characteristics of the three tributaries is discussed in the following paragraphs.



Source: Anderson and Goolsby, 1973

Figure 5.3-13 RELATIONS OF SPECIFIC CONDUCTANCE TO CONCENTRATION OF MAJOR CHEMICAL CONSTITUENTS IN THE ST. JOHNS RIVER AT JACKSONVILLE.

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JACKSONVILLE, FLORIDA

TABLE 5.3-4

Chemical Analyses of the St. Johns River at Jacksonville

Date of Collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Dissolved solids: Sum	Dissolved solids: Residue on evaporation at 180° C	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Special conductance (micromhos at 25° C)	pH	Color	Strontium (Sr)
1966																				
b Apr. 26	0.7	0.01	41	26	201	7.3	66	88	359	0.3	0.1	0.00	765	820	210	156	1470	7.3	70	
t Oct. 5	4.7	.05	1.04	274	2320	84	80	571	4090	.5	2.1	.16	7490	7830	1390	1320	1300	7.0	100	1.8
b Oct. 5	2.4	.00	138	377	3240	119	84	750	5690	.6	3.3	.20	10400	10500	1900	1830	17500	7.1	80	2.4
t Oct. 10	3.6	.05	29	14	95	3.6	64	42	176	.3	.1	.15	396	459	130	78	790	7.0	100	.54
b Oct. 10	3.9	.05	28	14	96	3.6	60	43	174	.3	.2	.26	394	462	128	79	790	6.8	100	.54
t Nov. 3	4.6	.04	27	10	71	2.6	40	34	136	.3	.2	.11	306	360	109	76	618	6.9	120	.55
b Nov. 3	2.6	.13	27	10	72	2.6	78	28	128	.3	.3	.10	310	363	109	45	770	6.8	110	.52
t Nov. 16	5.2	.08	211	608	5340	196	85	1240	9470	.9	1.5	.26	17100	18200	3030	2960	28000	7.0	40	3.5
b Nov. 16	2.5	.05	225	633	5520	200	109	1320	9720	.9	11	.24	17700	18700	3170	3080	30000	7.1	60	3.7
t Nov. 21	4.6	.11	104	263	2310	82	84	563	4090	.6	1.2	.30	7460	7560	1340	1270	12500	7.1	120	1.8
b Nov. 21	3.4	.10	131	351	3110	122	112	756	5540	.6	6.3	.22	10100	10600	1770	1680	13000	7.0	100	2.4
t Dec. 22	3.4	.12	72	141	1180	46	78	304	2100	.3	1.1	.18	3890	4150	760	696	6700	7.1	100	1.2
1967																				
t May 10	3.6	.05	215	448	3690	143	95	933	6800	.7	5.7	.32	12300	—	2360	2310	20800	6.9	45	4.8

Notes:

t = top sample
b = bottom sample
units in mg/l

Source: Anderson and Goolsby, 1973.

TABLE 5.3-6

Additional Chemical Analyses of the St. Johns River at Jacksonville

DATE	ORGANIC NITROGEN (N) (MG/L)	NITRATE (NO3) (MG/L)	DISSOLVED ORTHO PHOSPHATE (PO4) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	COLOR (PLATINUM-COBALT UNITS)	DISSOLVED OXYGEN (MG/L)	PERCENT SATURATION
02246500 - 09E ST JOHNS RIVER AT JACKSONVILLE FLA (LAT 30 19 26 LONG 081 39 12)												
DEC., 1967												
06...	--	.7	.57	11000	--	2080	2000	18500	6.9	50	6.8	--
MAY, 1968												
02...	--	.4	--	15300	--	2890	2800	24100	7.2	40	5.8	66
SEP.												
05...	--	.0	--	245	313	85	52	465	6.9	120	--	--
OCT., 1968												
07...	--	--	--	--	--	--	--	1700	--	--	5.6	69
14...	.68	1.6	.29	--	--	--	--	--	--	--	--	--
14...	.83	1.2	.30	6720	--	1320	1260	11700	7.4	130	4.4	54
14...	.73	1.0	.30	--	--	--	--	--	--	--	4.6	--
14...	.68	.8	.24	9280	--	1720	1650	15500	7.4	140	4.4	--
NOV.												
14...	--	--	--	--	--	--	--	--	--	--	--	54
DEC.												
19...	--	--	--	--	--	--	--	9650	--	--	--	--
FEB., 1969												
05...	--	--	--	--	--	--	--	4100	--	--	--	--
MAR., 1969												
28...	--	.1	.03	--	--	--	--	640	--	70	--	--
APR.												
30...	--	.6	--	4670	--	966	899	8400	7.0	70	6.3	74
JUNE												
19...	--	.4	--	3520	--	747	690	6100	7.7	50	--	--
AUG.												
08...	--	.9	--	3380	--	697	641	6100	7.4	50	6.1	80
14...	--	1.3	--	5400	--	995	936	9100	7.7	400	--	--
OCT., 1969												
08...	--	--	--	--	--	--	--	600	--	--	--	--
22...	--	2.2	.44	257	315	101	60	485	6.9	140	--	--
DEC.												
29...	--	2.2	.30	--	--	--	--	550	7.5	--	9.1	86
JAN., 1970												
06...	--	.1	.17	--	--	--	--	5800	--	--	--	--
27...	--	.0	.12	236	294	93	56	455	6.6	120	9.8	91
MAR.												
03...	--	1.6	.37	--	--	--	--	385	--	--	--	--
30...	--	1.3	--	179	278	70	41	350	6.7	100	--	--
MAY												
11...	--	--	--	--	--	--	--	4320	7.6	--	6.9	83
15...	.79	1.1	.41	822	939	212	158	1590	7.7	12	5.8	71
JUNE												
24...	--	1.3	.36	--	--	--	--	10500	--	--	--	--
AUG.												
25...	--	1.4	--	597	618	180	127	1130	7.6	40	6.8	--

Source: Fairchild and Leve, 1973.

TABLE 5.3-5 (cont'd)

DATE	DIS-CHARGE (CFS)	TEMP-ERATURE (DEG C)	SILICA (SIO2) (MG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)
02246500 - ST JOHNS RIVER AT JACKSONVILLE FLA (LAT 30 19 26 LONG 081 39 12)												
DEC., 1967												
06...	--	17	3.0	.08	161	409	3400	127	103	870	6000	.7
MAY , 1968												
02...	--	22	2.7	.03	240	555	4580	168	114	1160	8500	.9
SEP.												
05...	--	0	3.1	.14	19	9.1	58	2.8	40	30	103	.3
OCT., 1968												
07...	--	27	--	--	--	--	--	--	--	--	485	--
14...	--	--	--	--	--	--	--	--	--	--	--	--
14...	--	27	6.8	290	101	260	2080	79	78	502	3650	.4
14...	--	--	--	--	--	--	--	--	--	--	--	--
14...	--	27	6.4	270	122	344	2820	106	86	690	5150	.6
NOV.												
14...	--	--	--	--	--	--	--	--	--	--	--	--
DEC.												
19...	--	12	--	--	--	--	--	--	--	--	--	--
FEB., 1969												
05...	--	15	--	--	--	--	--	--	--	--	--	--
MAR., 1969												
28...	--	17	2.5	--	--	--	--	--	--	--	156	--
APR.												
30...	--	24	2.3	0	90	180	1440	12	82	388	2520	.5
JUNE												
19...	--	31	2.7	0	75	136	1080	37	70	200	1950	.3
AUG.												
08...	--	30	2.2	40	68	128	996	35	68	220	1800	.3
14...	--	30	1.4	30	92	186	1640	58	72	400	2950	.4
OCT., 1969												
08...	--	26.0	--	--	--	--	--	--	--	--	--	--
22...	--	27.0	4.6	--	25	9.2	53	3.0	49	37	98	.3
DEC.												
29...	--	13.0	6.2	--	--	--	--	--	--	--	113	--
JAN., 1970												
06...	--	13.0	6.4	--	--	--	--	--	--	--	1700	--
27...	--	12.0	5.0	--	23	8.6	51	2.5	46	30	92	.3
MAR.												
03...	--	16.5	3.0	--	--	--	--	--	--	--	71	--
30...	--	20.5	1.3	--	18	6.1	38	2.1	36	25	69	.2
MAY												
11...	--	26.0	--	--	--	--	--	--	--	--	--	--
MAY , 1970												
15...	--	27.5	3.0	250	32	32	227	9.8	66	77	405	.6
JUNE												
24...	--	30.5	2.3	--	--	--	--	--	--	--	3260	--
AUG.												
25...	--	--	2.0	--	34	23	150	5.9	64	66	272	.3

Source: Fairchild and Leve, 1973.

The Ortega River is approximately 30 miles long. It is of concern as it receives runoff from the western portion of the NAS. It is also likely that the river could receive shallow groundwater discharge (i.e., base flow) from the NAS as well. Stream gauge data is collected on the Ortega midway between the headwaters and the mouth of the river. The gauge station is above the influence of tidal action, which extends approximately 10 miles up the river from the confluence with the St. Johns. As reported by Anderson (1972) the drainage area for the Ortega River gauge station is 28 square miles, the average discharge is 42 cfs, with a minimum discharge of 0.20 cfs, and a maximum discharge of 2,950 cfs. Limited water quality data has also been reported for the Ortega River gauge station by Fairchild and Leve (1973). The results indicate that the Ortega River (above the tidal portion) is characterized by low dissolved solids content (70-80 ppm range), low specific conductance (less than 160 micro mhos/cm), and low iron. Below the zone of tidal influence, the Ortega would be expected to respond similarly to the St. Johns River, and exhibit extremely variable dissolved solids content.

The Trout River, located immediately adjacent to the western boundary of the NFD, is approximately 20 miles long. Tidal conditions extend up the river approximately 15 miles. Crest stage data (i.e., maximum flow), is collected on the river just upstream from the tidal boundary. As reported by Anderson (1972), the drainage area above the gauge station is 20 square miles, and the maximum discharge for the 11 year period of record is 1,140 cfs. No water quality data is available on the Trout River.

Drummond Creek is a minor tributary to the St. Johns River, located to the immediate north of the NFD Area. The creek is approximately 3 miles long. The creek is not gauged by the USGS, and therefore flow records are not available. According to available records a water quality monitoring station does not exist on Drummond Creek. The creek is of concern as it passes in close proximity to the NFD, and may therefore receive runoff from the site (or at least tidal backwash from NFD runoff via the St. Johns River). Drummond Creek is also of concern as the Jacksonville Municipal Landfill is located ½ mile north of the creek, and runoff from the landfill area flows directly to the creek. Future investigations regarding the potential for contaminants to enter Drummond Creek from operations at the NFD should therefore be designed to distinguish between the potential Navy contributions and those arising as a result of the Jacksonville Municipal Landfill.

The USGS has performed an initial appraisal of the water quality impacts associated with the Jacksonville Minicipal Landfill (Fairchild and Leve, 1973). Appendix A contains the landfill study information excerpted from the Fairchild and Leve report. The findings of the USGS indicate that solid waste deposited at the landfill is situated on the edge of a large pond hydraulically connected to the regional surficial aquifer. Waste is depositied below the water table and leachate is strongly suspected of entering both the pond and the aquifer. Initial samples showed elevated bacteriological and mineral levels indicating leachate contamination. The landfill had been in operation since 1970, 3 years prior to the USGS investigation and the authors concluded that further long term studies would be necessary to determine the extent and nature of potential problems.

5.3.7 Groundwater Resources

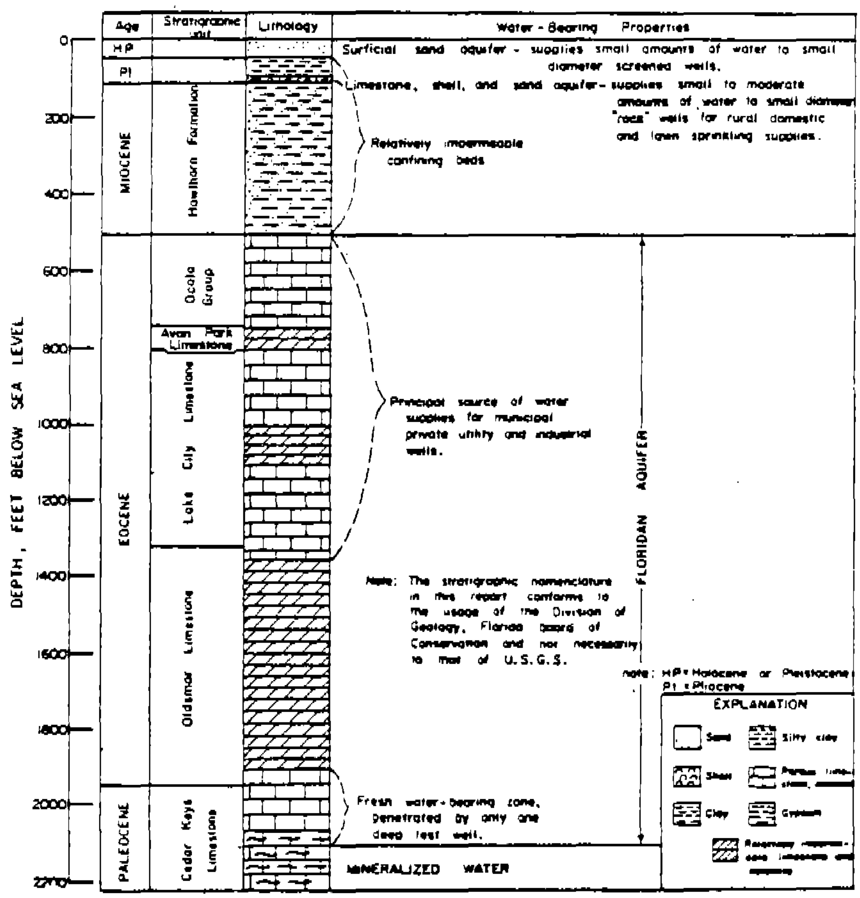
5.3.7.1 Aquifer Description

Two aquifer systems have been defined in the northeast Florida area. In ascending order they are the deep Floridan Aquifer and the shallow aquifer. These aquifers are separated by a complex aquiclude defined by the Hawthorn Formation. (Figure 5.3-14).

The deep Floridan Aquifer is known to produce water under artesian pressure. This aquifer is composed of a thick carbonate sequence with local evaporate from thin, soft, porous limestones and dolomite sequences interbedded with hard indurated limestone and dolomite beds. The water producing zones are thickest in the Ocala Group and thinnest in the deeper limestone. Evaporate mineralization along with hard impermeable dolomite beds in the Avon Park limestone, Lower Lake City limestone, and the Oldsmar limestone yield very little water to wells, and subdivide the aquifer into separate water producing zones under varying artesian pressure (Table 5.3-6). Aquifer tests have shown the coefficient of transmissibility to vary from 50,000 gpd/ft to 1,000,000 gpd/ft and averages 275,000 gpd/ft. The coefficient of storage ranges from 1.6×10^{-2} to 1.5×10^{-4} and averages 9.4×10^{-4} (Leve, 1968). Wells drilled through the entire sequence of the aquifer can expect to produce potable water from a zone 1,000 to 1,800 feet in thickness. Below this zone the water becomes mineralized. The Floridan Aquifer is recharged naturally by direct rainfall along the Ocala uplift where the limestone of the aquifer is exposed at the surface (approximately 30 miles west of the NAS and NFD, Figure 5.3-15). Some recharge also occurrs where sinkholes in this limestone penetrate to the Floridan Aquifer limestones.

The shallow aquifer is composed of surficial sand, silts and clays and a porous, cavernous limestone unit above the Hawthorn Formation. The limestone is the major source of water for shallow wells in the Jacksonville area. Where the limestone is missing, smaller amounts of water are obtained from the less permeable sand, silts, clays and shell beds. Recharge to the shallow aquifer is by direct rainfall. In same areas in the vicinity of Jacksonville this aquifer will produce water under artesian pressure, this is especially true for wells that tap the shallow limestone. It is not uncommon for some wells to stop flowing during dry periods. Figure 5.3-16 depicts the static water level of the shallow aquifer and potentiometric water level of the Floridan Aquifer. Because of overlapping character of the potentiometric surface of the Floridan Aquifer with the shallow aquifer it has been suggested that some recharge to the shallow aquifer may be caused by the upward movement of water from the Floridan Aquifer. It has been estimated by Leve and Goolsby (1969) that approximately 45,000 to 50,000 domestic wells produce 10 to 25 mgd) from this aquifer.

The Hawthorn Formation is a complex aquiclude that acts as a confining bed to the Floridan Aquifer and prevents the downward percolation of water from the shallow aquifer system. A dynamic equilibrium exists within the Hawthorn Formation that further defines this unit as an aquiclude. First it is a complex lithologic formation. Work by Miller, et al (1978) in the Oscala National Forest in Baker and Columbia Counties have helped to elucidate the internal stratigraphy and hydrologic character of the individual lithologic units. Additionally, the artesian character of



Source: Leve and Goolsby, 1969

Figure 5.3-14 GENERALIZED GEOLOGIC SECTION AND THE AQUIFERS IN THE JACKSONVILLE AREA.

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TABLE 5.3-6

Geologic Formations that Comprise the Floridan Aquifer in Northeast Florida and their Water-Bearing Characteristics

Geologic Age		Stratigraphic Unit	Approximate Thickness (feet): Western Part (Alachua, Columbia, Bradford, Union, Baker, western Putnam and western Clay Counties)	Approximate Thickness (feet): Eastern Part (Flagler, St. Johns, Duval, Nassau, eastern Putnam and eastern Clay Counties)	Water-Bearing Characteristics
Miocene		Basal sand and limestone in the Hawthorn Formation	0- 80	0- 10	Sand and limestone beds are locally important sources of water in western part of the area where they are thickest. Yield moderate to large amounts of water under both artesian and nonartesian conditions.
Oligocene		Suwannee Limestone	0- 50	Absent	
Eocene	Jackson	Ocala Group	Undifferentiated 80-320	Crystal River Fm. 0-280 Williston Fm. 0-120 Inglis Fm. 50-120	Utilized as primary source of ground water throughout northeast Florida. Soft, permeable limestones generally yield large amounts of water to wells.
Eocene	Claiborne	Avon Park Limestone	60-220	40-260	Soft, permeable limestones locally yield large quantities of water to wells. Hard, impermeable dolomitic limestone and dolomite beds separate permeable water-bearing zones and restrict movement of water in the aquifer in northeastern part of area.
Eocene	Claiborne	Lake City Limestone		550-650±	Large quantities of water are obtained from wells tapping relatively thin, permeable limestone and porous dolomite. Hard, indurated, zones restrict vertical movement of water within aquifer and divide it into separate water-bearing zones in northeastern part of area. The Oldsmar Limestone is tapped by a few wells in the vicinity of Fernandina and Jacksonville.
Eocene	Wilcox	Oldsmar Limestone		692	
Paleocene	Midway	Cedar Keys Formation		410+	Only one well at Jacksonville taps the Cedar Keys Formation.

Source: Leve, 1968.

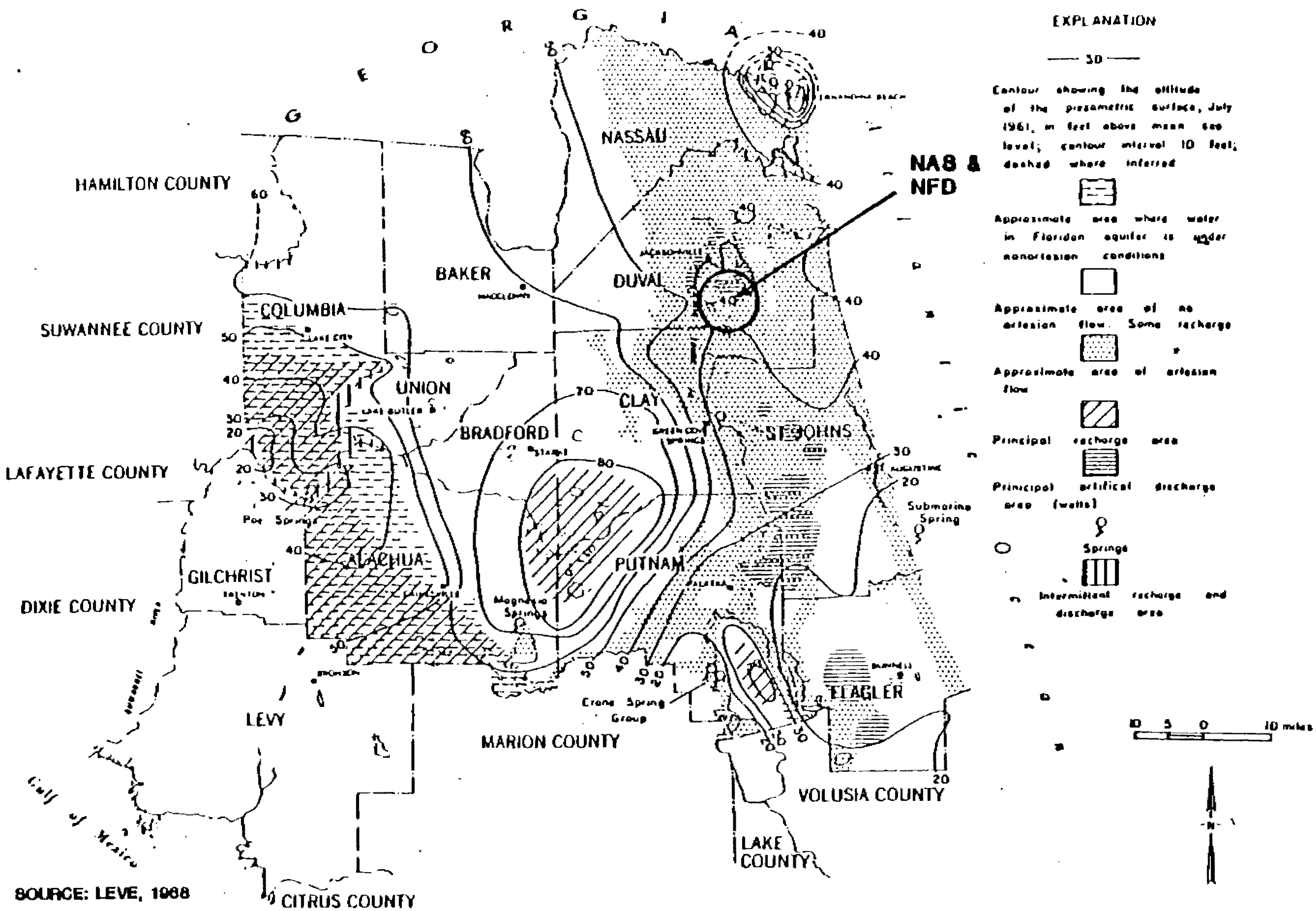

Figure 5.3-15 MAP OF NORTHEAST FLORIDA SHOWING THE OPERATION OF THE FLORIDIAN AQUIFER

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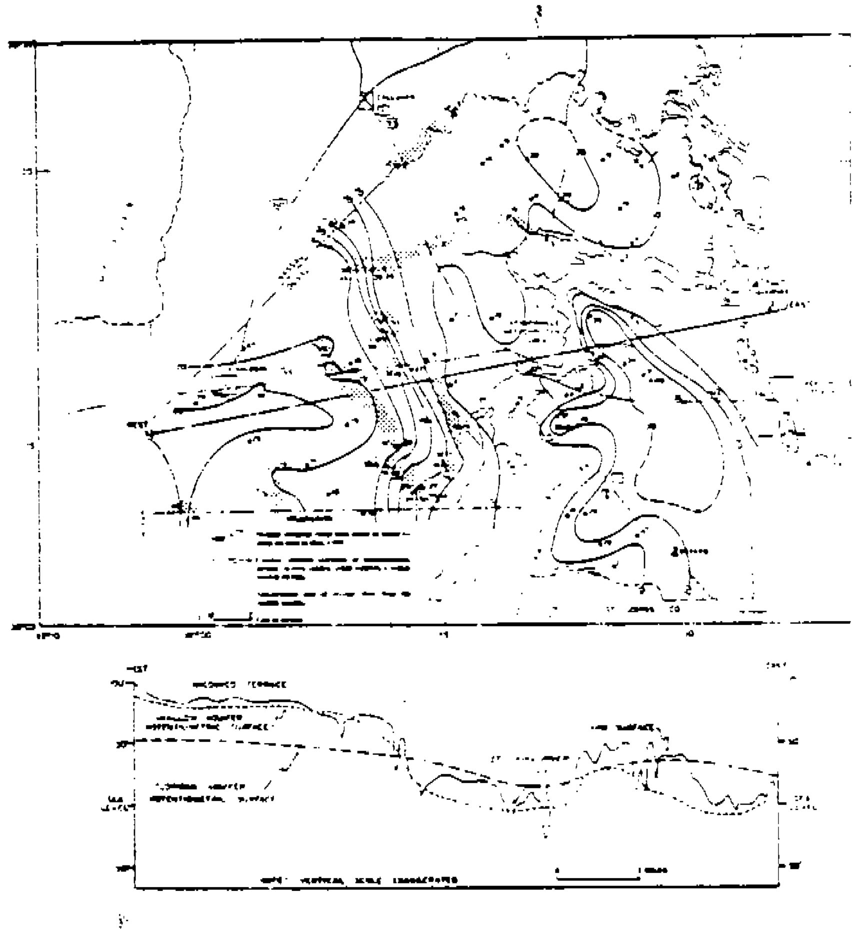

Source: Fairchild, 1972

Figure 5.3-16 MAP OF DUVAL COUNTY SHOWING THE POTENTIOMETRIC SURFACE OF THE SHALLOW AQUIFER SYSTEM AND THE AREA OF FLOW IN MAY 1969.

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the Floridan Aquifer does permits some upward migration of groundwater in the Floridan Aquifer into the lower sections of the Hawthorn Formations and the shallow aquifer.

Miller in his study of the Hawthorn Formation subdivided the Formation into five (5) separate units designated A, B, C, D and E (Table 5.3-7). Unit A is a brown sandy phospatic limestones which grades eastward into a limestone. Unit B is a greenish gray massive clay containing prominant organic material. Unit C is greenish-gray fine to medium sand which contains clay and limestone in the eastern part of the forest. Unit D is defined by an interbedded network of clay, clayey sand and fine grained sandstone. Unit E is a brown calcareous fossiliferous sandstone. During the above referenced study Miller also looked at the hydrologic parameters of each of the five (5) units (Table 5.3-8). The only unit that would conduct significant amounts of water was unit C. Production ratios were in the range of 2 to 3 gpm.

In summary the Hawthorn Formation is composed of five distinct lithologic units. It is reasonable, based on the artesian conditions that exist in the Floridan Aquifer, that some groundwater is able to leak upward into the E, D and C hydrologic units. However the upward movement of the groundwater probably does not penetrate past the clay unit defined by Unit B. In terms of the shallow aquifer, groundwater does migrate into the phosphate limestone but the downward leakage is slowed by the B clay unit. The natural percolation of groundwater into the Hawthorn Formation is presently more than offset by the artesian head in the Floridan Aquifer. If, on the other hand, the potentiometric potential of the Floridan Aquifer continues to decline then the overall potential for groundwater in the shallow aquifer to migrate through the clay and into the Floridan Aquifer will increase.

Thus, it is unlikely that in the near future contaminated groundwater in the shallow aquifer could affect the deeper Floridan Aquifer. The primary aquifer of concern is the shallow aquifer. The NAS, however obtains its water from the Floridan Aquifer. Since the majority of the local domestic supplies (off-base) tap the shallow limestone every effort should be made to keep the Aquifer clean.

5.3.7.2 Water Quality

The background water quality of the aquifers in the Jacksonville area has been studied by the USGS. Table 5.3-9 portrays chemical analysis data assembled by Leve and Goolsby (1969) in a study of groundwater supplies in the metropolitan area of Jacksonville. Shown on this table are water quality results for two wells completed in the surficial sand portion of the shallow aquifer, four wells in the limestone, shell and sand portion of the shallow aquifer, and five wells in the Floridan Aquifer. These results show that the surficial sand portion of the shallow aquifer is characterized by a low dissolved solids content and low hardness (less than 60 ppm). In some areas, water from the surficial sand portion of the shallow aquifer contains water with more than 1.5 ppm iron, exceeding drinking water standards (Leve and Goolsby, 1969). The surficial sand portion of the shallow aquifer is also subject to contamination from septic tanks, polluted surface drainage and potential surface contamination at the NAS. Except for iron, water from unpolluted wells in this aquifer is potable (Leve and Goolsby, 1969).

TABLE 5.3-7

Generalized Description of Hydrogeologic Units of the Hawthorn Formation in tho Osceola National Forest

Hydrogeologic Unit	Water Bearing Properties	Geologic Unit		Age	Thickness (feet)	Lithology
Surficial aquifer	Water unconfined. Readily absorbs and stores precipitation until water table rises to land surface. Principal source of baseflow to streams draining forest. Uppermost member of Hawthorn Formation is hydraulically continuous with surficial deposits and forms lower part of surficial aquifer.	Unnamed		Post-Miocene	6-54	Medium-grained sand and blue-gray sandy clay. Local peat layers.
		A	Hawthorn Formation	Miocene	15-102	Brown phosphatic sand, yellow-brown to blue-gray clay, gray phosphatic shell limestone. Limestone more prominent in western part of forest.
Hawthorn confining unit	Because of comparatively low permeability, most of unit acts to retard the downward movement of water from the surficial aquifer to the Floridan aquifer. Member C yields small quantities of water under confined conditions. Basal limestone beds are not considered part of the Floridan aquifer in the Forest.	B	Hawthorn Formation	Miocene	13-70	Green to greenish-gray massive clay. Often fractured. Black clay prominent.
		C	Hawthorn Formation	Miocene	13-58	Green to greenish-gray fine- to medium grained sand. Contains clay and limestone to east of forest.
		D	Hawthorn Formation	Miocene	5-43	Complexly interbedded shell limestone, clay, clayey sand, and fine-grained sandstone.
		E	Hawthorn Formation	Miocene	14-73	Brown sandstone, tan to dark-brown limestone, dolomite, and argillaceous limestone. Fossiliferous, well indurated.
Floridan aquifer	Yields large quantities of water under confined conditions everywhere under Osceola National Forest.	Ocala Limestone*		Eocene	102+	White calcarenite at top, containing some green clay. Gray hard fractured limestone below. Penetrated 102 feet.

*The Suwannee Limestone of Oligocene age, which is part of the Floridan aquifer in places, was not found in the Osceola National Forest.

TABLE 5.3-8

Results of Laboratory Tests of the Hawthorn Formation, West of Jacksonville

Hydro-geologic Unit	Geologic Unit		Laboratory: Depth To Core Sample (feet)	Laboratory: Vertical Hydraulic Conductivity (feet/d)	Laboratory: Horizontal Hydraulic Conductivity (feet/d)	Laboratory: Specific Storage ($feet^{-1}$)	Extensometer: Storage Coefficient	Extensometer: Vertical Hydraulic Conductivity (feet/d)	Extensometer: Leakance (day^{-1})
Surficial aquifer	Unnamed post-Miocene deposits								
Surficial aquifer	Hawthorn Formation	A	55	5.6×10^{-3}			7.9×10^{-4}		
Hawthorn confining unit	Hawthorn Formation	B Upper	77	1/ 16	5.5×10^{-2}				
		?	?	?	?	?	?	?	?
Hawthorn confining unit	Hawthorn Formation	B Lower	95	1.3×10^{-3}		1.8×10^{-5}	2×10^{-4}	2/ 2×10^{-4}	1.4×10^{-5}
Hawthorn confining unit	Hawthorn Formation	C	110		3.3×10^{-2}				
Hawthorn confining unit	Hawthorn Formation	D	127	1.9×10^{-2}	3.2×10^{-2}	2.2×10^{-6}	1.6×10^{-5}		
			135		1.2×10^{-1}				
			3/136	7.8×10^{-7}					
			137	4.9×10^{-6}					
Hawthorn confining unit	Hawthorn Formation	E Upper	149		4.9×10^{-2}				
			3/150	1.5×10^{-2}					
		?	?	?	?	?	?	?	?
		E Lower							
Floridan aquifer	Ocala Limestone								

1/ High value apparently due to vertical fractures in sample.
2/ Based on an assumed thickness of 14 feet for the lower part of B member.
3/ Dense limestone.

Source: Miller, et al, 1978

TABLE 5.3-9

Chemical Analyses of Groundwater in the Jacksonville Area

USGS Well or Station Number	Owner or Location	Date Sampled	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Strontium (Sr)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Hardness as $CaCO_3$	Noncarbonate Hardness as $CaCO_3$	Specific Conductance (Micromhos at 25°)	pH	Color	Free Carbon Dioxide (CO_2)	Temperature (°F)	Well Depth (Ft.)
Surficial Sand Aquifer																								
301922N0812634.1	Private	09-21-66	2.3	1.6	1.9	2.0	.16	12	.3	8	0	.0	25	.1	.1	48	12	6	105	5.2	5	80	73	40
303535N0820034.1	Private	06-07-66	4.9	.24	7.6	3.6	.20	6.1	3.6	12	0	.0	12	.2	33	71	34	24	118	5.8	5	31	73	15.
Limestone Sand and Shell Aquifer																								
300857N0813444.2	Private	05-20-65	29	2.0	83	15	–	14	1.3	328	0	.0	21	.2	.0	326	268	0	533	7.3	0	26	74	92
302136N0814255.2	Private	05-27-65	18	2.8	73	12	–	13	1.1	236	0	38	18	.3	0.0	289	232	38	472	7.9	10	5	72	80
301340N0814754.1	Private	11-03-66	19	–	43	16	.19	6.6	1.2	213	0	.8	12	.5	.1	205	174	0	349	7.8	0	5	71	60
301817N0813749.2	Private	03-19-65	43	.31	39	16	–	15	6.1	204	0	4.0	18	1.4	.0	243	162	0	353	7.8	0	5	73	--
Floridan Aquifer																								
302033N0813945.1	City of Jacksonville C-10	08-05-65	21	.17	76	29	3.6	11	2.1	164	0	176	15	.8	.0	416	313	178	642	7.9	10	3	80	1270
301838N0813935.1	City of Jacksonville C-35	08-06-65	22	.09	65	27	3.6	11	2.0	166	–	137	15	.6	.0	362	273	137	566	8.0	5	3	85	1280
301335N0813526.1	Private	09-26-66	20	.19	65	33	4.2	12	2.7	152	0	180	13	.9	.0	402	302	178	642	7.6	10	6	77	625
301617N0814217.1	City of Jacksonville	09-27-66	19	.19	41	22	2.7	11	2.4	148	0	81	12	.9	.1	262	196	74	440	7.7	10	5	78	729
301529N0813803.1	Lake Wood Utilities	09-27-66	21	.07	70	31	4.5	12	2.5	156	0	176	16	.8	.1	406	307	179	675	7.5	5	8	85	1187

(Results in parts per million except for color, pH and specific conductance)

Source: Leve and Goolsby, 1969.

Water from the limestone, shell and sand portion of the shallow aquifer is classified as hard to very hard (values above 150 ppm) and contains moderate dissolved solids levels (150-400ppm). The iron content is also variable and in some areas the aquifer contains hydrogen sulfide. Except for the high iron and hydrogen sulfide content occurring in localized areas water from this aquifer is considered potable (Leve and Goolsby, 1969).

Water quality in the Floridan Aquifer is variable with wells west of the St. Johns River and south of the Ortega River yielding the highest quality (Leve and Goolsby, 1969). Hardness levels range from 200 to 400 ppm over most of the area and dissolved solids are generally 500 ppm or less. Hydrogen sulfide is found in most all wells in the area and treatment is generally necessary. Although the water is generally considered potable, treatment is usually necessary for many industrial uses including boiler feed water (Leve and Goolsby, 1969).

The Floridan Aquifer is also subject to salt-water intrusion in several counties southeast of the Jacksonville area. In the Jacksonville area chloride content (used as an index of seawater contamination) is less than 50 ppm. However, in central St. Johns and Putnam Counties the chloride content of the aquifer is in the 50 to 250 ppm range. In southern St. Johns County and the majority of Flagler County chloride levels are in the 250 to 1,000 ppm range.

Along the Atlantic coast of St. Johns and Flagler counties chloride levels exceed 1,000 ppm. The increase in sea water contamination of the aquifer in the coastal areas is generally the result of lowered artesian pressures in the aquifer. These lowered artesian pressures stem from an increased rate of water withdrawal from the aquifer, particularly in the Jacksonville and Fernandina Beach areas of Florida (Leve, 1968). Typically, salt water underlies the fresh water in the Floridan Aquifer in the discharge areas of northeastern Florida. As the artesian pressures in the fresh water zones of the Floridan Aquifer are reduced by dishcarge or water withdrawal salt water from the lower part of the aquifer tends to move into the zones of reduced pressure and mix with the fresh water. Leve (1968) concluded that salt water contamination will continue to increase as more water is withdrawn from the Floridan Aquifer in northwestern Florida. Careful planning is necessary in the future to ensure that wells are properly spaced in the area and that water wells in the farming areas of northeastern Florida selectively utilize water from the upper part of the aquifer without disturbing the deeper saline water.

5.3.7.3 Naval Air Station Wells

The water supply system at the NAS Jacksonville utilizes groundwater as the source of supply. Currently, the water supply distribution network is fed from 5 deep wells, which are completed in the Floridan Aquifer beneath the site. Many more wells, however, have been drilled at the NAS over the stations' history and NAS personnel are in the process of locating and inventorying all wells located on base. To date 27 wells have been identified by NAS personnel, inclusive of the 5 major water supply wells that furnish water to the distribution network (Figure 5.3-17).

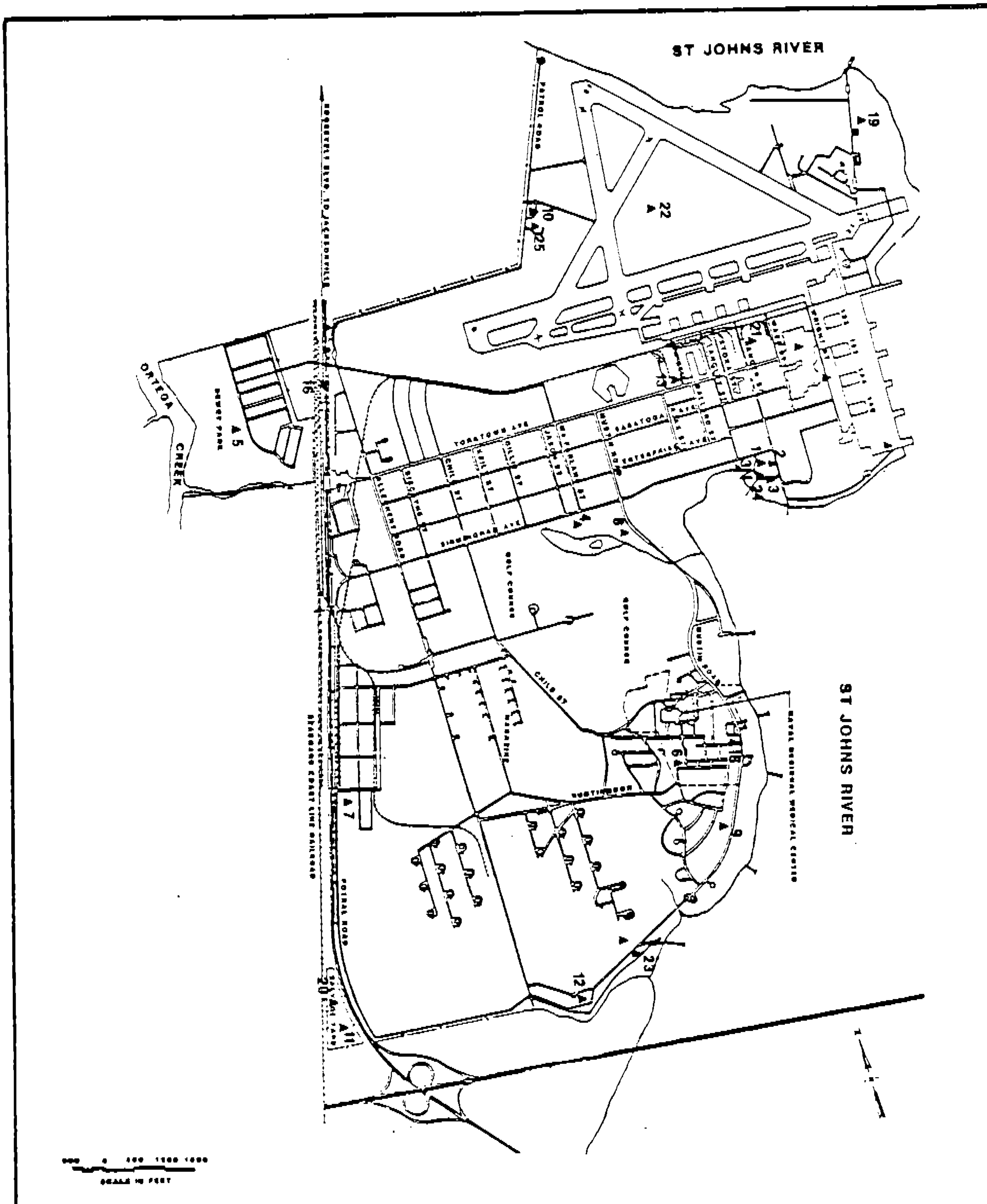

Figure 5.3-17 WELL LOCATIONS NAS JACKSONVILLE

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Table 5.3-10 summarizes the available information that could be obtained on the 27 wells. It can be seen from this table that many of the wells are used for non-potable purposes, such as irrigation, fire protection, or cooling water. A number of the wells are no longer utilized where this has been demonstrated, it is indicated on Table 5.3-10.

There has also been some confusion regarding the numbering system used over the years to identify the wells. Consequently a number of the wells bear the same number, depending on which system is utilized. In Table 5.3-10 two numbering systems are shown. The well number shown first in Table 5.3-10 is derived from the numbering system shown on NAS Public Works Drawing Number 1-25-99, entitled, Wells-Location and Information. The alternate well numbers shown parentheticly in Table 5.3-10 are derived from the numbers utilized in various engineering reports and water supply file information, such as: Smith and Gillespie (1970); SOUTHDIV (1974); Chas. T. Main, Inc. (November, 1954); and NAS Public Works water quality file data (Appendix A).

It can be seen from Table 5.3-10 that the majority of the NAS wells are deep wells, most likely completed in the Floridan Aquifer. Typically, the wells are cased from the land surface to the point where the Floridan Aquifer Zone is encountered. Below that depth, the wells are completed as open boreholes to the total depth of the well. In Table 5.3-10, the cased interval and the total depth of the wells are identified where this information is available.

Four of the wells (10(9), 13(12), 19 and 21) may be completed in the limestone, shell and sand portion of the shallow aquifer which is situated several hundred feet above the Floridan Aquifer. Typically, the limestone, shell and sand portion of the shallow aquifer is found at depths between 50 and 100 feet below the land surface in the Jacksonville area (Leve and Goolsby, 1969). Judging by the depths of these four wells (160 feet or less) it appears likely that they are completed in the limestone, shell and sand portion of the shallow aquifer.

None of the NAS wells identified by base personnel are completed in the surficial sand portion of the shallow aquifer. However, the depths of wells 20, 22, and 26 were not available from base personnel and therefore it cannot be concluded if all the wells on the base are completed in the shallow water-bearing zones found in the surficial sand deposits at the site.

Generally, the data base on the existing wells present at the site is extremely limited, with the exception of the five main water supply wells. For those wells at the site that are not currently in use, it is unknown if they have been sealed or otherwise properly abandoned. It is also unknown if any of these wells can or will be brought back into service in the future. Improperly sealed or open wells or bore holes are a common conduit to groundwater contamination, as potential contaminants have a direct and easy access to deeper waterbearing zones. This condition is not a current problem for the wells at the NAS, which tap the Floridan Aquifer. However, increased water usage and trends toward drawing down water levels may cause problems in the future (5 to 10 years).

TABLE 5.3-10

Inventory of Wells at the Jacksonville NAS

Well No. (Alt Nos)	Location	Map Grid	Diameter	Depth	Ft. of Casing	Status (current)	Free flow (GPM) in 1971	Piezometric elv. (msl)	Well logs avail.?	H_2O quality?	Notes
1(01)	Water Plant #1	12J	8"	708	463	NIU	150-613	40' Nov 1969		limited	
2(1)	Water Plant #1	12J	12"	1005	380	In use	600-3500	40' Nov 1969		Yes	Main water supply well
3(2)	Water Plant #1	12J	12"	998	464	NIU	3300	39' Nov 1969		Yes	Main water supply well
3(2) new	Water Plant #1	12J	12"/18"/ 26"	1210	410	In use	-	-		Yes	Replaces well 3(2)
4(3)	Water Plant #2	9J	10"	1015	312	In use	400-3800	41' Nov 1969		Yes	Main water supply well
5(4)	Water Plant #3	3G	12"	988	400	In use	1250	43' Nov 1969		Yes	Main water supply well
6(5)	Hospital Water Plant	90	12"	646	271	In use	1200	37' Nov 1969		Yes	Main water supply well
7(6)	S. of Bldg. #164	3N	10"	1096	316	In use	1700				Fire Protection only
8(7)	S. end of Casa Linda Lake	9K	6"	500	?	In use	500				Golf course irrigation

TABLE 5.3-10 (continued)

Inventory of Wells at the Jacksonville NAS

Well No. (Alt Nos)	Location	Map Grid	Diameter	Depth	Ft. of Casing	Status (current)	Free flow (GPM) in 1971	Piezometric elv. (msl)	Well logs avail.?	H_2O quality?	Notes
9(8)	NW of GG Qtrs.	10P	6"	498	?	In use	1000				Supply Hospital sprinklers
10(9)	West Side Sewage Plant	9D	6"	120	120	In use	50				Supplies wastewater treatment plant
11(10)	Salvage Yd.	2R	8"	400	288	In use	800				Supplies salvage yard
12(11)	Radio Tower Area	6S	4"	407	251	In use	300			Limited USGS data	Used in Radio Tower Area
13(12)	Bldg.#135	11H	6"	144	95	In use	45				Cooling water
14(13)	S. Boundary	Not Located	6"	400	?	NIU	300				Capped
15(14)	CPO Club	Not Located	4"	400	?	NIU	300				Capped
16(15)	YUKON	4F	4"	400	?	NIU	300				Capped
17(16)	Highway	Not Located	3"	400	?	NIU	300				Capped
18(17)	Hospital	10O	6"	400	?	NIU	300				Capped
19	Bldg#201	16D	2"	101	?	?	515-600				
20	Salvage Yd	1R	3"	?	?	?					
21	Bldg#104	13G	?	160	115	?					
22	CRASH STA	12E	?	?	?	?					

TABLE 5.3-10 (continued)

Inventory of Wells at the Jacksonville NAS

Well No. (Alt Nos)	Location	Map Grid	Diameter	Depth	Ft. of Casing	Status (current)	Free Flow (GPM) in 1971	Piezometric elv. (msl)	Well Logs avail.?	H_2O quality?	Notes
23	Inductance Pier	8R	8"	522	297	Avail. for Use					
24	Water Plant #1	12J	18"	1200	350	?					
25	Sewage Plant	9D	4"	650	120	?					
26	Black Point Test cell	?	12"	?	?	?					

Notes:
NIU = Not in use

Well numbering system according to Public Works Drawing #1-25-99 entitled, Wells-Location and Information. Alternate numbers shown in parenthesies and appear in reports as Smith and Gillespie (1970) and SOUTHDIV (1974).

Map grid according to Public Works Drawing #1-25-99 Wells - Location and Information.

During the site visit at the NAS facility, base personnel described a problem that had developed with well 3(2) at Water Plant No. 1. A large quantity (several truckloads) of fine to medium grained sand had been pumped from this well in the recent past. Subsequent surface erosion and slumping of the pumphouse foundation occurred, indicating that the integrity of the well bore was suspect. The well was inspected by NAS contractors in March of 1979 using downhole TV equipment and recommendations were made to drill a new well or line the existing 12-inch casing with a deeper 8-inch casing string. In the summer of 1979 a new well was drilled at the No. 1 Water Plant to replace the damaged well. This well is identified in Table 5.3-10 as well 3(2) New and the well permit for this well is included in Appendix A. Interviews revealed that the old well has not been plugged and abandoned to date. The damage to the well bore of the old well indicates that this well could serve as a conduit for potential vertical migration of contaminants since the well casing is no longer functional. The old well is close to 1,000 feet in depth and contaminants would have access to the deep zones of the Floridan Aquifer. As with the other non-useable wells at the NAS, it is recommended that the old well 3(2) at Water Plant No. 1 be plugged and properly abandoned as quickly as possible.

The NAS is in the process of completing the identification and inventory of all existing wells on the Naval property. It is therefore possible that more than the 27 wells listed in Table 5.3-10 will be identified. As an understanding of well location, status, depth, and aquifer zone(s) utilized, the elements of well construction or abandonment are crucial to the assessment of any potential risk of contamination to groundwater supply.

5.3.7.4 Groundwater Quality at the Naval Air Station

Water quality information is available for the 5 principal water supply wells that serve the NAS water supply network. The system consists of four main treatment plants connected to a central distribution network. Table 5.3-11 shows the results of water quality analyses conducted at the four water supply plants in August of 1981. Wells 1(01) through 3(2) supply Water Plant No.1, well 4(3) supplies Water Plant No. 2, well 5(4) supplies Water Plant No.3, and well 6(5) supplies the Hospital Water Plant. Generally, the quality of the NAS water supply is good, meeting applicable drinking water standards. The base water system is tested every three years, with the next sampling due in September 1984.

5.3.7.5 Naval Fuel Depot Wells

Three wells are located at the NFD area, although only one well is utilized. Minimal information on the wells was obtained through interviews with NFD area personnel. The information that was obtained is summarized below.

Well 1, located at Building 19, is not being used at present and is capped off (see Figure 5.3-18). This well is artesian. The well was used in the past for potable water supply. Depth of the well and other completion characteristics are unknown.

TABLE 5.3-11
August 1981 Water Quality Data for the Four Water Supply Plants at the NAS[1]

Parameter	Water Plant 1	Water Plant 2	Water Plant 3	Hospital Water Plant
Arsenic	ND	ND	0.009	0.008
Barium	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND
Chromium	ND	ND	ND	ND
Lead	0.037	ND	ND	ND
Mercury	ND	ND	ND	ND
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
Nitrate	0.020	0.010	0.021	0.010
Fluoride	0.58	0.58	0.45	0.50
Turbidity (NTU)	0.33	2.4	0.88	1.20
Lindane	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND
2,4,5-TP	ND	ND	ND	ND
Endrin	ND	ND	ND	ND
Chloride	13.8	13.8	10.6	12.9
Color	1	0.5	0.5	0.5
Copper	ND	0.14	0.004	0.020
Foaming Agents	0.001	0.004	0.003	ND
Iron	ND	0.46	ND	0.19
Manganese	ND	ND	ND	ND
Odor	ND	Slight	Slight	ND
pH	7.29	7.25	7.50	7.59
Sulfate	95	61	68.6	68.9
TDS	354	243	246	249
Zinc	0.036	0.015	0.16	0.59
H_2S	ND	ND	ND	ND
Total Hardness	278	216	190	209
Total Alkalinity	105	105	108	108
Non-Carbonate Hardness	173	111	82	101
Bicarbonate	105	105	108	108
Calcium	61.8	51.5	43.8	47.5
Magnesium	29.9	21.2	19.4	21.9
CO_2	14	14	10	10
Carbonate	ND	ND	ND	ND
Sodium	9.3	8.7	8.0	8.7
Stability Index	7.99	8.17	8.04	7.89
Saturation Index	-0.35	-0.46	-0.27	-0.15

Notes: 1. Values are reported in mg/liter.
ND = Not detected

Source: August 1981 Water Quality Analyses performed by Technical Services, Inc. of Jacksonville, FL for NAS-Public Works.

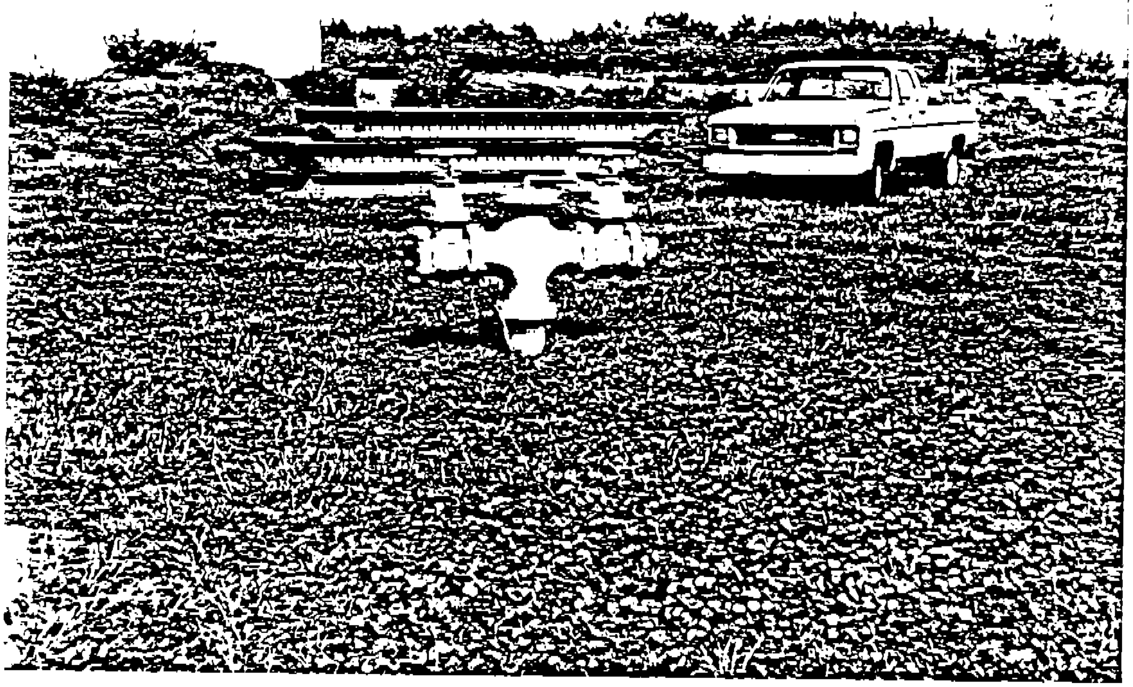

Figure 5.3-18 WELL 1 AT BUILDING 19,
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Well 2 is located south of Building 18. This well has been sheared off below the land surface, permanently capped (cap has been welded to the casing) and buried. The well is 150 feet deep.

Well 3, located at Building 51 (see Figure 5.3-19), is currently used for potable water supply purposes. The well is 1,015 feet deep, and is cased to 150 feet with well casing. Below 150 feet, the well is completed as an 8-inch open borehole. The well is artesian and yields 1,000 gpm. The locations of the three wells at the NFD are shown on Figure 5.3-20.

5.3.7.6 Off-Site Wells

All potable water supplies in the Jacksonville metropolitan area and the eastern part of Duval County are obtained from wells (Appendix A). Jacksonville is reportedly the largest city in the Nation obtaining its public supply from flowing wells (McGuiness, 1963). These groundwater supplies are obtained from two types of aquifers in the area: surficial sand beds, hydraulically connected with relatively thin limestone, shell and sand beds between 50 and 100 feet below the surface, which comprise the shallow aquifer (surficial aquifer); and the thick limestone and dolomite beds below 300 to 600 feet in depth, which comprise the Floridan Aquifer (Leve and Goolsby, 1969). While the Floridan Aquifer is the principal source of potable water supplies in the area, the surficial sand beds and the thin limestone, shell and sand beds are commonly utilized for private domestic supplies, some air conditioning, and for lawn sprinkling. The limestone, shell, and sand aquifer is hydraulically connected to the upper surficial sand aquifer, and is recharged locally by the upper aquifer. Generally, wells located in the surficial sand aquifer are used for watering purposes, while those in the limestone, shell, and sand aquifer are used for domestic supply, watering, and for some industrial purposes such as cooling condensers and for boiler make-up water (Leve and Goolsby, 1969).

At least 50,000 homes in the Jacksonville area obtain all of their water from privately owned wells, while an additional 5,000 to 10,000 homes which are serviced by municipal utilities also have wells to supplement the utility supplies (Leve and Goolsby, 1969). Therefore, it is obvious that groundwater is an important resource in the Jacksonville area.

The Jacksonville Department of Health, Welfare, Bio-Environmental Services (DHWBES) was contacted during this study in an effort to identify groundwater users in the immediate vicinity of the NAS. Twenty private wells were identified by the DHWBES immediately adjacent to the NAS boundary. These wells are shown on Figure 5.3-21. Well permits for three off-site wells and a drinking water analysis for the Ortega Hills housing development water supply were also provided by the DHWBES. These documents are included in Appendix A.

Although the information base on the wells in the immediate off site area is extremely limited, the three DHWBES well permits indicate that at least three of the wells in the area are deep wells completed in the Floridan Aquifer. The completion and construction information on the remaining wells, however, is unknown at this time and it must be conservatively concluded that a significant number of the wells are completed in the upper aquifers present in the area. Off-site use of groundwater (both shallow and deep) occurs at distances less than 3,000 feet from the NAS.

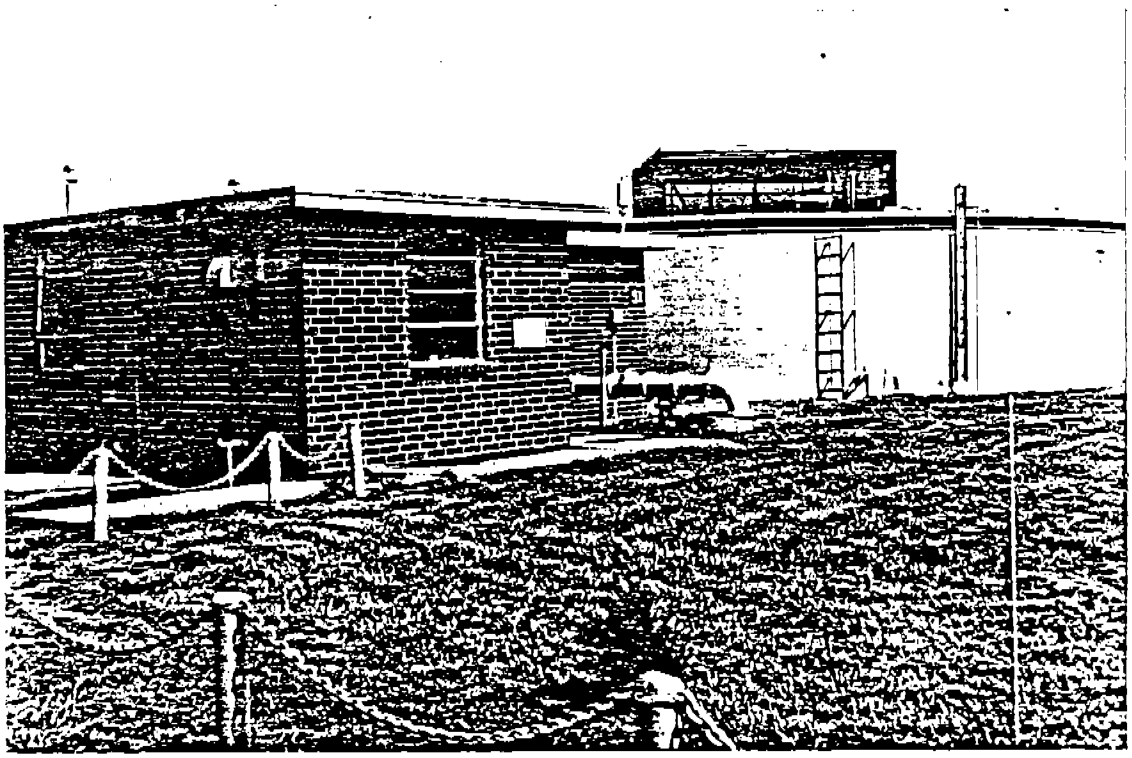

Figure 5.3-19 WELL 3 AT BUILDING 51
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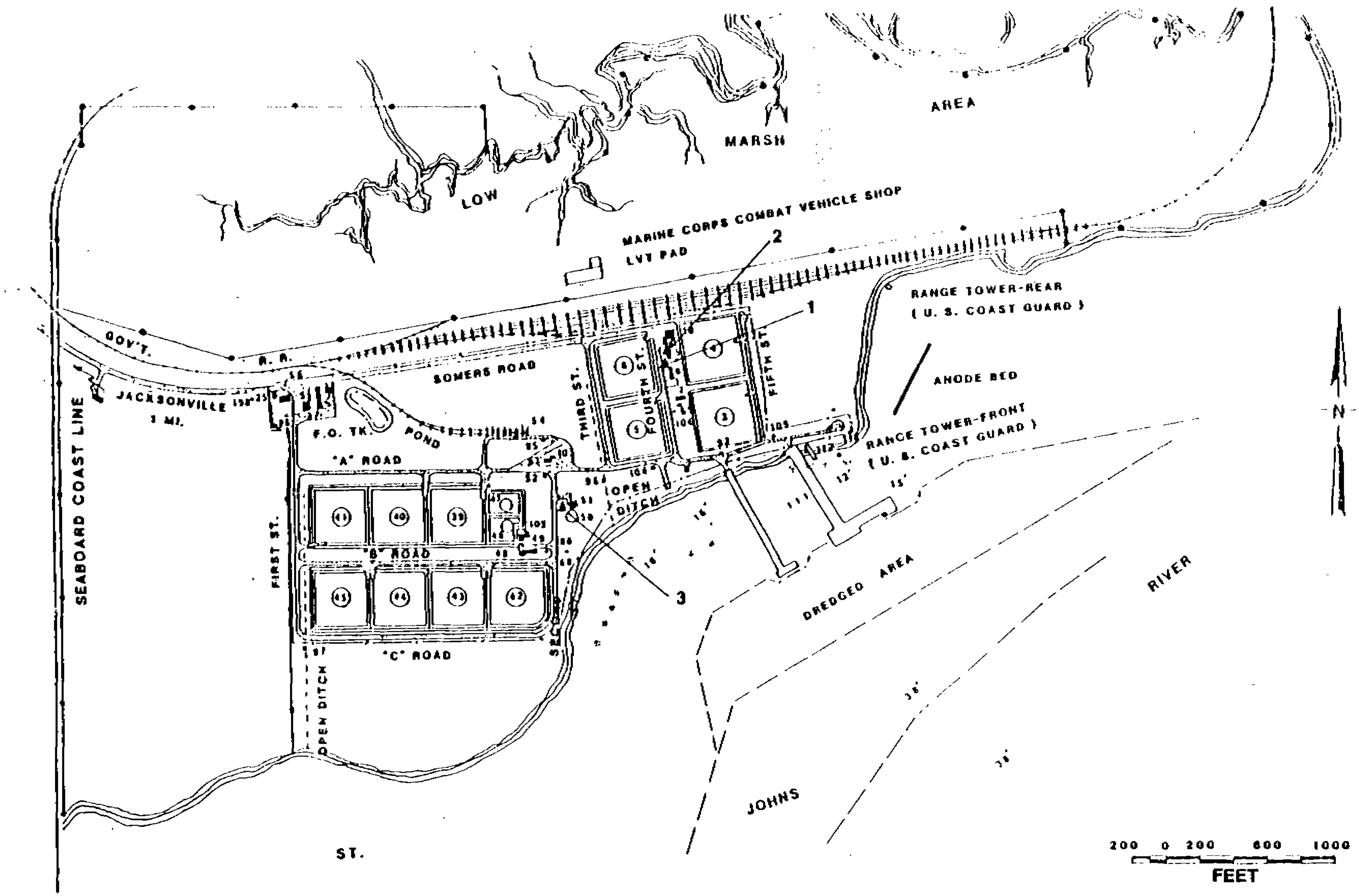

Figure 5.3-20 WELL LOCATIONS NFD JACKSONVILLE

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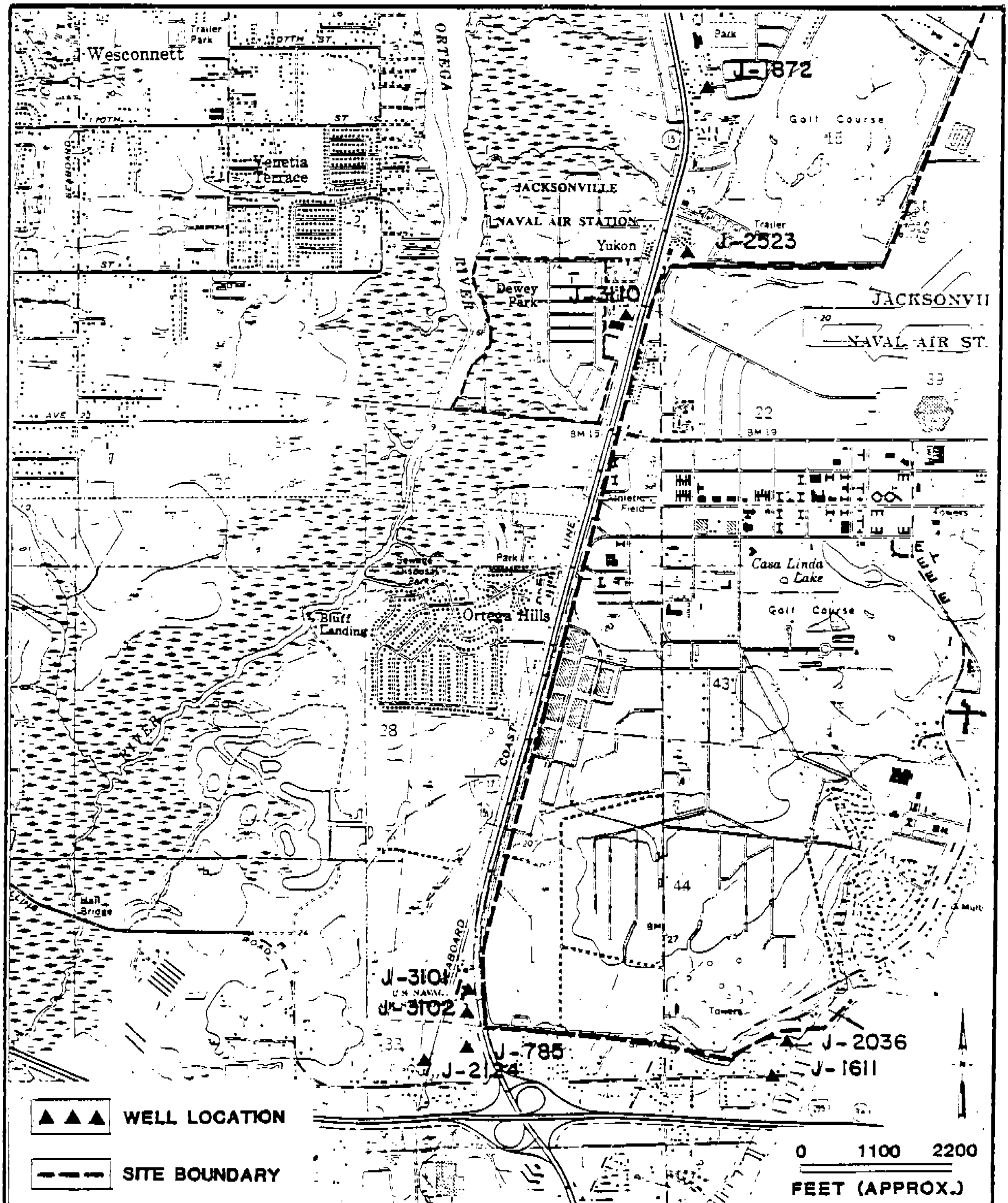

Figure 5.3-21 LOCATION OF WATER SUPPLY WELLS IDENTIFIED BY THE STATE DHWBES IN THE IMMEDIATE VICINITY OF THE NAS SITE BOUNDARY.

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5.3.8 Migration Potential

5.3.8.1 Surface Water

In general, the relatively light infiltration capacity of the sandy soils along with the relatively flat topography, that exists over most of the NAS, tend to reduce the amounts and rates of direct surface water runoff. This reduced amount and rate of surface runoff would likewise mean a decreased potential for pollution migration via natural surface water drainage systems.

In contrast, at the NARF and other more developed areas of the facility, the amounts and rates of direct surface water runoff are controlled and augmented by the storm drain system that collects water from impermeable surfaces and transports it nearly directly to the receiving body of water. Pollutants on these impermeable surfaces (e.g., runways, aprons, roads, parking areas and storage areas) would be more readily moved to the adjoining rivers and streams as shown on the Topography and Drainage Map (Figure 5.3-4). Most of the drainage for the eastern half of the NAS, including the NARF, discharges directly into the St. Johns River. Drainage for the western half of the NAS is to the Ortega River via three unnamed streams that are culverted beneath U.S. Route 17. The southern most stream, on the west side, passes through an off-base housing development known as Ortega Hills. The other two streams, on the west side, pass through undeveloped land including forest and wetland areas prior to discharging into the Ortega River. An unnamed stream drains the southern end of the facility, and passes through a small off-base housing area (just north of I-295) before entering the St. Johns River.

The potential for pollutant migration at the NFD, via direct surface water runoff, is not considered to be appreciable for the following reasons:

- Much of the surface runoff is contained within the fuel tank containment dikes and is released under a controlled discharge.
- Relatively little direct surface runoff is generated due to the infiltration capacity of the sandy soils, flat topography and small watershed area.

There is a limited potential for off-base sources of pollutants to migrate on-base or at least to collect along the shore line and impact tidal flats and wetland areas. The following are offered as examples of possible off-base sources:

- Past incidences of oil spills originating from the Eastport area, that were initially attributed to NFD operations.
- Possible implications and or impacts due to contaminants migrating from the old city dump, near Turner Pond, entering Drummond Creek, and possibly flowing

upstream in the St. Johns River (during flood tide) to the NFB.

5.3.8.2 Groundwater

Due to the sandy surface soils at the NAS, much of the 53 inches of average annual precipitation that falls on the surface infiltrates into the ground to recharge the shallow (water table) aquifer. Likewise pollutants spilled or disposed of at or near the surface can readily percolate downward to the water table and then migrate laterally under the prevailing groundwater flow rate and direction.

An actual case of shallow aquifer contamination, the Old Main Disposal Area at the NAS (Site No. 26) is described in the Geraghty & Miller, Inc. report to the Navy (Southern Division, Naval Facilities Engineering Command) dated May 27, 1980. To the extent that some of the information in this report may be useful in assessing the potential for pollution migration at other areas of the NAS, several of the key findings are listed here:

- The disposal area, which is presently covered and no longer used, was receiving a variety of liquid and solid waste residues (including waste oil and solvents) for a period of several decades.

- A water table high occurs near the center of the disposal area and groundwater within the shallow aquifer moves radially away at rates varying up to 0.4 feet per day (146 feet per year).

- Two distinct oil plumes estimated to contain about 70,000 to 125,000 gallons of oil were identified in the northeast portion of the disposal area and adjacent area. The oil in this plume is moving toward the deep ditch at a rate of about 0.01 to 0.03 feet per day.

- Groundwater contaminated with volatile organic compounds has moved 2,000 to 3,000 feet from the southwest position of the disposal area into the restricted area (magazine area) and will eventually discharge into the St. Johns River.

- The disappearance of volatile organics from water in the deep ditch as it flows to the St. Johns River (based on a one-time sampling) is attributed to several factors including evaporation, biodegradation, dilution, adsorption by organic matter, and absorption by plants.

- If heavy metals are seeping from the groundwater and into the deep ditch, as the data seems to indicate, they are reduced either by dilution or by adsorption on sediments before discharging into the St. Johns River.

- Although the presence of volatile organic compounds were detected in the shallow groundwater system, it is believed that, as long as this shallow groundwater system is not used as a potable water supply it poses no major problems.

As discussed previously, the aquifer of primary concern is the shallow (water table) aquifer. This shallow aquifer is the one of primary concern for the following reasons:

- The relative ease of contamination from surface sources.

- There is limited on-base use of water from this aquifer (i.e., wells used for lawn sprinkling, etc.)

- The NAS is bounded on three sides (north, west and south) by off-base housing developments that utilize the shallow aquifer as a water supply for various domestic purposes (i.e., indoor and outdoor).

The deep Floridan Aquifer, which is the principal aquifer in terms of water supply for the City of Jacksonville and the NAS, is not considered an aquifer of concern (for the purpose of this assessment), for the following reasons:

- The Floridan Aquifer is protected from surface sources of contamination by an approximately 200 feet thick confining layer (low permeability zone) known as the Hawthorn Formation.

- The Floridan Aquifer is artesian. The water within the formations that make up this aquifer occur under pressure. If a conduit existed (i.e., an improperly installed or abandoned well) through the Hawthorn Formation, the water would tend to flow upward from the Floridan Aquifer to the shallow (water table) aquifer. This upward component of flow would preclude the potential for downward migration of pollutants to the Floridan Aquifer from the surface of the NAS and the NFD.

At the NFD, neither the shallow aquifer or the Floridan Aquifer are of concern, from the standpoint of potential for pollutant migration or well contamination, for the following reasons:

- Most of the ground surface at the NFD and much surrounding areas was "made land" (i.e., dredge fill). This material consists of sediment dredged from the bottom of Jacksonville Harbor and St. Johns River Channel. The dredge fill material was placed over low areas that were once floodplains and tidewater areas for the St. Johns River. Due to the origin of the "made land" that is now the NFD, the quality of groundwater within the surficial sand portion of the shallow aquifer is most likely poor.

- Due to the hydraulic interconnection of the shallow aquifer with the tidal St. Johns River it is likely that the groundwater is salty or at least brackish.
- The one NFD well (No. 2) that was screened within the shallow aquifer has been permanently capped and burried.
- There are only two existing water wells at the NFD (No. 1 and No. 3). These wells are both artesian wells and receive their water from the deep Floridan Aquifer.
- The area surrounding the NFD consists of primarily heavy industry and there are no known potable water supply wells in the vicinity that tap the shallow aquifer.

5.4 BIOLOGICAL FEATURES

5.4.1 General

Both the NAS and NFD at Jacksonville are located in the "flatwoods" section of Duval County. This is a relatively level area composed of intricate patterns of low ridges interspersed with ponds, swamps and occasional knolls. The central feature of this portion of the county is the St. Johns River, which supports diverse assemblages of aquatic and wetland habitats.

5.4.2 Terrestrial Ecosystems

The predominant vegetative association of the "flatwoods" in northeast Florida is the pine flatwoods community, dominated by either long leaf, slash or black pine. This community exists in flat, poorly drained areas where standing water occurs during the wetter months of the season. The pine flatwoods is often a transition zone between higher, drier associations and wetlands. Typical plant species found in pine flatwoods are listed in Table B-1. The relatively higher, drier areas in the flatwoods tend to support less water tolerant, hardwood species such as live oak (Quercus virginiana) and turkey oak (Quercus laevis) along with the pines. The lower, wetter areas within the flatwoods, between ridges and adjacent to water bodies, support dense growths of hydrophytic hardwoods. This hydric hardwood or swamp community is one of the most impressive forest groups in the state, encompassing a great variety of tree species including oak, pine, palm and bay. Typical plant species encountered in this community are listed in Table B-2.

5.4.2.1 Naval Air Station Vegetation

The pine flatwoods vegetative community has been altered extensively on the base by past and present land use practices. It appears most of the natural vegetation was removed during the development of the base. Large areas adjacent to the runway on the northern section of the base were cleared to remove obstructions to aircraft. These areas are vegetated by grasses that are periodically mowed to prevent the growth of trees and shrubs. Land cover on the central portion of the base and the areas around the NRMC and base housing complex to the south has been converted to lawns, ornamental trees and shrubs and remnant hardwoods (particularly oaks).

Aerial photographs taken in 1943 show the undeveloped upland (primarily the southern portion) area of the base sparsely covered by pine trees, exhibiting an open savannah-like appearance. Later photographs indicate these areas were permitted to succeed toward natural pine flatwoods habitat until 1973 when a forest management program was initiated. Under this program, 925 acres (Figure 5.4-1) have been subjected to forest management practices. This includes previously undeveloped areas as well as previously mowed areas. The goals of the Navy's long-term Forest Management Plan are to maximize commercial timber production, reduce ground maintenance costs while increasing wildlife habitat. The primary tree species planted has been slash pine. Hardwood standards within the management areas are also managed to produce salable hardwood while enhancing wildlife habitat values.

5.4.2.2 Navy Fuel Depot Vegetation

The upland areas of the NFD are primarily manmade land constructed from dredged material. Forty-eight acres of the approximately 150-acre site is under forest management (Figure 5.4-2). These areas have been reforested with slash pine. Hydric hardwoods are found on lower wetter elevations, particularly bordering the Drummond Creek tidal marsh. The same species of plants listed in Tables B-1 and B-2 can be expected on the NFD.

5.4.2.3 Wildlife

Each of the several different vegetative communities found on the NAS and NFD can support a characteristic, although not necessarily unique, wildlife association due to differences in such basic habitat parameters as canopy cover, ground cover, and water and food availability. The relative scarcity of undeveloped areas and the proximity to urban development limits its value to the larger wildlife species, particularly carnivores such as the bobcat. Tables B-3 and B-4 list animal species that can be expected in typical pine flatwoods and hardwoods communities.

The NAS has also implemented a long-range Fish and Wildlife Management Plan, which is primarily directed toward managing the fish communities of Casa Linda Lake and Scotlis Pond. Terrestrial wildlife habitat management is a unit of the Forest and Land Management programs. The goals of these programs are to improve wildlife habitat through such practices as converting undeveloped areas to forest, providing food plots and preserving productive hardwood areas. No hunting is permitted on NAS or NFD.

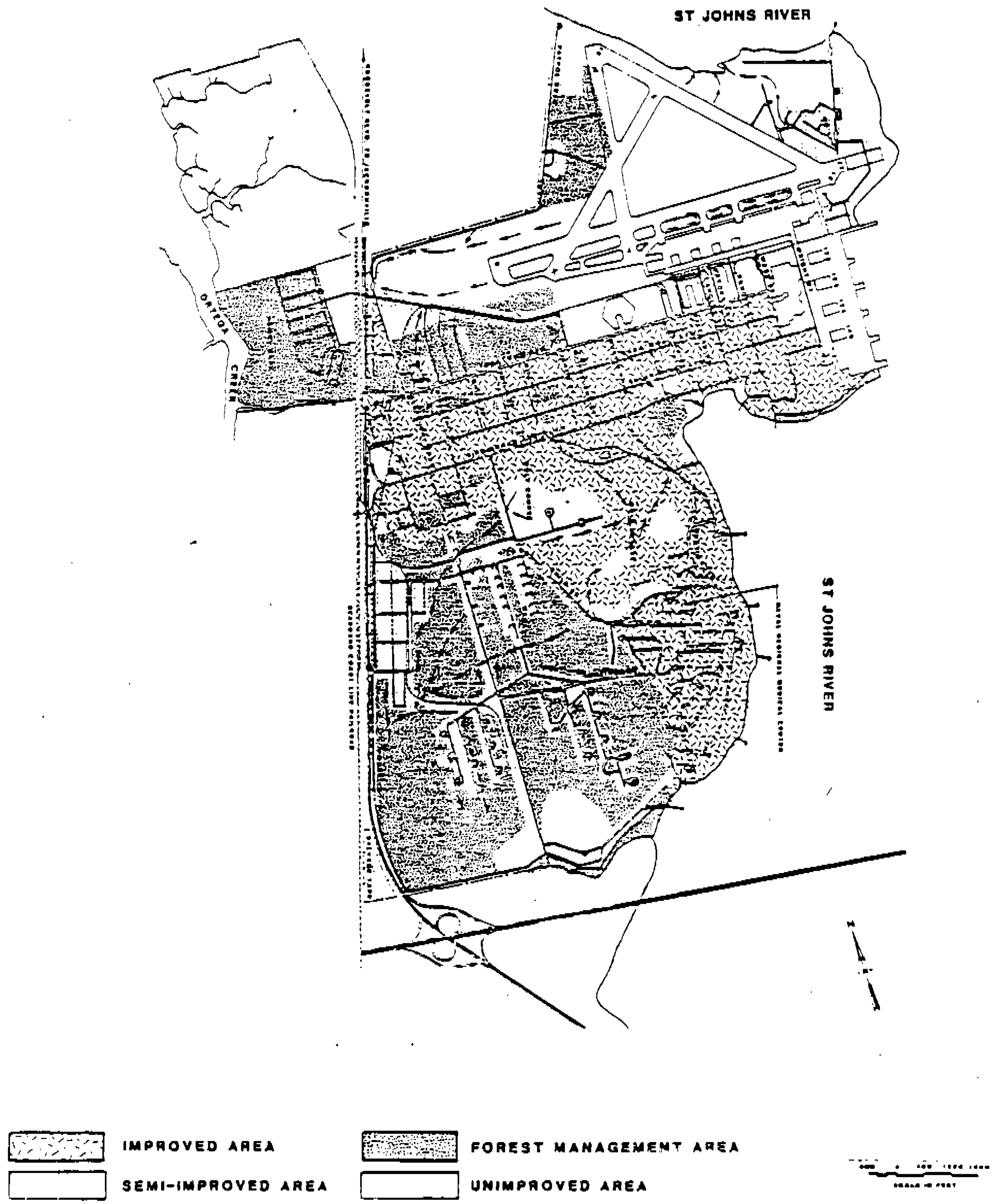

Figure 5.4-1 VEGETATION AND WILDLIFE AREAS NAS JACKSONVILLE

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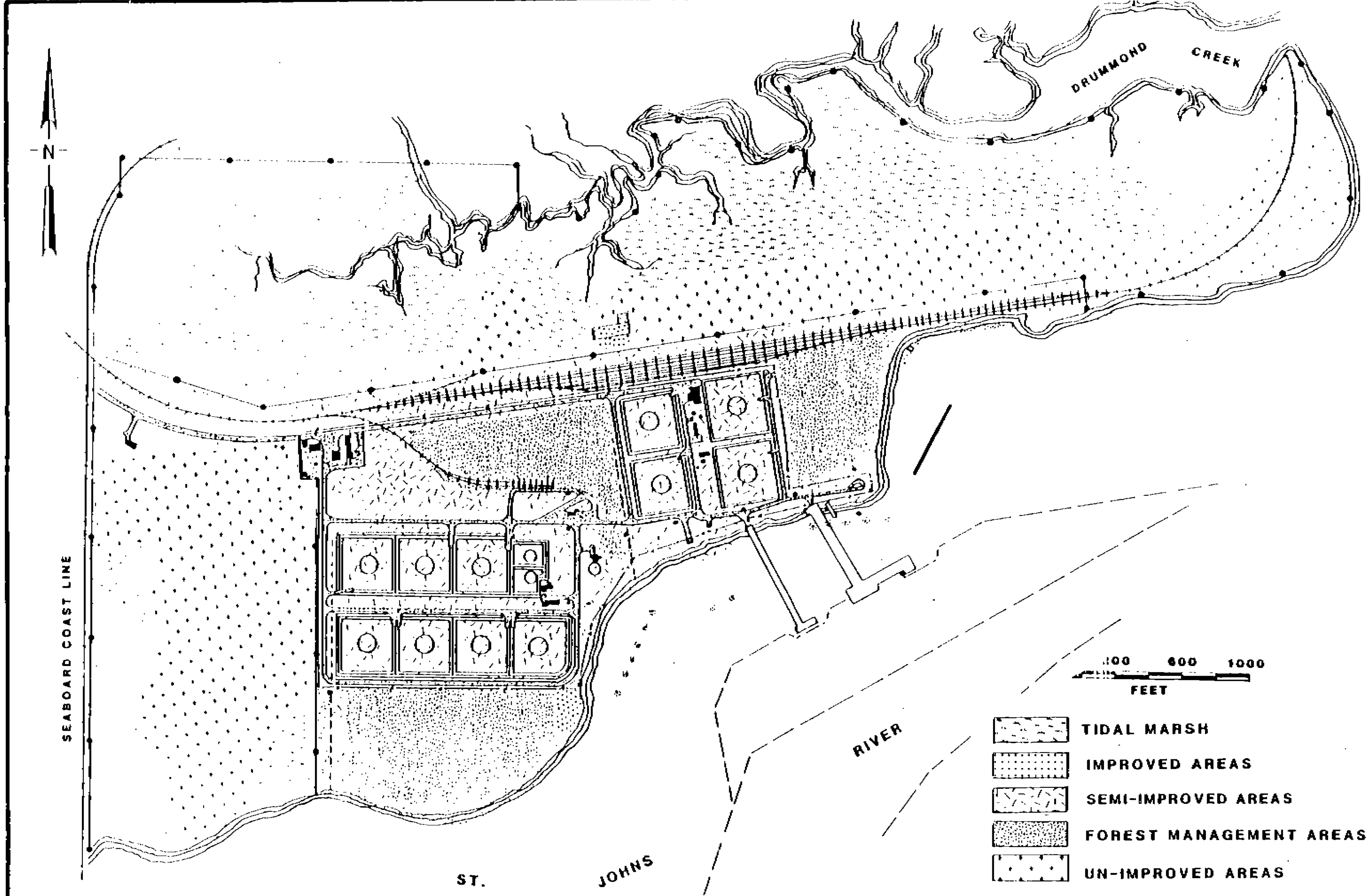

Figure 5.4-2 VEGETATION AND WILDLIFE AREAS NFD JACKSONVILLE

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5.4.3 Wetlands Ecosystems

The flatwoods region of northeast Florida supports a diverse assemblage of wetlands in depressed areas between the low ridges and along natural drainage ways and in the floodplains of streams and lakes. Freshwater and salt or brackish water wetlands within Jacksonville have been mapped by the Jacksonville Area Planning Board (Figures 5.4-3 and 5.4-4). In addition, maps depicting wetlands on both NAS and NFD have been prepared by the Navy for their Jacksonville Complex Master Plan (Figures 5.4-5 and 5.4-6). These maps coincide to a great extent, except for smaller wetland areas delineated on the NAS and NFD maps.

5.4.3.1 Naval Air Station

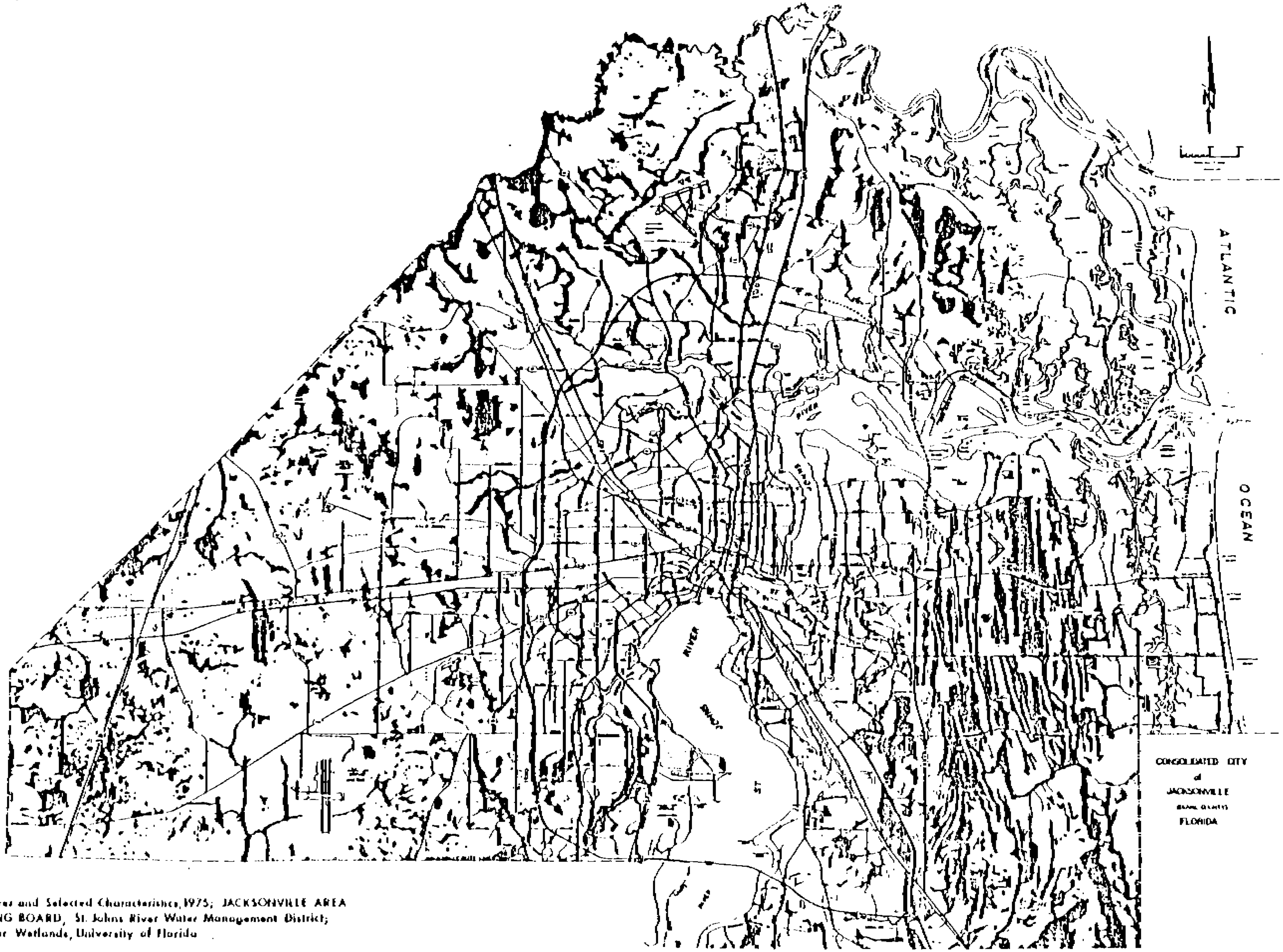
The primary wetland type on the NAS is the hardwood swamp. This wetland forest is located along major drainage ways in the southern portion of the base and along Ortega Creek in Dewey Park. This riverine swamp is subject to periodic overflow caused primarily by tidal fluctuations. No one tree species dominates. The most common species are red maple (Acer rubrum), water tupelo (Nyssa sylvatica var. biflora), sweet gum (Liquidamber styraciflua), bald cypress (Taxodiun distichum), pop ash (Fraxinus caroliniana), Florida elm (Ulmus floridana), and cabbage palm (Sabal palmetto). Additional species were listed previously in Table B-2.

A small area of freshwater (slightly brackish) tidal marsh is located at the northern end of the NAS (Figure 5.4-3). This area has been disturbed in the past by expansion activities on the base. The marsh area supports herbaceous (grasses, rushes, and reeds) and shrub vegetation. In addition, narrow bands of marsh vegetation particularly common threesquare (Scirpus americanus) occur along several areas of base-river shoreline.

5.4.3.2 Navy Fuel Depot

The NFD is located much closer to the mouth of the St. Johns River which results in a greater salt water influence on wetland vegetation. Only species of plants tolerant of high salt concentrations can survive under this condition. In northeast Florida, these plants are limited to a relatively small number of herbaceous species, primarily smooth cordgrass (Spartina alterniflora) and black needle rush (Juncus roemerianus) which largely comprise the salt marsh vegetative association. Additional species are listed in Table B-5.

The NFD salt marsh occurs along Drummond Creek at the northern end of the property (Figures 5.4-4 and 5.4-6). Smaller patches of salt marsh are located on the southern portion of the property where tidal exchange with the St. Johns River occurs (Figure 5.4-4). The importance of salt marshes has been well documented. The marsh directly provides habitat to shrimp, oysters, crabs and the early life stages of many commercially important fish such as mullet, menhaden and drum. Many birds such as herons, egrets, ospreys, hawks and rails breed and/or feed in the marshes. A variety of amphibians, reptiles and mammals are partially dependent upon salt marshes, frequently entering in search of food. One reptile, the American alligator, is not uncommon in the marsh and marsh fringe areas. Typical salt marsh species are listed in Table B-6.



Source: Land Cover and Selected Characteristics,1975; JACKSONVILLE AREA
PLANNING BOARD, St. Johns River Water Management District;
Center for Wetlands, University of Florida

Figure 5.4-3 SELECTED FRESHWATER MARSHES & SWAMPS

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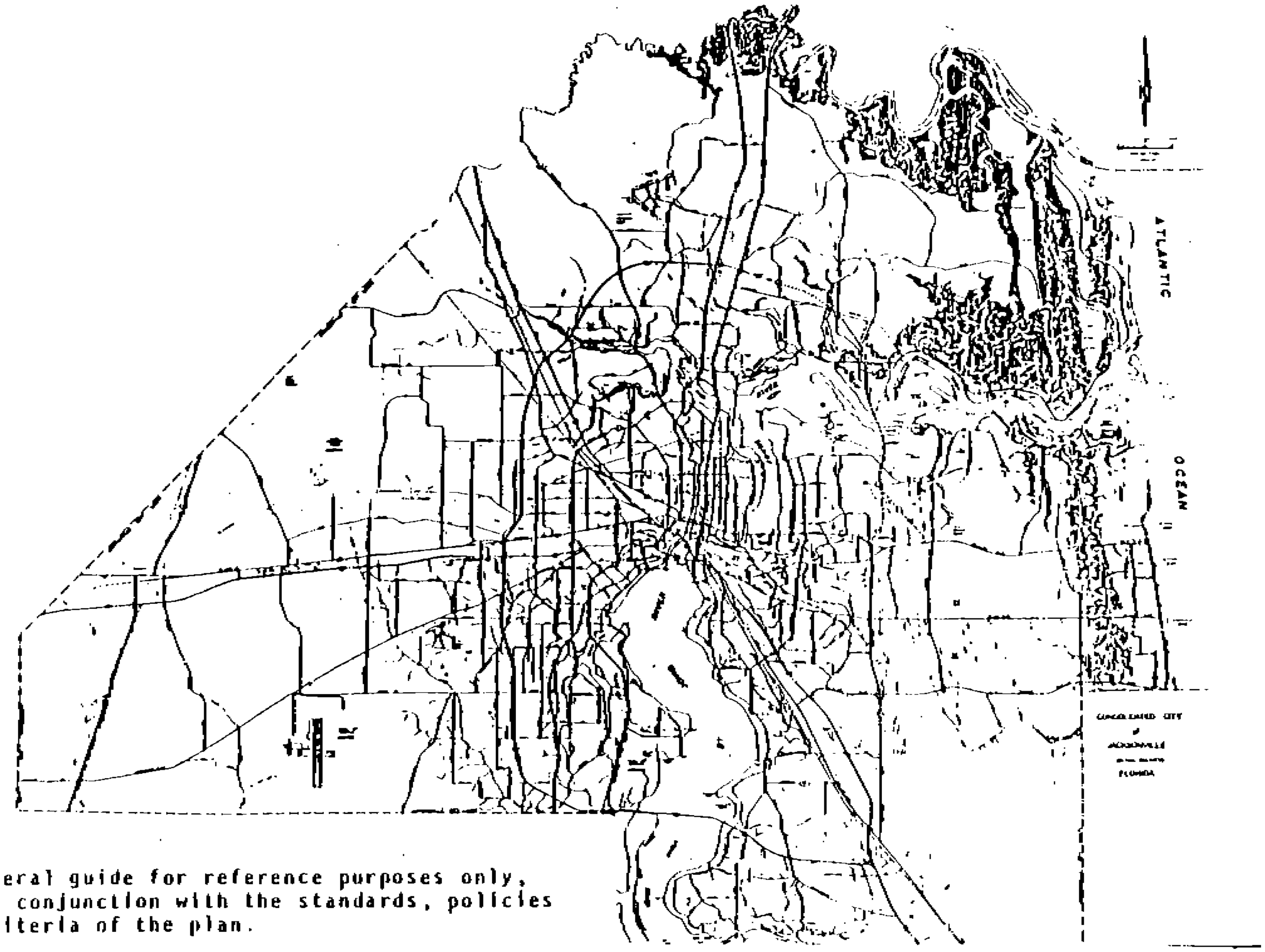

This map is a general guide for reference purposes only, to be utilized in conjunction with the standards, policies and locational criteria of the plan.

Source: Land Cover and Selected Characteristics, 1975; JACKSONVILLE AREA PLANNING BOARD; St. Johns River Water Management District; Center for Wetlands, University of Florida

Figure 5.4-4 SELECTED COASTAL (TIDAL) MARSHES

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JACKSONVILLE, FLORIDA

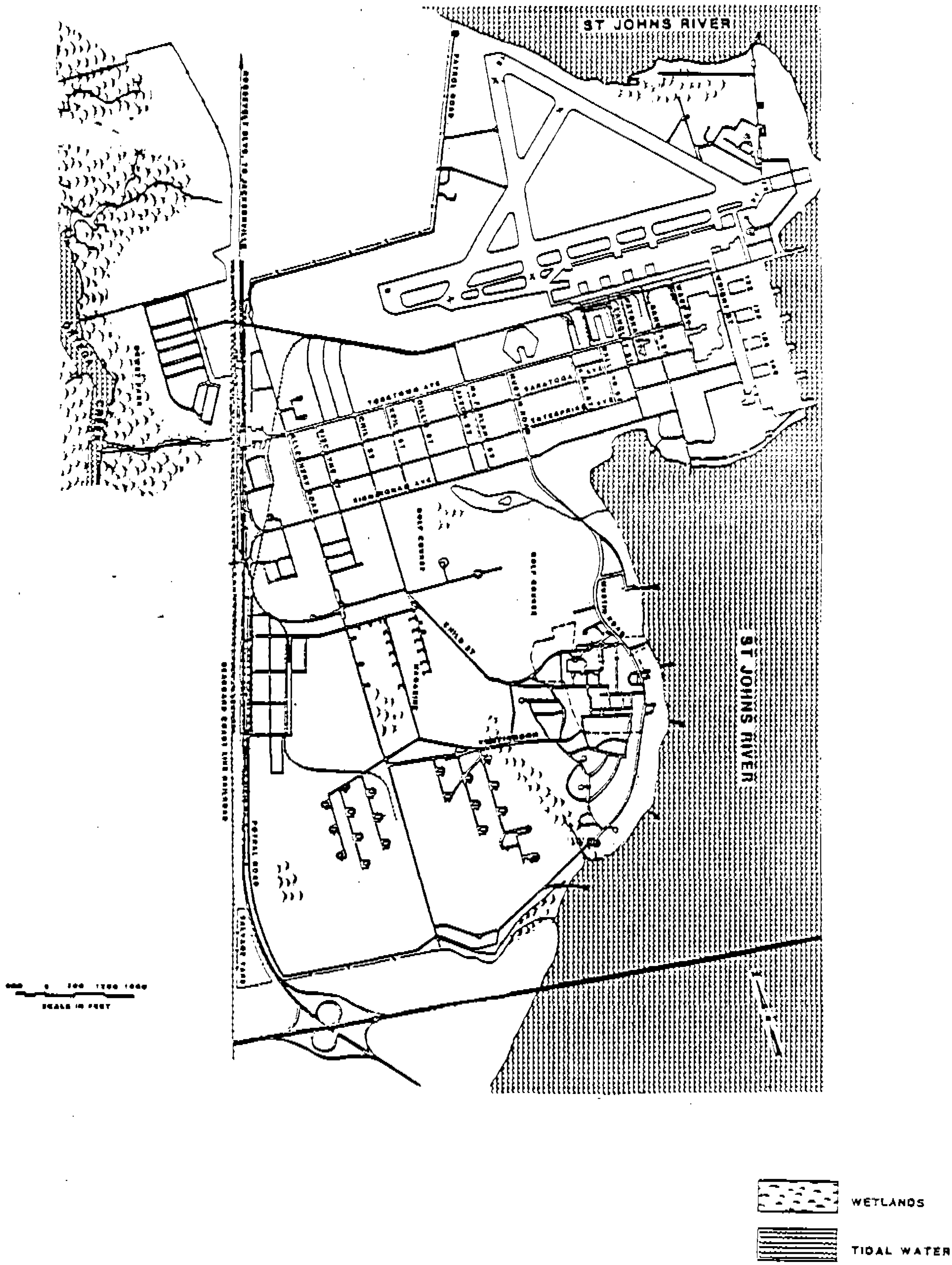

Figure 5.4-5 WETLANDS NAS JACKSONVILLE

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JACKSONVILLE, FLORIDA

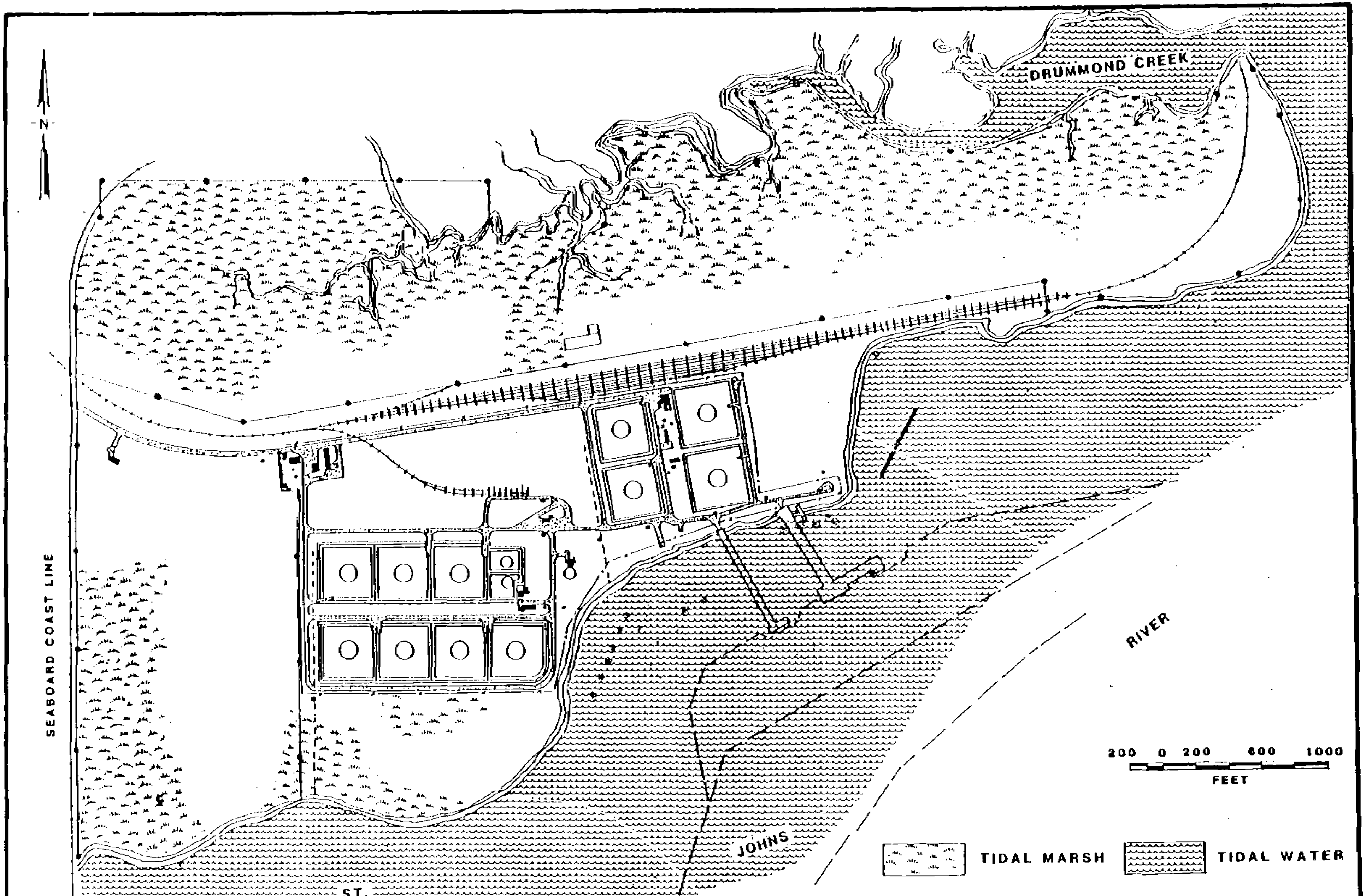

Figure 5.4-6 WETLANDS NFD JACKSONVILLE

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Narrow bands of hydric hardwoods also occur between the Drummond Creek salt marsh and upland areas. This system was discussed in Section 5.4.2.2.

5.4.4 Aquatic Ecosystems

The St. Johns River estuary continues to be a very productive aquatic system in spite of intense development along its banks in the Jacksonville area. Over 150 species of fish have been identified in this system, many of them early life stages of commercially important marine species. In addition, studies by the Florida Department of Natural Resources indicate the St. Johns River to be the most important nursery ground to the shrimp fishery along the northeast Florida coast. Some fish species of commercial and/or recreational importance are listed in Table B-7. A detailed listing can be found in Melane's 1955 study.

Through the efforts of the various environmental agencies and the city of Jacksonville, the water quality of the river has significantly improved over the last decade.

5.4.4.1 Naval Air Station

Two small lakes, Casa Linda Lake and Scotlis Pond are located on the NAS. Casa Linda Lake is approximately 10 acres in area and supports populations of largemouth bass, bluegill, golden shiners and yellow bullhead catfish. Under the NAS Long-Range Fish and Wildlife Managment Plan, Casa Linda Lake is managed for largemouth bass and bluegill to provide a fishery for base personnel. Scotlis Pond is approximately 3 acres in area. It was constructed in the early 1970s and stocked with largemouth bass, bluegill and redear sunfish in 1974-1975. This pond is presently not open to fishing. Both water bodies have a recurring problem of overgrowth by the aquatic "weed" southern naiad.

A fish kill occurred in Casa Linda Lake in 1979. The cause was the pesticide Dazonon which had been applied to the golf course to control nematodes. Several days of rain followed the application, apparently washing a toxic concentration of the pesticide into the lake.

5.4.5 Rare, Threatened or Endangered Species

Table 5.4-1 lists rare, threatened and endangered species that may occur in the Jacksonville area. Only those species designated by the U.S. Fish and Wildlife Service are protected by the Endangered Species Act of 1973.

5.4.5.1 Naval Air Station

There is an active bald eagle nest on the NAS within the Dewey Park area. This nest has been observed by wildlife biologists from the Florida Game and Freshwater Fish Commission since 1979. Successful hatchings have occurred in 1979, 1980 and 1982. Although active in 1981, no offspring were observed. Reportedly there was another bald eagle nest located on the southern portion of the NAS in the vicinity of the magazine area. However, the NACIP team could not locate this nest at the time of the site inspection.

TABLE 5.4-1

Rare, Threatened or Endangered Species that
May Occur in the Jacksonville Area

Species	Legal Status(1) GFWFC(2)	USFWS(3)
Eastern Indigo Snake	T	T
Bobcat		UR
Brown Pelican	T	E
Snowy Egret	SSC	
Louisiana Heron	SSC	
Little Blue Heron	SSC	
American Oyster Catcher	SSC	
Least Tern	T	
American Alligator	SSC	T
Wood Stork	E	
Florida Otter		UR
Gopher Turle	SSC	
Atlantic Loggerhead Turtle	T	T
Florida Manatee	E	E
Fox Squirrel	T	
Southern Bald Eagle	T	E
Florida Sandhill Crane	T	
Shortnose Sturgeon		E

Notes:

(1) E = Endangered; T = Threatened; SSC = Species of Special Concern; UR Under Review (for possible listing).

(2) Florida Game and Fresh Water Fish Commission.

(3) U.S. Fish and Wildlife Service.

Another endangered species, the Florida manatee, has been observed by the NACIP team on several occasions in the St. Johns River just off shore from the NAS. The St. Johns River has been classified by the U.S. Fish and Wildlife Service as a critical habitat for the manatee.

The American alligator, a threatened species, has been observed in water bodies adjacent to the NAS as well as on the base.

5.4.5.2 Navy Fuel Depot

No Federally listed species have been observed on the NFD property.

The manatee, the shortnose sturgeon and the American alligator can be expected in the offshore waters. The Drummond Creek salt marsh may be utilized by bald eagles and other protected birds of prey.

5.5 ADJACENT LAND USE

The area adjacent to the NAS is zoned for land uses from Commercial Intensive (CI) and Industrial Light Warehouse (ILW) to Residential (R) and Open Rural (OR). There is no heavy industry adjacent to NAS Jacksonville. To the west, across Route 17, is a sand and gravel operation. Also to the west is a cement mixing company.

The area adjacent to the NFD is generally zoned for industrial use. On the north side, from the St. Johns River west to the Seaboard Coast Line, land use varies from Industrial Waterfront (IW) to Industrial Heavy (IH) at the Seaboard Coast Line. The west side along the Seaboard Coast Line Railroad to the St. Johns River is Industrial Waterfront (IW). Due north of the NFD is Drummond Creek. This creek passes through the Jacksonville municipal landfill. Fuel tanks containing bulk storage for various oil companies are located on the St. Johns River both up and downstream from the NFD.

SECTION 6

ACTIVITY FINDINGS

6.1 GENERAL

A description of the operations at NAS Jacksonville that utilize(d) hazardous materials is provided in this section. The descriptions are focused on the following types of operations: ordnance, non-ordnance, low level radiological, hazardous materials storage, and waste disposal. The information included in this section provides the background and documentation upon which sections 2, 3, and 4 are based.

In addition to describing the various operations, the wastes generated by each operation and method of disposal are identified. The periods of operation and quantities of materials disposed are described in as great a detail as was possible to obtain. For example, the changing missions of NAS Jacksonville over the years and the varying intensity of operations (i.e., WWII, Korea, Vietnam) allows for only an estimate of waste quantities where historical data was not available.

6.2 ORDNANCE OPERATIONS

Operations at NAS and NFD Jacksonville are primarily focused on providing services and materials to support operation of aviation activities and store and supply fuels. Ordnance operations play a minor role at the NAS. There is a restricted magazine area at the NAS and the Torpedo Rework Facility (site 38) is located within this boundary. Activities at this facility include the repair and cleaning of propulsion systems, addition of Otto fuel to and inspection of torpedos. Personnel with the Ordnance Environmental Support Office (OESO) reported that approximately one 55 gallon drum of solid waste material (i.e., rags and gloves containing Otto fuel) was generated per day. It was also reported that these drums have always been disposed of off-site.

6.3 NON-ORDNANCE OPERATIONS

6.3.1 Vehicle Maintenance Shop

The vehicle maintenance shop is located in Building 105. The shops primary mission is to rebuild, repair, and maintain automobiles, trucks, and jeeps. Waste oils and solvents are stored in 55 gallon drums and hauled off-site by a private contractor. Until 1976 these waste materials were disposed in the waste oil and solvent pits in the registered base dump, Site No. 26.

6.3.2 Pest Control Shop

The Disease Vector Ecology and Control Center, which currently occupies Building 937 (since 1978), has been established as a tenant of the NAS since 1949. This facility is used for the storage and mixing of pesticides and herbicides used at the activity. Characteristic materials stored in this facility include: malathion, chlordane, aldrin, dieldrin, lindane, and diazinon.

6.3.3 Fleet Photo Shop and Audio Visual Center

This photographic shop provides photographic services to all Naval Air Station departments and tenant commands. The services provided by the photography shop include still and high speed photography.

The liquid wastes generated by the photography shop include bleach and developer/fixers. In the past these waste streams were disposed of in shop drains. Currently, they are disposed of in the sewer and routed to the domestic sewage treatment plant. A silver recovery process was installed at the shop in 1972 thereby reducing the quantity discharged. Silver levels in treated wastewater are in compliance with the facility's discharge permit. A description of these wastes is contained in Table 6.3-1.

6.3.4 Boiler Plants, Power Plants

The energy system at NAS Jacksonville is dependent on electricity purchased from the Jacksonville Electric Authority (JEA) and natural gas purchased from the Florida Gas Company. This gas is used as the primary fuel in the boiler plants. Backup fuel storage is 14 days or approximately 420,000 gallons. A project is underway to increase the capacity of reserve fuel supply to thirty days requirement. The storage capacity at that time will be approximately 900,000 gallons.

The gas distribution system at the activity consists of one main. The main feeds power plants #1, #2, and #3. Gas distribution on the base is maintained by the Florida Gas Company to the five-foot building line.

Natural gas is the primary fuel in the main boiler plants, Buildings 104, 650, and H-2032. Each building has four boilers, and each boiler has dual fuel capability of natural gas and No. 6 fuel oil. The incinerator plant has three boilers that burn solid waste and fuel oil. The total installed capacity of the main distribution system is 438,000,000 BTU/hr. In addition, there are ten boilers that have various capacities within the limits of 400,000 to 3,500,000 BTU/hr, and these units serve individual buildings. The small units total capacity is 13,552,000 BTU/hr, and the small units operate on No. 2 fuel oil.

Boiler plant #1 (Building 104) has an installed capacity of 200,000,000 BTU/hr. The four boilers were installed in 1941 and operate at 125 psi. Boiler plant #2 (Building 650) has an installed capacity of 180,000,000 BTU/hr. Boilers 7, 8, and 9 were installed in 1940, and boiler 10 was installed in 1941; they operate at 125 psi. Boiler plants #1 and #2 are interconnected. They each have condensate return systems, and approximately 20% of the original flow is returned.

Boiler plant #3 (Building H-2032) has an installed capacity of 58,000,000 BTU/hr. Boilers 26 and 27 were installed in 1940. The boilers operate at 125 psi, and have an output of 9,000,000 BTU/hr each. Boiler 28 was installed in 1941, and Boiler 29 was installed in 1942. The output capacity of each boiler is 20,000,000 BTU/hr at 125 psi. Condensate return is 85% of the original flow.

TABLE 6.3-1

Hazardous Waste Inventory Photo Shop/Audio Visual Center

RESPONSIBLE TENANT/DEPARTMENT	DESCRIPTION OF HAZARDOUS WASTE[1]	HAZARD[2]	QUANTITY GENERATED ANNUALLY (express units)	STORAGE SITE[3]				CURRENT TREATMENT, DISPOSAL, RECLAMATION	COMMENT
				LOCATION OF SITE	KIND OF[4] STORAGE	QUANTITY STORED (express units)	AVERAGE STORAGE TIME		
AUDIO VISUAL CEN	Hunt Color-Print - 30- Bleach Fix Replenisher	Toxic Corrosive	12 24-Gal	Lg. #921	Containers inside A/C Building	6 25-Gal	6 Mos	Sewage Plant	All Chemicals Listed are Toxic and Corrosive
	Bleach Starter	" "	8 1-Gal	Containers inside A/C Bldg. #921	" "	4 1-Gal	6 Mos	" "	" "
	C-41 Bleach Replenisher		20 5-Gal			10 5-Gal	6 Mos	" "	" "
	C-41 Fixer - Replenisher	" "	18 5-Gal	" "	" "	9 5-Gal	6 Mos	" "	" "
Sulfuric Acid	C-41 Developer Replenisher	" "	40 5-Gal	" "	" "	10 5-Gal	3 Mos	" "	" "
	C-41 Stabilizer & Replenisher	" "	12 5-Gal	" "	" "	6 5-Gal	6 Mos	" "	" "
	Royal print Activator/ Stop Bath	" "	120 1/2 Gal	" "	" "	30 1/2 Gal	3 Mos	" "	" "
	Royal print Fixer	" "	96 5-Qt	" "	" "	24 5-Qt	3 Mos	" "	" "
Acetic) Acid)	Starmat type B Dev. Starter	" "	12 Qt	" "	" "	6 Qt	6 Mos	" "	" "
Aluminum	Hunt Starfix Fixer	" "	24 20-Gal	" "	" "	12 20-Gal	6 Mos	" "	" "

[1]Description should include common/chemical name and other appropriate details (e.g., concentration, military specification, stock number, pesticide registration). Do not include radioactive wastes.

[2]Possible hazards.
- Toxic
- Corrosive
- Reactive
- Ignitable

[3]Any area with an accumulation of hazardous wastes constitutes a storage site.

[4]Examples of kinds of storage:
- 55-gal drums on pallets over soil
- Small containers on concrete
- Containers inside sub-standard building
- Drums inside adequate shelter
- Storage tank under pavement

(Continued)

RESPONSIBLE TENANT/DEPARTMENT	DESCRIPTION OF HAZARDOUS WASTE[1]	HAZARD[2]	QUANTITY GENERATED ANNUALLY (express units)	STORAGE SITE[3] LOCATION OF SITE	KIND OF[4] STORAGE	QUANTITY STORED (express units)	AVERAGE STORAGE TIME	CURRENT TREATMENT, DISPOSAL, RECLAMATION	COMME
AUDIO VISUAL CEN	Hunt Type B Developer/ Replenisher	Toxic Corro- sive	22 20-Gal	Containers inside A/C building Bldg. #921	Containers Inside A/C Bldg.	11 20- Gal	6 Mos	Sewage Plant	All Chemicals listed are Toxic and Corrosive
Potassium) Hydroxide)	E-6 Color Dev. Replen.	" "	44 5-Gal	" "	" "	11 5-Gal	3 Mos	" "	" "

[1]Description should include common/chemical name and other appropriate details (e.g., concentration, military specification, stock number, pesticide registration). Do not include radioactive wastes.

[2]Possible hazards.
- Toxic
- Corrosive
- Reactive
- Ignitable

[3]Any area with an accumulation of hazardous wastes constitutes a storage site.

[4]Examples of kinds of storage:
- 55-gal drums on pallets over soil
- Small containers on concrete
- Containers inside sub-standard building
- Drums inside adequate shelter
- Storage tank under pavement

(Continued)

RESPONSIBLE TENANT/DEPARTMENT	DESCRIPTION OF HAZARDOUS WASTE[1]	HAZARD[2]	QUANTITY GENERATED ANNUALLY (express units)	STORAGE SITE[3] LOCATION OF SITE	KIND OF[4] STORAGE	QUANTITY STORED (express units)	AVERAGE STORAGE TIME	CURRENT TREATMENT, DISPOSAL, RECLAMATION	COMMENT
AUDIO VISUAL CEN.	E-6 First Dev. Replen.	Toxic Corrosive	44 5-Gal	LG. #921	Containers inside A/C Bldg.	11 5-Gal	3 Mos	Sewage Plant	All Chemicals listed are toxic & corrosive
	E-6 Reversal Bath & Replen.	" "	12 5-Gal	" "	" "	6 5-Gal	6 Mos	" "	"
Formal-) dehyde)	E-6 Stabilizer Replenisher	" "	20 5-Gal	" "	" "	10 5-Gal	6 Mos	" "	"
	E-6 Conditioner & Replenisher	" "	16 5-Gal	" "	" "	4 5-Gal	3 Mos	" "	"
	E-6 Fixer and Replenisher	" "	16 5-Gal	" "	" "	8 5-Gal	6 Mos	" "	"
Acetic) Acid)	E-6AR Bleach Replenisher	" "	12 5-Gal	" "	" "	6 5-Gal	6 Mos		
	Color Developer Starter	" "	4 25-Gal	" "	" "	2 25-Gal	6 Mos		
	Hunt Color-Print - 30 Dev. Starter	" "	12 Qt	" "	" "	12 Qt	6 Mos	" "	"
Potassium) Hydroxide)	Hunt Color-Print - 30 Dev.	" "	12 25-Gal	" "	" "	6 25-Gal	6 Mos	" "	"
	Hunt Color-Print - 30 Bleach Type "A" Fix Replenisher	" "	12 25-Gal	" "	" "	6 25-Gal	6 Mos	" "	"

[1] Description should include common/chemical name and other appropriate details (e.g., concentration, military specification, stock number, pesticide registration). Do not include radioactive wastes.

[2] Possible hazards.
- Toxic
- Corrosive
- Reactive
- Ignitable

[3] Any area with an accumulation of hazardous wastes constitutes a storage site.

[4] Examples of kinds of storage:
- 55-gal drums on pallets over soil
- Small containers on concrete
- Containers inside sub-standard building.
- Drums inside adequate shelter
- Storage tank under pavement

6.3.5 Wastewater Collection and Treatment

Until 1961, there were no industrial wastewater treatment facilities at NAS Jacksonville. In 1940, two trickling filter plants were constructed for treatment of domestic wastes (combined domestic and industrial). The west side plant is located north of the center of the main east-west runway. The east side plant (no longer in existence) was located south of the east end of the main runway. In 1972, the east side plant was taken out of service and the flow directed to the west side plant. The west side plant was expanded to 2.25 mgd capacity and upgraded (to activated sludge with aerobic sludge digestion) in 1972.

Prior to 1972, industrial wastes reaching the east side plant were treated initially by settling (for paint chip removal) and skimming for removal of oils and solvent. These industrial wastes were then transported to the previously identified solvent waste disposal site. Effluent from settling/skimming was treated in the trickling filter plant for discharge to the St. Johns River. Trickling filter sludges were disposed near the PCB storage area (Site 27).

After construction in 1974, the upgraded west side activated sludge plant was supplemented with a chromium reduction/precipitation and cyanide reduction/ oxidation facility for pretreatment of chromium and cyanide bearing plating wastes, and was fully operational in 1981. While designed for automated operation, this facility is currently being operated manually with (apparently) good results. The batch-type process design used typically responds well to manual operation.

Of note, paint chips and solvents from aircraft and component paint removal operations are treated initially at the source. A combined pump station and paint chip removal system (currently inoperative) behind the component stripping ramp area is used to screen out paint chips which are then conveyed to a dumpster for contractor removal. Solvents used in aircraft and component stripping are typically lost to the atmosphere in the process of stripping, flowing through the screens, pump station wet well, and the west side treatment plant. The total solvent discharge from aircraft stripping (93112) and component stripping (93111) is approximately 1,200 gallons per week of methylene chloride/cresylic acid blend, 225 gallons per week of butyrate stripper, 55 gallons per week of trichloroethane and 25 gallons per week of naphtha. With a 2.1 mgd average flow and five-day work week, concentrations reaching the activated sludge unit (assuming no volatilization loss) would be: methylene chloride, 152 mg/l; trichloroethane, 7 mg/l; and naphtha, 1.6 mg/l. The butyrate stripper is insufficiently defined to predict specific gravity and behavior. Based on 250 horsepower aeration capacity, 2 lb oxygen per horsepower hour and 20 percent oxygen in air, the effluent concentration of methylene chloride and trichloroethane would be 73 percent and 66 percent respectively of influent concentrations. If there were no losses of methylene chloride and trichloroethane before the treatment plant, the effluent concentrations could be as much as 110 mg/l and 4.6 mg/l, respectively. Because of the patterns of use and losses attendant on that use, the influent and effluent concentrations are one to two orders of magnitude below these levels. This is based on results of analysis of effluent in accordance with NPDES permit for the west side plant.

Sludges from the west side plant were formerly disposed on base, either to the PCB storage area (Site 27) or broadcast near the west side plant. One area of stressed vegetation within the new pine plantation southeast of the plant, Site No. 4, showed evidence of sludge dumping (tomato plants). Sludges are currently disposed in the pine woods surrounding the waste treatment plant with approval from the EFD based on results of an EP toxicity test.

Also at this location, the out of service trickling filter plant filters (two) contain an unknown quality of oil used as bottom bearing seals to prevent intrusion of sand or salt into the bearing.

6.3.6 Firefighting Training

The firefighting companies at the NAS provides fire protection for the general NAS activities and aircraft operations. The NAS Fire Department conducts firefighting training exercises at a site south of the effluent polishing pond No. 834 identified as Site No. 2. Junk vehicles are sprayed with JP-5 or waste oil and ignited to simulate aircraft crashes. Prior to use of the current area, a firefighting pit, Site No. 28, was used for firefighting training. When the old firefighting training area was in operation, a mixture of flammable materials were used as fuel. Reportedly waste oils and lubricants were dumped in the pit and burned.

6.3.7 Incinerators

An incinerator plant on the station has three boilers that burn solid waste and fuel oil. These boilers were installed in 1980 and each has an output capacity of 6,000,000 BTU/hr. The output from the incinerator is connected into the system between boiler plants #1 and #2. The maximum allowable firing rate is two boilers at 4,000 lbs/hr total.

6.3.8 Fuel Farms/Gas Stations

The old gas station Building 48, Site No. 19 has been taken out of service. The site currently houses the base garden center. The underground gasoline storage tanks with a total capacity of 16,000 gallons are believed to remain. Although there were no reported problems from leaks at this facility, the potential exists for tanks, fittings, hoses to corrode causing contents to leak.

The existing base service station, Building 429, Site No. 33 has had a recent fuel leak. Approximately 2,000 gallons of gasoline leaked from an underground pipe fitting and infiltrated the sewer system allowing gasoline vapors to migrate in the sewer line to lavatory receptacles within a 9 block area of the service station.

All petroleum facilities are entirely on shore and consist of storage and transfer of aviation, automotive, heating and waste fuels. The handling of waste oil and fuels are the joint responsibility of the Naval Supply Center and Public Works Department. The Naval Air Station's petroleum product storage facilities requiring SPCC consideration consist of twenty-five (25) underground tanks and seven (7) above-ground tanks varying in size from 1,500 to 567,000 gallons. A recent report, Hazardous Waste Management Plan for Jacksonville, Florida Naval Complex Including Kings Bay, describes the Fuel Farms/Gas Station area in great detail (Cassidy, 1981). Discussions relating to past disposal practices that are contained in this report are summarized below.

Facility 159-a bulk fuel storage facility is located at the north-east end of the station adjacent to Catapult Road. The bulk fuel storage facility consists of eleven (11) underground storage tanks. The tanks are constructed at ground level with earth covering to form a large mound. This facility has an annual throughput of approximately 60 million gallons. All fuel deliverables are via barge.

The Fuel/Lube Oil Storage Facility (Facility 119) consists of seven underground storage tanks used to store Aviation Lube Oil, No. 2 Fuel Oil, MOGAS, AVGAS, and Waste Oil. Four (4) tanks are abandoned, filled with sand and are flanged off. The remaining four (4) tanks are filled with water. A listing of those tanks is shown in Table 6.3-2. Where known, average annual flow rates are noted as a comment.

A disposal area, south of the station's golf course, was used to dispose of waste solvents, cresols, oil, grease and other liquid industrial wastes. The disposal area is now closed and projects C9-81, C10-81 and C11-81 will remove pollutants and restore the area.

Fuel/Storage/Transfer areas also exist at Facilities 120, 120A, 650A, 650B, H-2032, 1987, 1988 and 1963. A detailed discussion of these facilities is also included in Cassidy (1981).

6.3.9 Sanitation, Refuse and Garbage

The main sources of solid waste generation include the Naval Air Station Operations and Administrative Activities, the NARF and the family housing units.

Until 1977 the majority of solid waste generated on the base was collected by Standard Refuse, Inc., a refuse collection contractor. Items that were not acceptable in the contractor collection system were collected by the Public Works Department or were hauled to the on station disposal area by the generating organizations. Approximately 330 cubic yards of waste per week was disposed of at a disposal area operated by the Public Works Department on board station at this time. The disposal area was located south of the Golf Course and immediately west of the New Family Housing Area. The Public Works Department maintained a disposal area supervisor at the site, to insure that only burnable material was deposited at the disposal area and to see that refuse was placed in piles to facilitate burning, consolidation and covering (Cassidy, 1981). Generally the disposal area was burned every Friday. The burned and semiburned material was then pushed over an embankment formed by previously covered refuse and ash. The new material was then covered with fill material.

Liquid waste, including sludge from grease traps and oil sumps as well waste chemicals from NARF shops was collected in 400 to 750 gallon tank trailers pulled by tractors. Liquid waste products including cleaning solvents, paint thinners, heavy petroleum products sludge, and galley grease trap sludge were disposed of at a holding tank at the sewage treatment plant

TABLE 6.3-2 Facility 119 - Fuel/Lube Oil Storage

Structure Number	Material Construction	Fuel	Comment[1]
119-A	Steel	No. 2	90,000 g/yr
119-B	Steel	Lube Oil	15,000 g/yr
119-C	Steel	AVGAS	
119-D	Steel	AVGAS	45,000 g/yr
119-I	Steel	AVGAS	
119-J	Steel	MOGAS	480,000 g/yr
119-L	Steel	MOGAS (Leaded)	
119-K	Steel	Paint Waste	
119-Q	Steel	Abandoned	Filled with water
119-R	Steel	Abandoned	Filled with water
119-S	Steel	Abandoned	Filled with water
119-T	Steel	Abandoned	Filled with water
119-Y	Steel	Abandoned	Filled with sand/ Flanged off
119-Z	Steel	Abandoned	Filled with sand/ Flanged off
119-AA	Steel	Abandoned	Filled with sand/ Flanged off
119-AB	Steel	Abandoned	Filled with sand/ Flanged off

Note: 1. Capacity of all tanks is 27,200 gallons

Source: Cassidy, 1981.

or at a slurry pit located next to the disposal site. Part of the liquid waste generated at the NARF activities was hauled to the sewage treatment plant holding area but the majority of the NARF waste and all of the sludge generated at other activities was hauled to the slurry pit located at the station disposal area (Cassidy, 1981).

The majority of the solid waste collected on board station was disposed of by the refuse collection contractor off-site.

The majority of the waste petroleum products generated on board station were recycled as a part of the station refueling contract. Waste oil and contaminated aircraft fuel was placed in holding tanks throughout the station for collection by the station refueling contractor. The Defense Property Disposal Office collected $12,600 in FY 75 for waste petroleum products (Cassidy, 1981).

6.3.11 Defense Property Disposal

The Defense Property Disposal Office (DPDO) is located off-site. However, the DPDO facility, located across from the NAS, arranges for sale or disposal of "used" or surplus items from NAS and NFD Jacksonville.

6.3.12 Naval Air Rework Facility

The NARF, one of the major tenant activities at Jacksonville, employs approximately 3,000 workers in stripping, testing, and refitting P-3 (long-range anti-submarine) and A-7 (ground support) aircraft. The general flow of work begins with removal of engines and other components (propellors, control surfaces, etc.). After these components have been removed, the airframe is stripped of paint and sprayed with corrosion inhibitors before inspection and repainting. Components are also stripped of paint, sprayed (or given other treatment), and inspected before being repainted and installed on the airframe. Engines are disassembled, inspected, and moving parts are "magnafluxed" (inspected for cracks) and, if necessary, replated before assembly and installation in the airframe.

In addition to direct aircraft-related operations, the NARF operations include support functions, such as battery repair (for fork lifts), joiners (crating and carpentry), and riggers shops. Chemical usage at NARF is predominantly located in six shops, with only minor amounts consumed in other areas.

The following paragraphs describe in more detail the hazardous chemicals and the nature of operations conducted in each major shop and support function which may result in these three categories of discharges.

The following paragraphs describe in more detail the hazardous chemicals and the nature of operations conducted in each major shop and support function which may result in these three categories of discharges.

6.3.12.1 Component Stripping and Cleaning Shop (93111)

This shop performs paint stripping operations and degreases and steamcleans aircraft components. These operations require the use of paint strippers and organic solvents. Paint strippers, including methylene chloride and cresylic acid, trichloroethane, butyl acetate and naphtha are used in an open paint stripping shed. The spent stripper and paint is washed off the metal parts, and discharged into floor drains. Approximately 430 gallons per week of solvents are disposed. The waste is pumped through an inoperative paint chip remover and the enters the industrial waste water system. This shop also contains a "hot strip" tank containing dichlorobenzene. Approximately 12-13 drums (660-715 gallons) of the material is disposed off-site. Cold carbon remover (methylene chloride, Phenol 48, and emulsifiers) is also used in a tank, but is not disposed. Losses from evaporation dragout, and reactors are replenished.

The solvents used in the shop's operation include: trichloroethane (55 gallons/week discharged into ramp drains); naphtha (25 gallons/week discharged into ramp drains); trichloroethylene (165 gallons/month lost to evaporation and 55 gallons/month now shipped to off-site disposal; butyrate (100-125 gallons/week discharged into ramp drains and lost to evaporation). The stripper and solvent wastes were discharged to the storm sewer system for approximately 32 years ending in 1972.

6.3.12.2 Aircraft Stripping Shop (93112)

This shop performs airframe stripping and paint and corrosion treatment. The operation generates waste methylene chloride - Mil. spec. 81294 (less than 17 drums per week), paint stripper wastes, containing cresylic acid, cellulose acetate, and butyrate thinner (less than 2 drums per week), and waste alodine (less than 140 ounces per week of dry powder). These wastes are discharged into the industrial waste water treatment plant via the floor drains in the shop. A NARF report (O'Brian, 1979) provides data on the amount of chromium, phenol and cyanide which enter the drains from paint stripping and conversion coating operations for each aircraft processed. This data is presented in Table 6.3-3. Using the data for the number of aircraft processed from January to June, 1978, the shop would discharge 2866 lb. of chromium, 52,972 lb. of phenol, and 71 lb. of cyanide to the industrial treatment facility in a 6 month period.

Approximately 400,000 lb/yr of glass beads are used as abrasive blast on aircraft. The waste beads are currently drummed and disposed of offsite by a contractor. Before 1981, the glass beads were disposed into the St. Johns River.

6.3.12.3 Metal Treating Shop (93113)

This shop performs miscellaneous metal finishing and treating operations. The shop has 42 tanks containing various metal treating solutions and rinse waters. Many of the metal treating formulations are replenished by adding chemicals as specified by the Materials Engineering Laboratory. The tanks are therefore emptied only at long intervals. For example the alodine tank has been emptied only twice in 14 years according to the shop's records. Table 6.3-4 summarizes the major waste types, quantities, and disposal practices of this shop.

TABLE 6.3-3
Chemical Wastes From Paint Stripping And Conversion Coating Operations

Chemicals	Aircraft Model (No. Processed Jan-Jun 78) A-7E(54)	A-7(116)	P-3(28)	Misc.(12)
Chromium(Cr) fm stripper(lbs.)	14.9	8.7	23.2	9.9
Phenol fm stripper (lbs.)	304	179	477	203
Chromium(Cr) fm alodine (lbs.)	1.13	1.13	2.8	1.1
Cyanide (CN) fm alodine (lbs.)	0.28	0.28	0.7	0.3

NOTES:

(1) Excessive stripper was used on the A-7E because of a special coating.

(2) Only one P-3 can be stripped at a time, but two A-7 aircraft can be stripped at once.

(3) The workload for the period investigated is 2-3 times normal due to a special program requirement.

(4) Stripping shed used approximately 1,000 gallons of stripper and 20 pounds of alodine per week in 1978. These enter the drain in a fairly constant volume.

(5) Calculations for amounts of various chemicals are based on composition of manufacturer's material presently in use. TURCO 6037 is 12.3 percent by weight phenol, 1.75 percent by weight sodium chromate. ALODINE 1200 is 20-30 percent chromium (Cr) and 5-10 percent cyanide (Cn).

Source: O'Brien, 1979

TABLE 6.3-4
Metal Treating Shop Wastes

Waste Type	Waste Quantity	Present Disposal Practice	Past Disposal Practice
Chromic acid (1 lb/100 gal)	6.7 lb/yr.	(not used) since 1973	until 1973
Excelgold 1200	1050 gal (total)	*	all in 1980
Alodine	80 oz./yr	*	(disposed twice in 14 yrs.)
Chromate	1140 gal/yr. (3 tanks, total capacity 3450 gal)	IWWTP	IWWTP
Sodium Dichromate	730 gal capacity	IWWTP	IWWTP
Parcolube	360 gal/yr.	*	*
Parcolube sealer	760 gal/yr.	*	*
Sulfuric Acid	av. 80 gal/yr.	*	*
Hydrochloric Acid	av. 50 gal/yr. (300 gal capacity)	*	*
Metralux	(315 gal capacity)	(not used since 1977)	*
Phosphoric Acid	315 gal every 4 yrs.	*	*
Trichloroethylene	100 gal total	(Not used)	until 1977
1,1,1,-Trichloroethane		(100 gal on hand)	*
Sodium hydroxide	460 gal every 1.5 yr.	IWWTP	Drain
Nickel Acetate sealer	av. 20 gal/yr (100 gal every 5 yrs.)	*	*
Black Dye	av. 20 gal/yr. (100 gal every 5 yrs.)	*	*
Potassium Bifluoride	av. 76 gal/yr. (380 gal capacity)	IWWTP	IWWTP
Black Oxide for stainless	220 gal/yr.	*	*

Note: *A disposal practice could not be determined by the NACIP team.

6.3.12.4 Component Finish Shop (93115)

This shop paints small aircraft components (propellers, control surfaces, etc.). The operation generates approximately five 55 gallon drums of paint shop and solvent wastes per week. Paint shop wastes (600 gpw), cold carbon remover (200 gpw), and vapor degreasing solvents (300 gpw) are stored together in an underground tank (Tank 11 9K). Two or three times per month NY-TREX, Inc. disposes of the waste under contract No. N62467-82-B-2468. The waste has been manifested as F017 which is a RCRA listing for paint wastes. It has been determined that the underground storage tank held a mixture containing listed waste F001 (spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, etc.). In the past, these wastes were disposed in the solvent pit at the registered base disposal site, Site No. 26. Clean-up of this site is underway.

6.3.12.5 Aircraft Finish Shop (93116)

The function of this shop is painting airframes before assembly of components. The operation generates approximately three 55 gallon drums of paint shops and solvent wastes per week. Currently, these wastes are disposed of through contract No. N62467-82-B-2460. Until 1978, Plant Maintenance practice was to dispose the wastes in the solvent pit at the registered base disposal site, Site No. 26. This site is currently undergoing clean-up.

6.3.12.6 Plating Shop (96225)

The plating shop, which has been in operation since 1962, performs metal plating with nickel, copper, silver, chromium, tin, and lead. Table 6.3-5 summarizes the major hazardous materials discharged in rinse waters to the industrial waste water treatment plant, according to a NARF report. In addition, spent sodium hydroxide (100 gal/ year) and sulfuric acid and other acids (150 gal/year) are collected in drums for treatment at the industrial wastewater treatment plant. Prior to construction of the central industrial waste treatment facility, a small plating waste treatment facility (for cyanide reduction and chromium reduction) adjacent to the shop, was used. Tricholoroethylene waste (ten 55 gallon drums per year) is currently being disposed of off-site by a contractor. In the past, it was disposed of in the solvent pit at the registered base disposal site, Site No. 26. This site is currently undergoing clean-up.

6.3.12.7 Cleaning Shop (96223)

The cleaning shop cleans engines and engine parts. Chemicals and materials used by the shop include: silicate stripper, sodium hydroxide, chromic acid, potassium permanaganate, sodium chromate, sodium dichromate, 1,1,1-trichloroethane, dichloromethane, phosphoric acid, corrosion remover, steam cleaning compound, cold carbon remover, and alodine. It is estimated that 92 oz. of sodium dichromate and 62 oz. of chromic acid per week are discharged to the industrial wastewater treatment plant. Approximately 220 gallons of trichloroethane per week from this operation is disposed of off-site by contract.

TABLE 6.3-5

Hazardous Materials Routinely Discharged in Rinse Waters in Plating Shop (96225) Operations

Chemical	Events/Day	Amount/Event (Oz.)
Chromic acid	1-1/3	160
Nickel sulfamate	2	66
Cadmium oxide	2 days/wk, every 30 minutes	1.5
Silver cyanide	14	1.6
Potassium cyanide	14	0.2
Sodium cyanide (with copper or cadmium plating bath)	20	5.1
Copper cyanide	14	0.5
Nickel chloride/sulfate	4	2
Lead/tin fluoborate	14	6.3

Source: O'Brien, 1979

The cleaning shop used trichloroethylene until 1978, and generated approximately the same amount (approximately 220 gallons per week) of waste solvent. Prior to 1979 these solvent wastes were disposed in the solvent pit at the registered base disposal site, Site No. 26, by Plant Maintenance. Site 26 is currently undergoing clean-up.

6.3.12.8 <u>Paint Shop</u> (96226)

This shop is responsible for painting engine parts. The shop uses the following chemicals and materials: acetone, xylene, cellosove, methyl ethyl ketone, toluene, 1,1,1-trichloroethane, enamels, lacquers, zinc chromate primer, thinners, sermetal. Approximately two to three gallons of waste per day is generated from this shop's operation. This material is stored in waste cans for off-site disposal by contract. Until 1978 these wastes were disposed of in the solvent and paint waste pit at the registered base disposal site, Site No. 26, which is currently undergoing clean-up.

6.3.12.9 <u>Plant Services Division, Battery Shop</u> (65210)

This shop, repairs nickel/cadmium and lead acid batteries. The shop has been in Building 125 since approximately 1959. In 1973 H-2 and H-3 helicopters arrived on base necessitating the splitting of the shop into acid and alkaline areas. Currently, unusable nickel/cadmuim cells (approximately 120 cubic feet) are being stored in an outside area behind the shop (Building 125). Spent electrolyte (Nos. 1275 and 1250) from lead/acid batteries has been routinely disposed into a lead - lined sink which discharges to ground behind the building, Site No. 14.

6.3.12.10 <u>Avionics Division, Instrument Branch</u> (94100)

The shops in the instrument branch are responsible for maintenance and repair of aviation instruments. Operations in this branch which generate wastes include painting of instrument parts, photographic processes, and electroplating. Less than 5 gallons of paint and paint thinner waste are generated per week. These wastes are collected by Plant Maintenance and disposed off-site via contractors. For approximately 36 years these wastes were disposed in the solvent pit at the registered base disposal area, Site No. 26. Developer wastes are dumped down the sink into the industrial wastewater treatment system, as is the very small volume of electroplating wastes.

6.3.12.11 <u>Avionics Division, Calibration Laboratory Branch</u> (94400)

Employees interviewed in other NARF shops reported that waste mercury from broken manometers and other instruments was sent to Avionics for disposal. The Calibration Laboratory also had instruments containing mercury and as such was also a source of waste mercury. For approximately 36 years as much as two to three quarts per year of mercury was disposed.

6.3.13 <u>Water Treatment Plant</u>

The treatment plant consist of the raw water supply wells, aerators for hydrogen sulfide aeration, ground storage, service pumps and chlorination for disinfection. Chlorine is applied to disinfect the delivered water and to aid in chemical oxidation of hydrogen sulfide. The chlorine is stored inside the water plant structures in separate rooms. No significant problem has been reported with the storage method.

6.3.14 Naval Regional Medical Center

Medical and dental laboratories in the NRMC use small quantities of chemicals (e.g., mercury) which are routinely disposed of into the sanitary sewer system. The Nuclear Medicine Department keeps on hand various radiochemicals. The department has a licensed "hot sink" for disposal of low levels of radioactive wastes. Approximately 2 millicuries per month of ^{125}I (iodine-125) from radioimmunoassays and 3 picocuries of ^{57}Co (cobalt-57) per month are disposed to the sanitary sewer, in accordance with NRC (Nuclear Regulatory Commission) regulations.

The NRMC is conducting a drug screening program which results in the generation of water contaminated with radioactive isotopes (^{125}I). This material is currently being drummed and disposed of off-site.

6.4 RADIOLOGICAL OPERATIONS

6.4.1 General

A history of the uses and disposition of sources of low level ionizing radiation at NAS Jacksonville was obtained from available records and interviews with station personnel. Sources of low level ionizing radiation have been present at NAS Jacksonville, primarily in the from of luminoius instrument dials, since the origin of the station. Use of radioisotopes in other aircraft parts constitutes another source of low level ionizing radiation. Low level radioisotopes and ionizing radiation sources are also present at the Naval Regional Medical Center.

6.4.2 Aircraft Operations

With the development of aircraft came the need to produce gauge and dial faces that the pilot would be able to read during night-time operations. Luminous paints utilized in the watch and clock industry were ideal for this application and thus found direct and immediate application into the aircraft gauge and dial industry. Luminous paints consist of a compound capable of emitting light when energy is imparted to it (a phosphor) coupled with the required source of energy. This needed source of energy can be provided in a number of ways, however, one that was readily identified, was very effective and found widespread use was radioactive material, usually radium-226. The use of radium-226 by the luminous dial industries was uncontrolled and each gauge or dial contains a relatively small quantity of radioactive material. However, in aircraft maintenance operations where a large number of these gauges and dials are used, maintained, repaired, stored, and calibrated, the quantity of radioactive material can become significant, with any personnel involvement resulting in low-level radiation exposure. If as a result of these maintenance operations the radioactive material is disturbed or dislodged from the gauge or dial face, that work area can then become radioactively contaminated and this presents a personnel contamination hazard.

The Naval Air Rework Facility (NARF) at NAS Jacksonville overhauls and maintains naval aircraft. Several of the shops in NARF have handled aircraft instruments with radium dials. Aircraft instrument dial stripping operations took place during and after World War II. A review of records and interviews with station personnel indicated that these gauges and dials were used, maintained, repaired, stored, and calibrated in various shops in NARF. In the period during and after World War II paint wastes were disposed in several locations on the station, as described in Section 6.6. Instrument dials were also disposed on-site. In more recent years disposal was handled by the Naval Supply Systems Command in Norfolk. These materials were then packaged and shipped to a disposal site. Other sources of ionizing radiation from aircraft include vacuum tubes which are part of aircraft exciter systems, as well as uranium counterweight used in naval aircraft.

6.4.3 Naval Regional Medical Center NRMC

The Nuclear Medicine Department of the NRMC uses various radioisotopes and posseses equipment which are sources of ionizing radiation. These sources and disposal practices were described in Section 6.3.14.

6.5 HAZARDOUS MATERIALS STORAGE OPERATIONS

The NAS currently has never had a centralized hazardous materials storage area. Hazardous materials are stored in a number of areas on the station. Shops in NARF limit storage of all chemicals to several days supply. Drummed chemicals are stored outdoors in various locations on wooden pallets. These storage areas are fenced or cordoned off and labelled with hazard warning signs.

Drummed chemical wastes are also stored in outdoor storage areas. An area near the industrial pretreatment lift station is used for this purpose. Paint waste drums are located outside hangars and buildings where aircraft and aircraft parts are painted. The paint wastes are then collected for disposal off-site by a contractor.

Waste solvents generated by NARF are placed in a 27,200 gallon buried storage tank. A waste collection contractor, NY-TREX, Inc, collects approximately 50,000 gallons annually in 5,000 gallon increments. The waste solvent contains methylene chloride, methylethylketone, ethylacetate, trichloroethalene, methyl isobutyl ketone, n-butylacetate, and xylene.

6.6 WASTE DISPOSAL OPERATIONS

NAS JACKSONVILLE

The FCHA staff has identified 38 potential contamination sites during the investigation at the NAS Jacksonville during the week of 28 June 1982 (Figure 6.6-1 Table 6.6-1). Sites 26 and 27 were identified under Naval Facilities Engineering Command Contract No. N6246-78-C-0717, 1980. They have been identified for the purpose of avoiding duplication of effort. The NAS Jacksonville oil and solvent disposal areas in the registered base disposal area, Site No. 26, and the polychlorinated biphenyl (PCB) storage area (Site No. 27) were registered with the United States Environmental Protection Agency on 11 June 1980. Both of these sites are currently under-

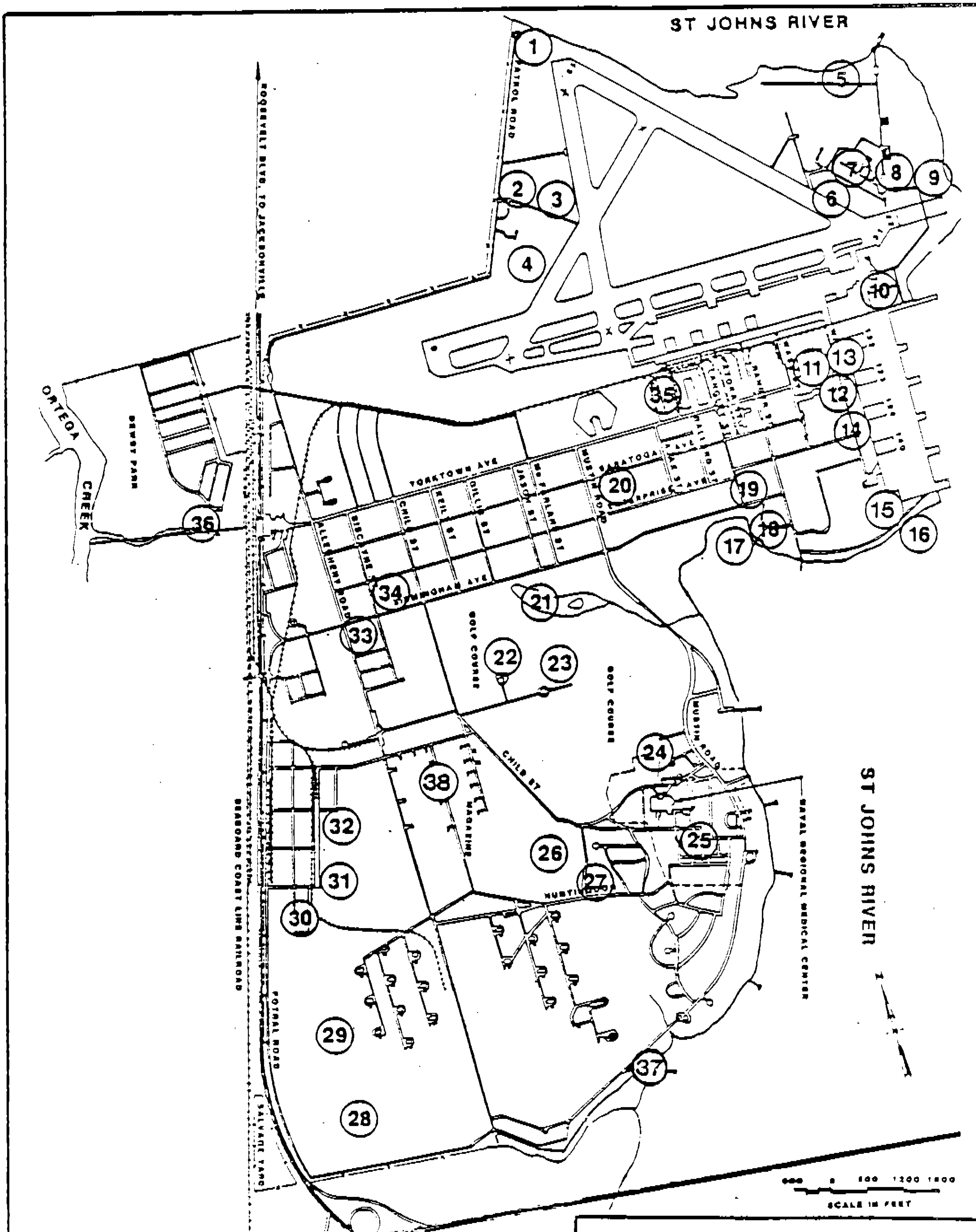

Figure 6.6-1 SPILL/DISPOSAL SITES IDENTIFIED BY IAS TEAM AT NAS JACKSONVILLE

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TABLE 6.6-1

Potential Contamination Sites at NAS Jacksonville

Site No	Discription
1	Patrol Road Turn-around Site
2	Present Firefighting Training Area
3	Sludge Disposal Area /Sewage Treatment Plant Area
4	Pine Tree Planting Area
5	Shoreline Fill West of Fuel Barge Dock Site
6	Fuel Farm
7	JP-4 Explosion and Roof Collapse, Fuel Farm Area, Underground Tanks
8	Vacant Lot, Fuels Farm Area
9	Old Disposal Area (East of Fuel Farm)
10	Building 119, A-T
11	Hangar Building 101
12	Old Test Cell Building
13	Radium Paint Waste Disposal Pit
14	Battery Shop
15	Solvent and Paint Sludge Disposal Area (NARF)
16	Storm Sewer Discharge - Black Point
17	Glass Bead Disposal Area
18	Radioactive Waste Fill Area
19	Old Gas Station
20	Solid Waste Incinerator
21	Golf Course
22	"Ft. Dix"

TABLE 6.6-1(Con't)

Potential Contamination Sites at NAS Jacksonville

Site No	Discription
23	Old Skeet Range
24	Scrap Metal Disposal Area
25	Building No. 2038
26	Old Main Registered Disposal Area
27	PCB Storage Area
28	Fire Pit
29	Organic Disposal Area
30	Old Drum Lot
31	Asphalt Mix Area
32	Base Landfill
33	Base Service Station
34	Old Transformer Storage Building
35	Temporary PCB Storage Area
36	Dewey Park
37	Power Barge
38	Torpedo Rework Facility

going clean-up. These sites were also reported to the State of Florida Department of Environmental Regulation and the City of Jacksonville Bio-Environmental Service Division on 10 June 1980.

The PCB, solvent and waste oil contaminents have been clearly defined and are located in the immediate area of the disposal and spill sites. The PCB spill site and the solvent waste oil disposal area are completely fenced and the gates are securely locked. There are adequate warning signs posted at the sites and children do not play at these sites. The contaminent constituents are not a threat to the Station's drinking water supply. The Geraghty-Miller site investigation report states that since the surficial aquifer is not utilized for drinking purposes, there is no health hazard associated with the presence of the contaminent constituents in the surficial aquifer. NAS Jacksonville's drinking water source is the Floridan Aquifer which is very deep and more than adequately protected from infiltration by three overlays and a constant positive upward gradient pressure. Test Well No. S-14 is one of several groundwater monitoring wells under surveillance at the disposal site. The drinking water supply is monitored and no PCBs or other adverse constituents have been found.

Jacksonville has officially notified all of the required public agencies and has protected the St. Johns River from contaminents. Special projects for pollution abatement and restoration of the disposal sites have been prepared and are currently under design. The corrective projects have been funded. These projects are being accomplished and the matter of NAS Jacksonville disposal sites closed.

6.6.1 Patrol Road Turn-Around Site No. 1

This site is located north of the patrol road turn-around along the shoreline of the St. Johns River, at grid coordinates A-11, B-11, and B-12. This area has been used periodically for the disposal of construction debris in order to reclaim land and provide shoreline protection. The site contains rubble, consisting mostly of concrete and asphalt (see Photograph 6.6-1). The site is approximately 50 feet wide by 300 feet long. The specific date(s) of disposal and quantities disposed were not available. The site is now covered with vegetation with no visible environmental impacts. Only inert materials, which pose no threat to the environment or human health, were identified at this site. Therefore, a Confirmation Study is not recommended.

6.6.2 Present Firefighting Training Area, Site No. 2

This site is located in the immediate vicinity north of the sewage treatment plant at grid coordinates D-10. The site occupies an area approximately 100 feet wide by 100 feet long and contains junk vehicles which are used for firefighting training. These vehicles are ignited using JP-5 or waste oil as fuel. This area has been used for training from 1966 to the present. It has been estimated that approximately 6,000 gallons of fuel have been burned at this site annually. The area immediately surrounding the junk vehicles shows visible evidence of fire damage. Although there is a potential for liquids discharged to the ground to migrate offsite, the quantities are small and the associated risk minimal. Therefore a Confirmation Study is not recommended.

Photo 6.6-1

Site 1 Patrol Road Turn-Around

6.6.3 Sludge Disposal Area/Sewage Treatment Plant Area, Site No. 3

This site is located just north of the sewage treatment plant at grid coordinates D-10 (Figure 6.6-2). The dimensions of the sludge dump area are approximately 15 acres. Approximately 20,000 tons of sewage sludge containing toxic metals were dumped here from 1962 to 1980. However, the sludge is not hazardous under RCRA regulations, (see EP toxicity test data Appendix C). This site does not pose a potential threat to human health and the environment and therefore is not recommended for a Confirmation Study.

6.6.4 Pine Tree Planting Area, Site No. 4

This site is located approximately 200 feet southeast of the sewage treatment plant chemistry laboratory, Building No. 261L at coordinates E-10 (see detailed Figure 6.6-2). Until 1975 this area was reportedly used for the disposal of paint shavings, sewage sludge, asbestos, oil and other petroleum products. Inspection of the area yielded visual confirmation of paint shavings. Paint shavings were identified throughout the area, approximately 1 acre. Sewage sludge was identified in an area approximately 100 feet long by 100 feet wide. Heavy metals from this site may possibly migrate into the potable water supply. Therefore, this site is recommended for a Confirmation Study.

6.6.5 Shoreline Fill, West of Fuel Barge Dock Site No. 5

This area, used in the 1940s, is approximately 200 feet wide by 600 feet long and is located at grid coordinates C15 and 16. Visual inspection revealed that the materials disposed in this area were largely concrete runway debris. Because there is no evidence that the hazardous materials were disposed of at this site a Confirmation Study is not recommended.

6.6.6 Fuel Farm, Site No. 6

A fuel leak (No. 6 fuel oil) occurred in a pipeline at a connection to a buried tank. An unknown quantity of fuel leaked into the underground concrete lined "steampit" which is located at the watertable. Therefore the pit contains a quantity of water at the invert level for its entire length. The oil was reported to have floated on the surface of the water in the pit, and to have been contained within the concrete pit. After this was discovered, all the oil was pumped out. Because the oil was contained in the "steampit" and subsequently removed, a Confirmation Study is not recommended.

6.6.7 JP-4 Explosion and Roof Collapse, Fuel Farm Area, Underground Tanks, Site No. 7

This area is located west of Catapult Road at coordinates E-15. Reportedly explosions involving underground tanks occured in this area in 1978 and 1979. The explosion and fire in an underground tank in 1978 resulted in pumping of the residual fuel, not consumed by fire, into tank trucks and hauling it off-site for disposal as waste oil. Because the fuel was contained in the tank and subsequently removed, a Confirmation Study is not recommended.

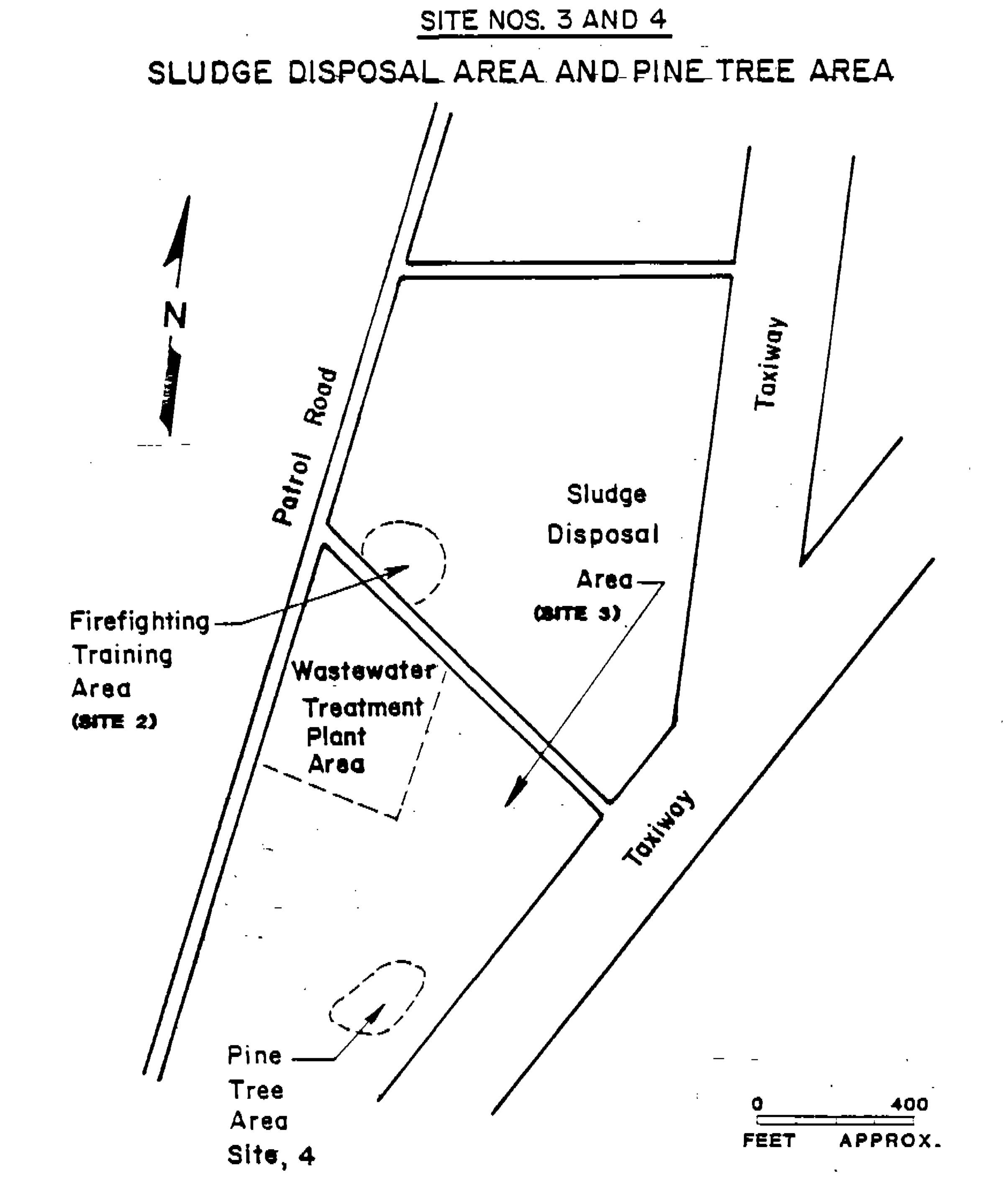

Figure 6.6-2 SITES 3 AND 4 - SLUDGE DISPOSAL AND PINE TREE AREAS

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6.6.8 Vacant Lot, Fuels Farm Area, Site No. 8

This area (200 feet X 100 feet) is located adjacent to the east side of Catapult Road at coordinates E-16 (see detailed Figure 6.6-3). As indicated by an aerial photo dated September 1976, the area was used for parking aircraft (approximately 5 fighter planes). Inspection of the site revealed four piles (possibly abrasive blast grit) and two disintegrated plastic bags of fine granular materials. Due to the minimal quantites at this site, this site has not been recommended for a Confirmation Study.

6.6.9 Old Disposal Area (East of Fuel Farm), Site No. 9

This site is approximately 200 feet wide by 400 feet long and located east of Catapult Road along the shoreline of the St. John's River at grid coordinates E-16 (See Photograph 6.6-2 and detailed Figure 6.6-3). This site contains garbage, construction debris, and a few 55-gallon drums. This material was disposed for approximately one year during the years 1977-1978. Soil tests conducted in this area have shown high chromium levels, indicating that industrial wastes (i.e., chromium sludge) may have been disposed in this area. Due to the level of toxic chromium and hydrological conditions conducive to migration, this site is recommended for a Confirmation Study.

6.6.10 Building 119 (A-T), Site No. 10

Approximately 600 gallons of hot stripper, MIL-R-81835 or Turco 3823 are currently stored in an underground steel tank (capacity 25,000 gal.) in the vicinity of Building 119, at coordinates G-15. The contents of the tank are intended to be disposed of offsite by contract. This tank is used for the temporary storage of hazardous waste and while there is a potential for leakage there is no evidence to support that this has occured. As such, the tank does not currently classify as a disposal site, consequently a Confirmation Study is not recommended.

6.6.11 Hangar Building 101, Site No. 11

The floor of the main hanger section of Building 101, coordinates H-13,14, is constructed of steel plates over steel beams (Figure 6.6-4). Reportedly unauthorized disposal of waste solvents and other materials below the old floor boards occurred for many years. Approximately 2,000 gal. of solvents may have been disposed, (assume 1 gal per wk over 40 yr. period). In 1975 a fire broke out below the steel plates (Figure 6.6-5). Infiltration of waste solvents and other flammable liquids from deteriorated industrial sewer lines or disposal may also be responsible for the presence of flammable materials under the hanger floor. Information about specific waste materials was not available. However, any chemical used in Building 101, such as TCE and oils, might potentially reach this area. The quantity of materials spilled may be significant and therefore, this site is recommended for a Confirmation Study.

In addition, a spill of more than 150 lb of mercury also occurred in the "old pump shop" in Building 101 (coordinates H-14). Although most of the spilled mercury was removed and sent for reclaiming, reportedly some was not removed and remained at the site.

SITE NOS. 8 AND 9

VACANT LOT – FUEL FARM AREA
OLD DISPOSAL AREA EAST OF FUEL FARM

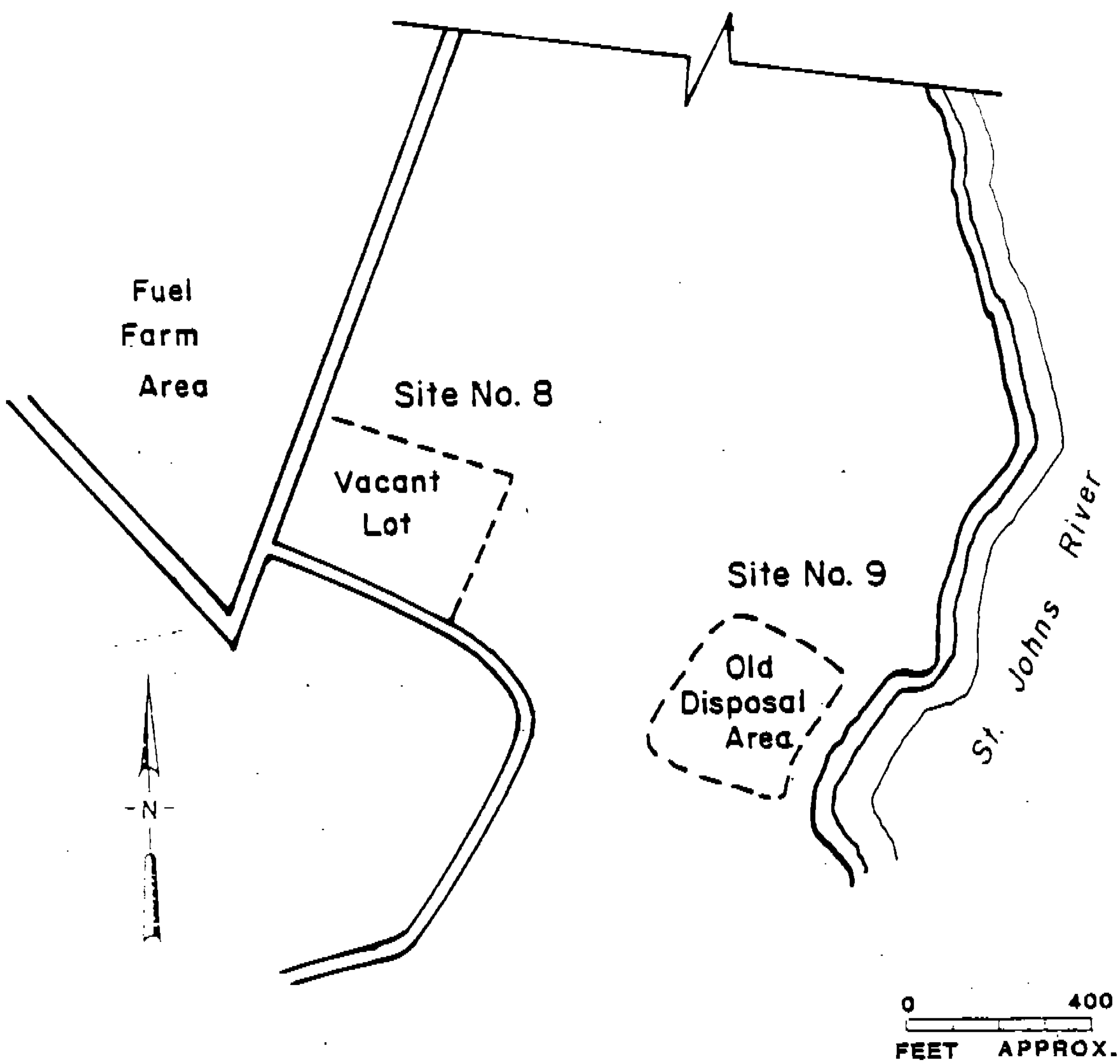

Figure 6.6-3 SITES 8 & 9 VACANT LOT, AND OLD DISPOSAL AREA

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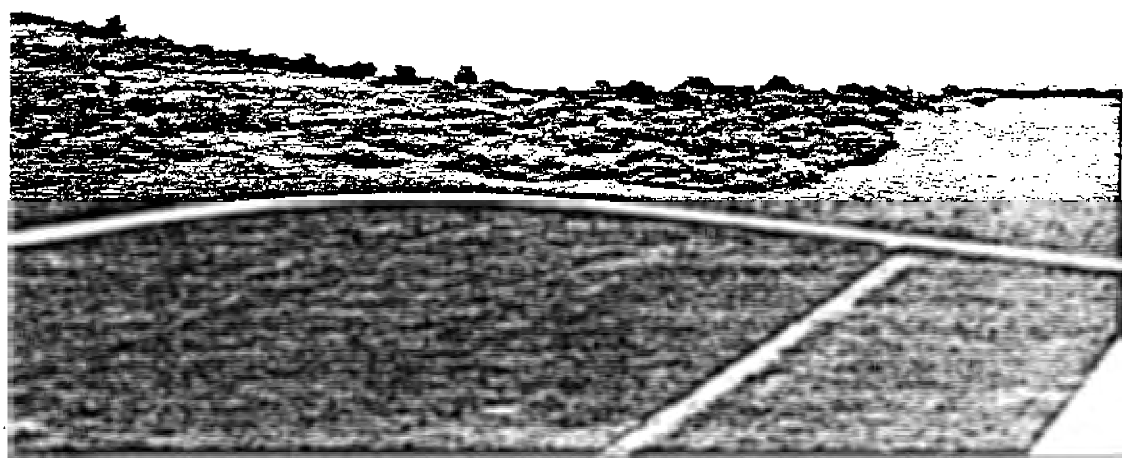
Photo 6.6-2

Site 9 - Old Disposal (East Fuel Farm) Area



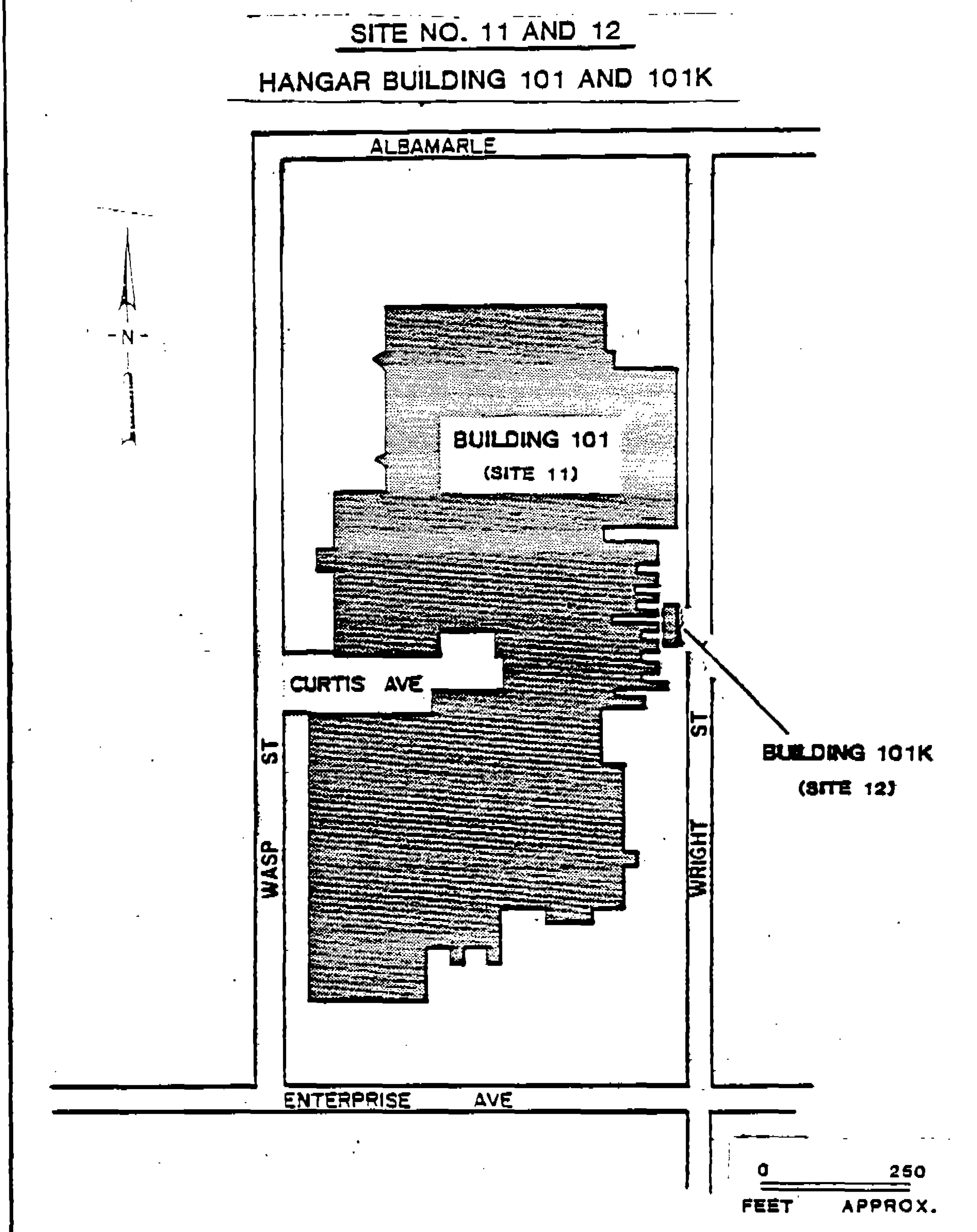


Figure 6.6-4 SITES 11 and 12 - HANGAR BUILDING 101 AND BUILDING 101K

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Figure 6.6- 5 Fire Caused by Flammable Wastes Under Hangar 101 floor

6.6.12 Old Test Cell Building, Site No. 12

Reportedly there are interconnections of the storm and sanitary sewers with the building roof drains and the industrial sewer system in the old test cell area, Building 101 k (coordinates H-14) (see detailed Figure 6.6-4). In addition, it was reported that numerous spills of chemicals from ruptured or rusted drums occurred at this site. Due to the quantity and toxic and reactive nature of the materials used at the site, this site is recommended for a Confirmation Study.

6.6.13 Radium Paint Waste Disposal Pit, Site No. 13

The area north of Building 167 coordinates H-14 was used for the disposal of radioactive radium paint waste from aircraft instrument dial painting operations which took place at NARF during World War II and continued until the late 1950's. These wastes were disposed into a burial pit approximately 40 ft by 50 ft by 0.75 ft deep and contained the paint wastes mixed with soil. This site was excavated in the late 50's. At the time of excavation, radioactivity readings at the surface taken with a radiation survey meter were in the range of 3 to 5 mR/hr above background. The contaminated soil was moved to another site (see Radioactive Waste Fill Area, Site No. 18) described later in this section.

It is unlikely that this site was used for disposal of other radioactive wastes. At the time this site was used, the only other radioactive materials which were disposed of at NARF were electron tubes from aircraft exciter systems and drogue lights, used for night-time aircraft refueling. It was common practice to pack these items in 5 gallon cans, fill the cans with cement, and dispose them at sea from aircraft. Because the hazardous materials were removed and no residual contamination has been detected, this site is not recommended for a Confirmation Study.

6.6.14 Battery Shop, Site No. 14

The battery shop is located in Building 125 at coordinates I-14 (see detailed Figure 6.6-6). The shop contains a seepage pit where waste acids from lead-acid batteries were disposed. Approximately 100 gallons of waste were dumped annually from 1959 to 1982. Due to the quantity of wastes disposed, disposal method, and hydrogeological conditions in the area this site is recommended for a Confirmation Study.

6.6.15 Solvent and Paint Sludge Disposal Area (NARF), Site No. 15

This area approximately 100 feet by 100 feet is located along the eastern side of Building 970 (see detailed Figure 6.6-7). The area was used for disposal of solvents and paint sludges as recently as 1978. A 1978 photograph (Figure 6.6-8) shows the lack of vegetation in large patches where the soil is caked and cracked. Another photograph showed a white residue on the soil. The soil was tested by the Materials Engineering Laboratory and reportedly showed presence of "solvents of all types".

This area was used for the disposal of waste solvents and paints. Based on current operations, it is estimated that up to 2,000 gallons of these wastes were disposed of at this site annually for approximately 36

SITE NO. 14

BATTERY SHOP

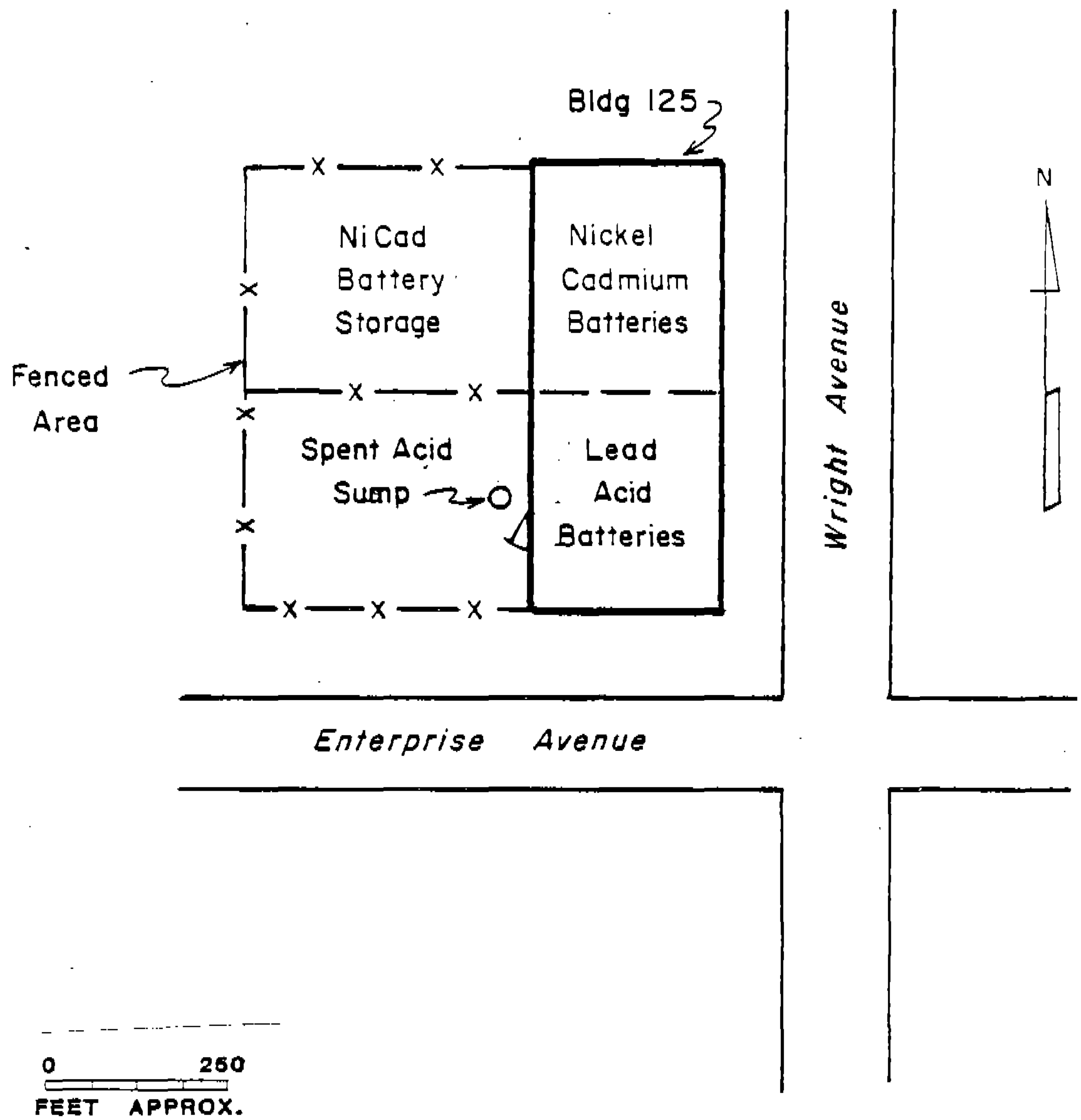

Figure 6.6-6 SITE 14 BATTERY SHOP.

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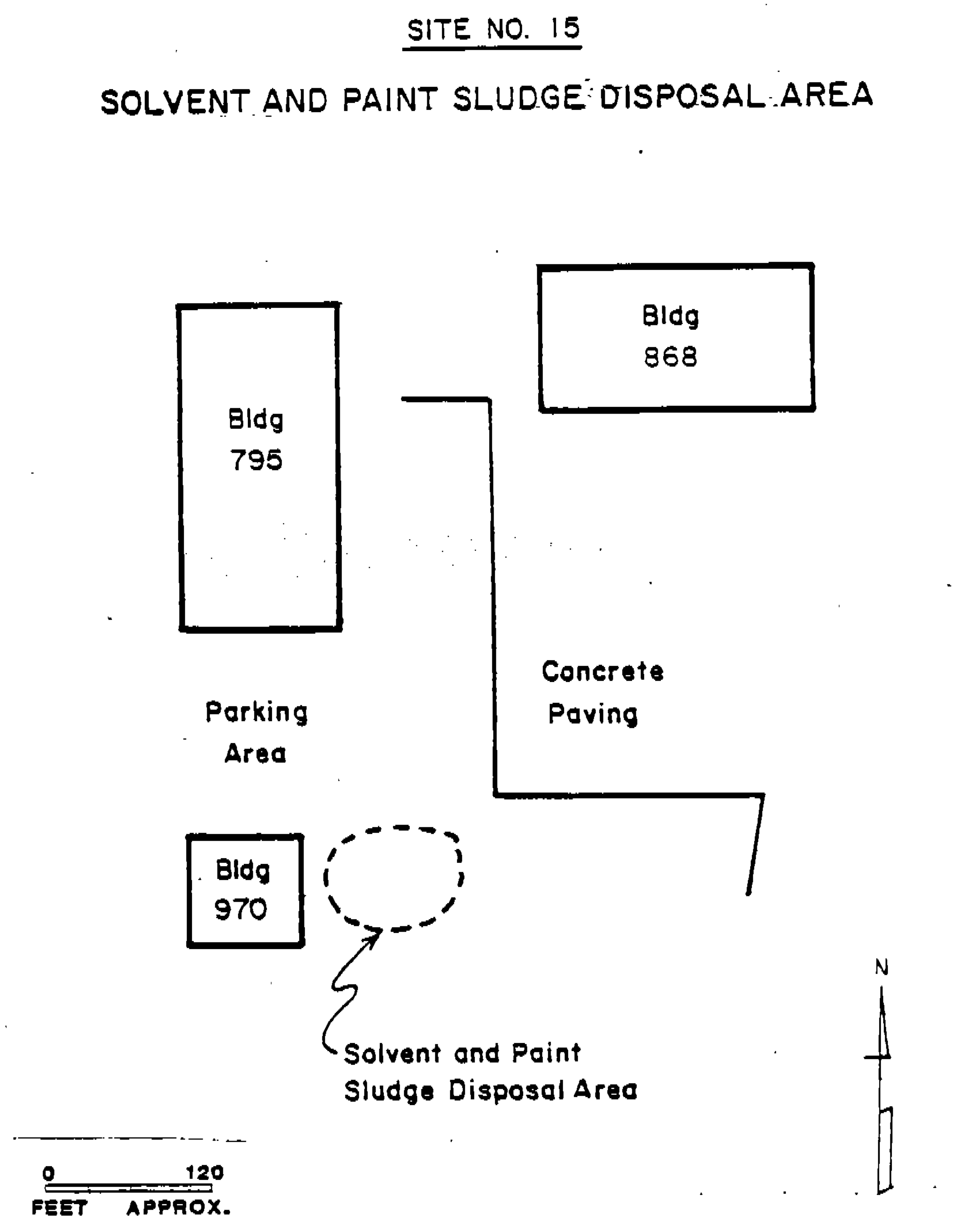

Figure 6.6-7 SITE 15 SOLVENT AND PAINT SLUDGE DISPOSAL AREA (NARF)

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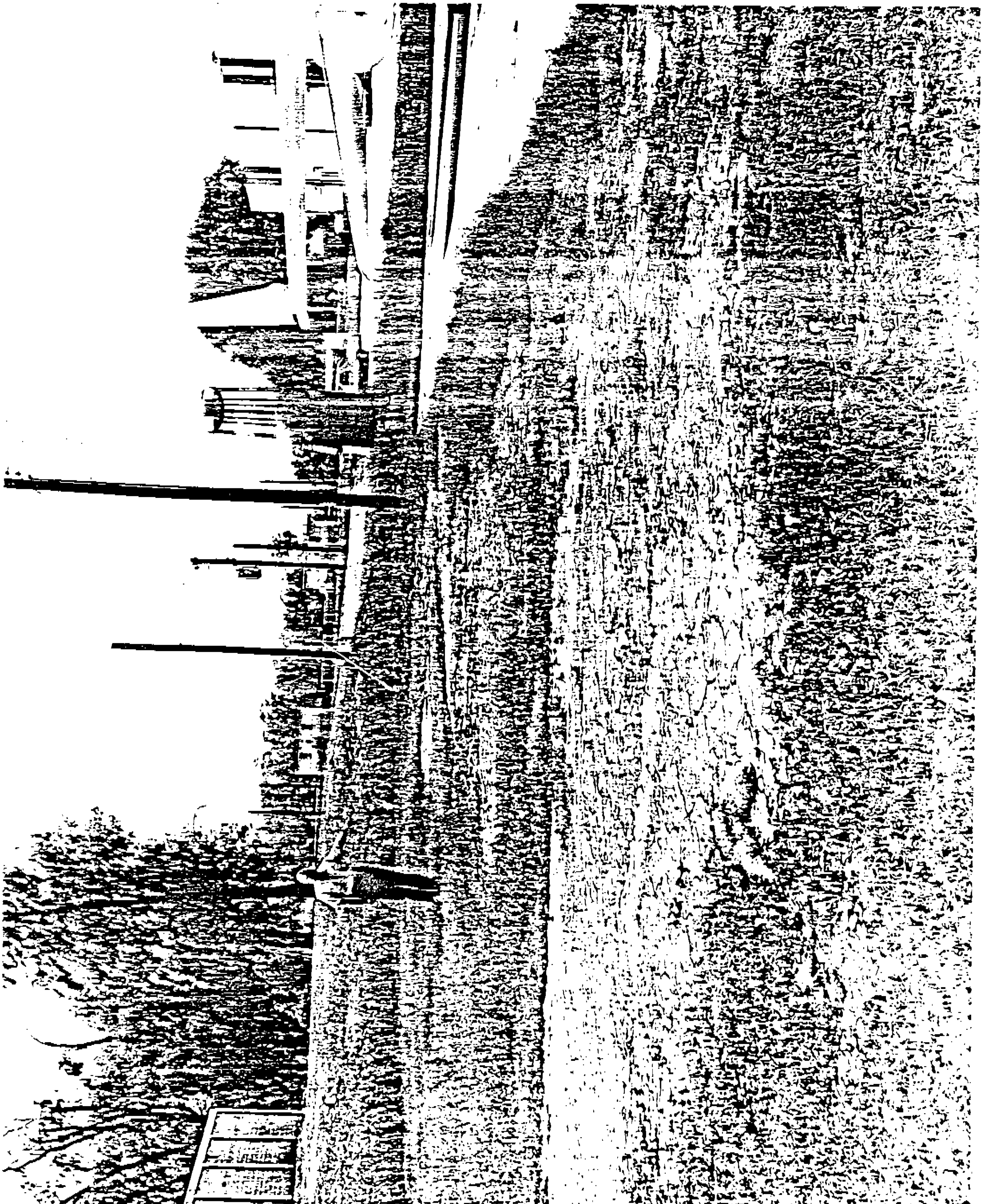
Figure 6.6-8 Area near Building 970 where solvents and paint sludge were dispos



years. This site is characterized by large quantities of hazardous materials and hydrogeologic conditions conducive to migration off-site. Therefore, this site is recommended for a Confirmation Study.

6.6.16 Storm Sewer Discharge - Black Point, Site No. 16

The storm sewer runs along buildings 101, 50, 795, coordinates J, K-15 and discharges at Black Point (see detailed Figure 6.6-9). There has been a re-occurring discharge of JP-5 fuel and oil which are believed to come from a fuel tank overflow in the vicinity of test cell 12, and possibly a variety of other sources in the NARF area. An oil boom was installed at the outfall to contain the oil (see Photograph 6.6-3). Over the years various chemical wastes from NARF were reportedly disposed of by discharge into the storm sewer system, eroded the sewer and leached into the ground. It is difficult to estimate the volume of material disposed of in this way, but it is likely that a variety of chemical wastes may have been disposed/spilled on the ground and since have migrated back into the storm sewer. The storm sewer acts as a conduit to the St. Johns River. The possible discharge of toxic materials through the storm sewer to the St. Johns River poses a potential threat to human health and aquatic life in the river. Therefore, this site is recommended for a Confirmation Study.

6.6.17 Glass Bead Disposal Area, Site No. 17

This area is located approximately 10-15 feet from the shoreline at grid coordinates J-12 (see detailed Figure 6.6-10). The area was used for the disposal of spent glass beads used in the abrasive blasting operations conducted at NARF (Code 93112). Disposal of the spent glass beads in this off-shore area was started 1965 stopped in January, 1981. There is visible evidence of a "glass bead bar" that has been created as a result of off-shore dumping, (see Photograph 6.6-4).

NARF personnel report that approximately 400,000 lb. of the glass beads is used per year, and it can be expected that 80% (approx 300,000 lb.) per year may have been disposed at this site. The glass beads contain cadmium, chromium, nickel and lead. Table 6.6-2 presents the metal analysis of a sample of "wet process" bead blasting material. The blasting beads are considered a hazardous waste according to RCRA regulations, by virtue of the EP Toxicity test results (Table 6.6-3). Because of these results and because a large quantity was disposed of here a Confirmation Study is recommended.

Currently the glass beads used for blasting are stored in bags inside an aircraft maintenance building. The spent beads that are contaminated with cadmium are stored in drums and removed by a private contractor for disposal off-site.

6.6.18 Radioactive Waste Fill Area, Site No. 18

Radioactive radium paint wastes from aircraft instrument dial stripping operations at NARF during and after World War II were placed in a burial site (Site No. 21) in the NARF until the late 50's. When this operation ceased, the site was excavated, as described in Section 6.6.17. The contaminated soil, approximately 1500 cubic feet, was disposed of at a site

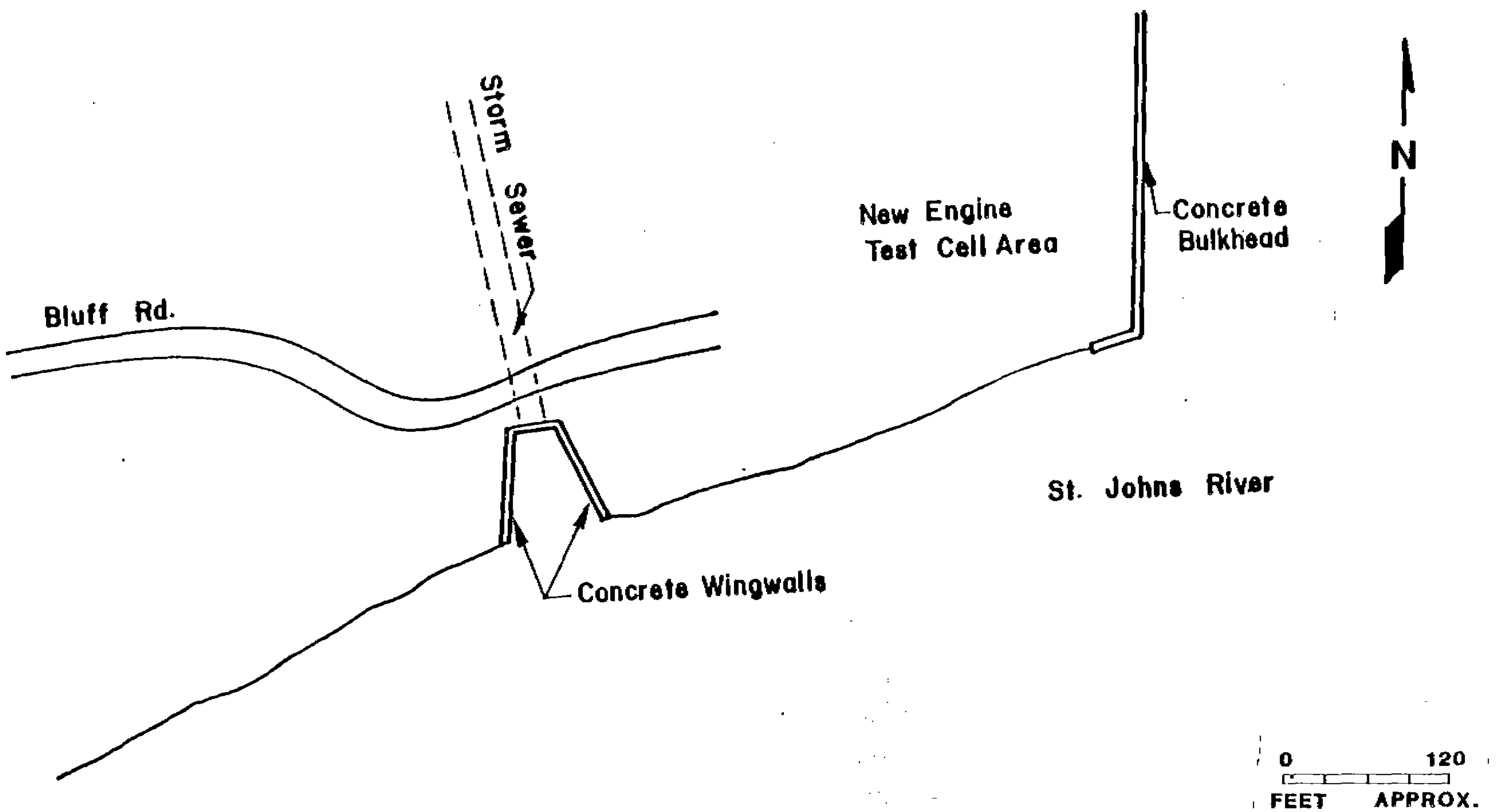


Figure 6.6-9 SITE 16 STORM SEWER DISCHARGE (BLACK POINT)

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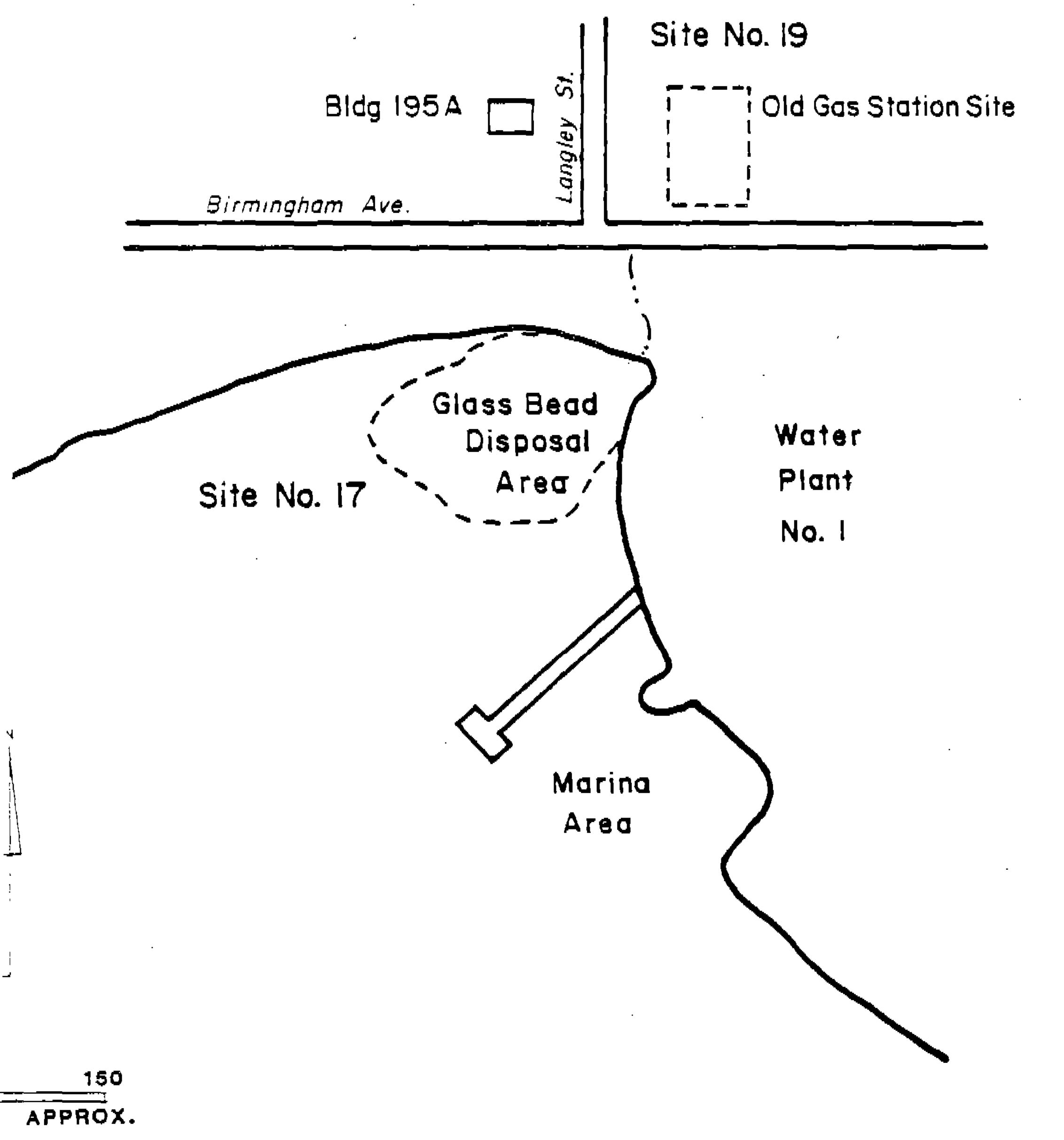
JACKSONVILLE, FLORIDA

Photo 6.6-3

Site 16 - Storm Sewer Discharge Black Point

SITE NOS. 17 AND 19

GLASS BEAD DISPOSAL AREA
AND OLD GAS STATION SITE



SITE 17 GLASS BEAD DISPOSAL AREA

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JACKSONVILLE, FLORIDA

Photo 6.6-4

Site 17 - Glass Bead Disposal Area

TABLE 6.6-2

Chemical Analysis* of NARF Glass Bead
Blasting Material (Wet Process Waste)

Parameter	Dried Solid Phase (mg/g)	Liquid Phase Only (mg/l)
Cadmium	120	0.61
Chromium	220	0.01
Copper	10	0.01
Nickel	670	0.55
Lead	460	0.05

*Analysis performed by Materials Engineering Division Laboratory, NARF, March 25, 1981.

TABLE 6.6-3

EP Toxicity Test Results* For Glass Bead Blasting Material

Parameter	EP Extract Concentration (mg/g)	Maximum Concentration*
Chromium	0	5.0
Cadmium	11	1.0
Nickel	2.4	--

*Source: Federal Register 45, No. 98 May 19, 1981, pp. 33122 - 33133.

*Analysis performed by Materials Engineering Division Laboratory, NARF, May 15, 1981.

near the shoreline in the vicinity of the present Marina No. 1 (coordinates J-12), This area was originally at water level, but was built up 3 to 5 ft. by the fill material. When excavated, radiation measurements of the soil (using a radiation survey meter) were reportedly 3 to 5 mR/hr. At the time of the site visit, surface measurements of radiation using a survey meter (NUCOR CRM 595 with CP 595 probe) were not significantly above background readings (0.15 mR/hr). The site has already been cleaned up and so poses no threat to human health or the environment, and therefore a Confirmation Study is not recommended.

6.6.19 Old Gas Station, Site No. 19

The old gas station Building 48 located at coordinates J-12 is currently the base garden center (see detailed Figure 6.6-10). The site contains two abandoned buried gasoline storage tanks and is in close proximity to the potable water well which was abandoned. There is a possibility that the abandoned gasoline tanks may be leaking gasoline into the ground where conditions are conducive to migration. Therefore, a Confirmation Study is recommended.

6.6.20 Solid Waste Incinerator, Site No. 20

The solid waste incinerator, Building 952, is located at coordinates I-10. The ash and solids are taken to the Clay County Landfill. There is no evidence of hazardous wastes either spilled or disposed of at this site. Therefore, a Confirmation Study is not recommended.

6.6.21 Golf Course, Site No. 21

The pesticides Dazonon and "Roundup" are occasionally applied to the golf course greens to control moles and crickets. On 30 April 1979 these pesticides were applied to the greens. On 6 May 1979 a fish kill resulted following several days of rain. The fish kill in Casa Linda Lake later was attributed to runoff of pesticides, specifically Dazonon, into the lake. This was an isolated incident. No further environmental damage was detected, therefore a Confirmation Study is not recommended.

6.6.22 "Ft. Dix", Site No. 22

The area known as Ft. Dix was reported to be used as a small arms ammo disposal area for target or skeet range. This area's dimensions are approximately 100 feet by 100 feet, and is located at grid coordinates K-7. There was no visible evidence of disposal during the site inspection. Because there is no substantiated evidence of disposal of hazardous materials, a Confirmation Study is not recommended.

6.6.23 Old Skeet Range, Site No. 23

In an area adjacent to the golf course, coordinates L-8, cinder piles and disturbed ground (indicating a possible disposal area) were identified. This area, which appeared to be an old sand pit, is approximately 500 feet long by 100 feet wide. Also observed were a few empty drums and engine containers that were pushed over an embankment and two (2) 2-inch white PVC standpipes. This site has not been recommended for a Confirmation

Study because only inert wastes were identified, and there is no evidence of hazardous materials disposal.

6.6.24 Scrap Metal Disposal Area, Site No. 24

The scrap metal disposal area is located adjacent to Building No. 497 at coordinates M-10. A new training center for housing management is being constructed at this site. There is scrap metal piled in the area along with assorted junk truck parts and empty drums, (see Photograph 6.6-5). There is no evidence of waste burial at the site, and excavation of soils for foundations yielded no evidence of contamination. Due to the types of materials disposed at this site and lack of evidence of soil contamination, a Confirmation Study is not required at this site.

6.6.25 Building No. 2038, Site No. 25

This area, adjacent to Building 2038 located at coordinates 0-10 was used for the storage of hospital wastes containing radioactive iodine (^{125}I) and other radioisotopes. The site was cleaned up by a contractor, surveyed, and determined to be free of radiation.

Since 1979, as many as 25 barrels per month of these wastes, each containing approximately 500 to 700 microcuries of ^{125}I when fresh, were being generated. A total of approximately 300 barrels required offsite disposal. This disposal took place in June 1982, under the direction of Radiological Affairs Support Office (RASO). The empty barrels were left at the site. A Confirmation Study is not recommended for this site.

6.6.26 Old Main Registered Disposal Area Site No. 26

This area, located at coordinates N&J-8 and 0-7&8 was used for the disposal of a variety of wastes including waste solvents and waste oils. Before 1940, the site was a vehicle graveyard. From 1940 to 1968, the site was operated as the NAS disposal area for trash, garbage, demolition and construction debris and waste oil. These wastes were burned at the edge of trenches and pits with the remains bulldozed into the trench and pits and covered. Air pollution control requirements halted burning and the wastes were then hauled off-site by contract. However, waste oil continued to be dumped in pits, and the NARF disposed of paint waste and solvents in a adjacent slurry pit. The site was officially closed January 15, 1979.

A portion of the disposal area was also used for the disposal of low level radioactive wastes during World War II and until approximately 1955. A report from the Commanding Officer of the Naval Civil Engineering Laboratory (Port Huememe, CA) dated February 1, 1973, described the radioactive waste as "radium-contaminated paint stripper, in vials." Instruments with radium dials and other low-level radioactive wastes were probably disposed there, according to other reports. Although the radiation levels measured at the time were not considered "high enough to cause ambient problems" (see report), there was concern that "if one of the vials should be picked up and carried, or if some of the contents of the vials should be accidently (sic) ingested, an unfortunate incident could occur." Therefore it was decided to decontaminate the area. The following description taken from a memo from the station safety manager to the commanding officer dated 31, July, 1973, provides an account of the cleanup.

Photo 6.6-5

Site 24 - Scrap Metal Disposal Area

Radioactive radium paint waste accumulated from aircraft instrument dial stripping operations in the Overhaul and Repair Department (now NARF) during and after World War II. The waste was bured in a remote area of the station dump (until approximately 1955) and the burial site was enclosed with a fence and posted with "Radioactive Materials" warning signs. After 1955, radioactive waste disposal was accomplished in accordance with Atomic Energy Commission Regulations under the technical direction of Mr. R. E. Byrd, Industrial Hygienist.

Plans for an enlisted personnel housing development, to be located hear the station dump, were completed in FY73; consequently, a decision was made to excavate and dispose of the accumulation of buried radioactive waste. A request for funds to implement the disposal project was submitted to the Pollution Abatement Control Agency and $30,000 was allocated for this purpose. A request was then submitted to the Radiological Affairs Support Office (RASO), Ft. Balvoir, Virginia, for assistance in the waste disposal project. Mr. Gene Hendrix, SW2 R. H. Quest and HM1 G. M. Jones were assigned to supervise excavation and packaging the waste. Also assigned to work in the project were the following NAS JAX Public Works employees: Mr. R. J. Wilson, Supervisor, Mr. J. J. Arnold, Heavy Equipment Operator and Mr. H. H. Cohens, Mr. S. Canady, Mr. D. M. McNair and Mr. N. Moxon, all Laborers.

The RASO Team arrived at NAS JAX on 11 May 1974 and the project was begun. The station furnished coveralls, rubber boots/gloves and dust respirators for the workforce; however, the dump area was very wet and RASO technicians did not require the use of respirators. Mr. Byrd obtained air flasks and collected breath samples of RASO personnel, six Public Works employees and himself, prior to excavation of the waste. Dirt within the burial site was excavated to the depth required to remove the radioactive contamination and the waste was packaged in 55 gallon steel drums. The drums were sealed with lids secured with bolted lock rings. Five hundred and one drums were filled, sealed and loaded on wood pallets, labeled with "Radioactive Materials, Low, Specific Activity: decals required by the Interstate Commerce Commission, and left inside the fenced dump area to await award of the disposal contract. Several drums were weighed and the total weight of 501 drums was estimated at 353,205 pounds.

A contract to dispose of the waste/dirt at Barnwell, South Caroline was awarded. The first load of waste was shipped on 8 July 1974 and the last load left the station on 22 July 1974. Total cost of the contract was $15,400., according to P. W. Maintenance Control Director.

Mr. Oakley called the Safety Manager on 23 July 1974 to inquire about contents of the drums in that water spilled out when the drums were removed from the R.R. cars. Mr. Hendrix return call on 24 July 1974 indicated that water which spilled out the drums contained radioactive particles, which according to radiac instrument reading taken by Mr. Oakley, were insignificant for harmful radioactive exposure.

The Safety Manager and N.R.M.C. Industrial Hygienist jointly monitored the disposal project to insure incorporation of safety practices and expeditions removal of the waste from this activity. In essence, a confirmation study has already been completed for this site.

6.6.27 PCB Storage Area, Site No. 27

This area, approximately 100 feet by 100 feet is located at coordinates 0-7&8, and was used for the outdoor storage of transformers containing PCB's. The transformers were vandalized in 1978 resulting in the spillage of transformer fluids on the ground. The transformers were removed and the PCB contaminated soil removed and disposed. The site was secured by an 8 foot chain link fence which has subsequently been taken down. A Confirmation Study has already been completed for this site.

6.6.28 Fire Pit, Site No. 28

This site was a former firefighting training area. The fire pit is located in the vicinity of Building 842 at coordinates R-3. Approximately 5-10 gallons/day of waste oil was placed in the pit and burned from 1946 to 1952. There was no visible evidence of the pit during the site survey and no conclusive evidence of disposal without burning. Therefore, a Confirmation Study is not recommended for this site.

6.6.29 Organic Disposal Area Site No. 29

The organic disposal area located at coordinates O&P-3 has been used for the disposal of organic debris (wood, grass clippings, etc.) However, inspection of the site yielded evidence of crushed drums (approximately 1 dozen), construction debris, discolored soil piles, scrap metals, and PVC cases. Reportedly materials other than organic debris have been disposed in this area in the past. However, quantities, types of wastes and dates were not obtainable (see Photograph 6.6-6. There is also an area approximately 50 feet wide and 5 feet high containing creosoted wood blocks.

In addition, the disposal area may have previously been used as a borrow pit. The disposal area is approximately 200 feet wide by 1,000 feet long. This side does not pose a threat to human health and the environment. As a consequence, a Confirmation Study is not recommended.

6.6.30 Old Drum Lot, Site No. 30

This site, located at coordinates 0-3, was used for the outdoor, unprotected storage of drums containing raw products (see detailed Figure 6.6-11). The drums were stored on Marsden Matting. Approximately 10,000 drums were stored at this site from 1955 to 1967. Although there is no visible evidence of environmental impairment at this site, it was reported that from time to time drums containing hazardous materials corroded and leaked their contents onto the ground. Surface soils in the area were re-

Photo 6.6-6

Site 29 - Organic Disposal Area

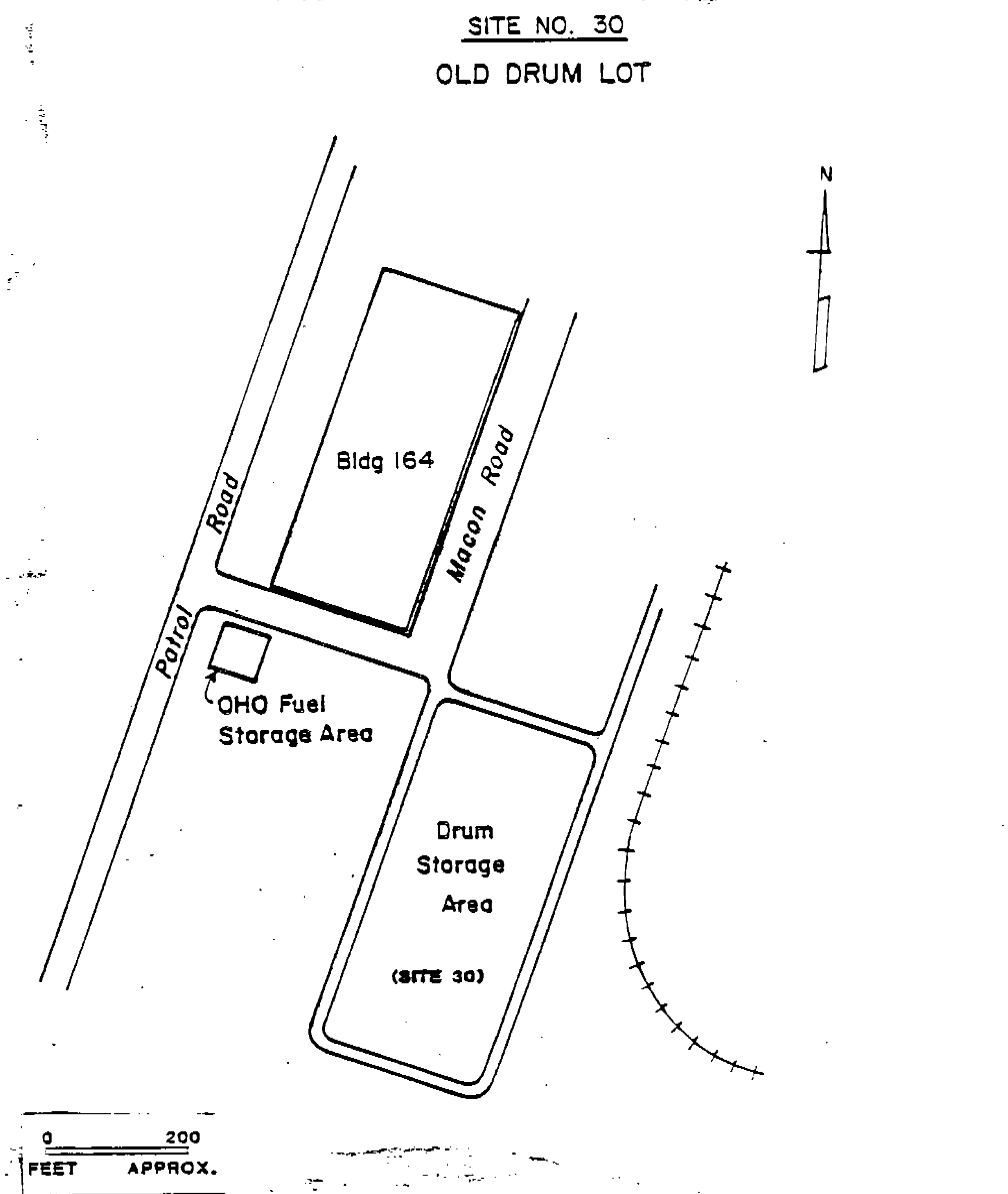

Figure 6.6-11 SITE 30 OLD DRUM LOT

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cently tested for PCB contamination. Test results were negative. This site is characterized by hydrogeological conditions conducive to migration, a residential area with water supply wells within 1/2 mile, and the possibility that drums containing hazardous materials leaked their contents onto the ground (approximately 10 drums per year for 12 years). Therefore, this site is recommended for a Confirmation Study.

6.6.31 Asphalt Mix Area, Site No. 31

This site is located at coordinates N-4 adjacent to the contract garbage hauler truck maintenance area. The area is presently used by the public works department for storage of equipment, materials, and junk vehicles. Leaking drums containing asphalt mix materials were reported to have been stored in this area. There is no visible evidence of contamination. Because of the small quantities and characteristics of asphalt mix materials stored here, this site is not recommended for a Confirmation Study.

6.6.32 Base Landfill Site No. 32

The old base landfill is located at coordinates M-4. This area was used during the 1960's for disposing of soil, refuse and construction debris and junk vehicles. This site covers approximately 2 acres. A portion of this area is presently used for the collection (in dumpsters) of large household refuse (i.e., appliances). This site has not been recommended for a Confirmation Study. The wastes identified are not hazardous and pose no significant impact to human health or the environment.

6.6.33 Base Service Station, Site No. 33

The base service station, Building 429, is located at coordinates J-5. There has been a problem with gasoline leakage from this station as recently as June, 1982. Gasoline vapors were detected in sewer lines within a 9 block area of the station at an explosion index of 100%. The total loss of fuel was approximately 2,000 gallons. The problem was greater at this area because this area is at the end of a small sewer line. Therefore, low wastewater depths in the line permitted increased movement of fuel into the line. A nearby groundwater monitoring well 27 ft deep yielded no odors upon inspection, (see Photograph 6.6-7). The source of the problem has been identified and work was underway to correct this problem at the time of the site visit, therefore, a Confirmation Study is not recommended.

6.6.34 Old Transformer Storage Building, Site No. 34

Building 525 (coordinates J-6) was formerly used to store transformers. This building and the adjacent building (No. 951) today serve as the base commissary. Building 525 was originally a warehouse. According to interviews with base personnel, the building was completely remodeled when it was converted to a commissary in 1978. There is no evidence of hazardous materials remaining at this site, therefore a Confirmation Study is not recommended.

Photo 6.6-7

Site 33 - Base Service Station Ongoing Remedial Action

6.6.35 Temporary PCB Storage Area, Site No. 35

The temporary PCB storage area, Building 480, is located at coordinates H-11. This building was inspected in July, 1981 by the EPA and approved for temporary storage of PCB's. In 1980, a contractor removed asbestos pipe insulation from a building in NARF, and deposited the asbestos in Building 480. The contractor was later required to remove the bulk material and decontaminate the building after dust samples indicated that the area was contaminated. Since the building was cleaned up, it is not expected to pose a current health or environmental problem. Therefore, a Confirmation Study is not recommended for this site.

6.6.36 Dewey Park, Site No. 36

This area is located west of gate 3 south of the Dewey Park Water Plant at coordinates H-3&4. The site contains construction debris and materials from fire damaged buildings. The site occupies an area approximately 2 acres in size in a clearing in a wooded area. Access to this area is through Dewey Park; however, the site spans the border of Navy Property. The site contains inert materials and therefore has not been recommended for a Confirmation Study.

6.6.37 Power Barge, Site No. 37

This site is located at coordinates R-8. Reportedly, an explosion of a transformer had occurred on the shore in the vicinity of the power barge dock when the barge was in operation. Investigation of this issue revealed that all transformers were located on the barge and that no explosions were reported. Therefore this site is not recommended for a Confirmation Study.

6.6.38 Torpedo Rework Facility, Site No. 38

This site is located within the restricted magazine area boundary of the base. Interviews with base and Ordnance Environmental Support Office (OESO) personnel revealed that approximately 1, 55 gallon drum per day of solid waste materials (i.e. rags, gloves containing Otto Fuel) was generated per day. They indicated that drums containing waste have always been disposed of off-site. Therefore, this site is not recommended for a Confirmation Study.

Naval Fuel Depot

Five potential contamination sites were identified during the investigation at the Naval Fuel Depot, Jacksonville, Florida during the on-site visit of the IAS. (Figure 6.6-12, Table 6.6-4)

6.6.37 Sludge Weathering Area and Slurry Pit, Site No. 1

This site is located adjacent to "C" Road due south of facility 42, Bottom sludge and rust removed from fuel tanks during cleaning were spread over the weathering area and tilled into the soil in accordance with API Publication 2015A (see photograph 6.6-8). Washwater generated during tank cleaning was pumped into the slurry pit. This practice was conducted

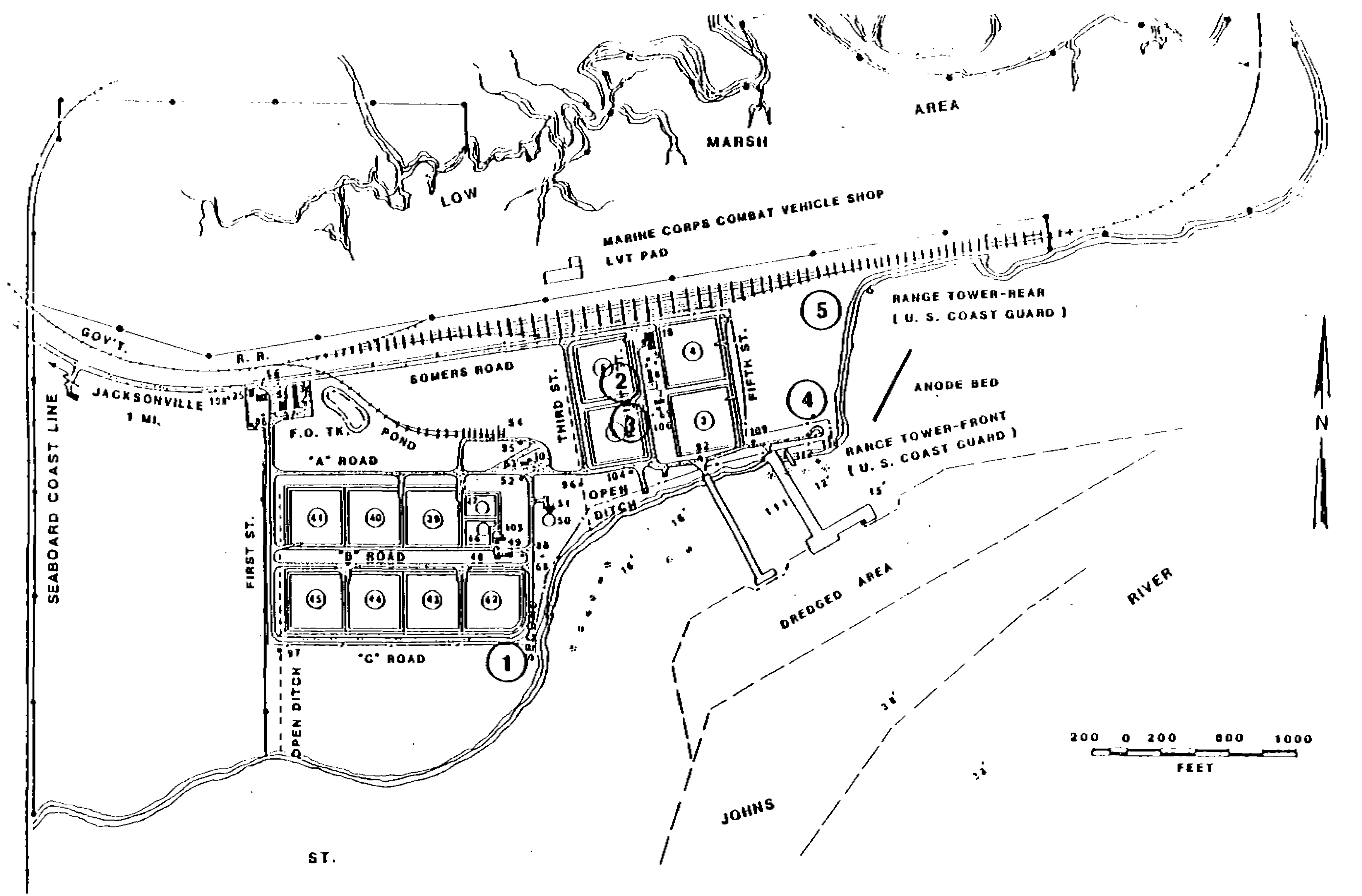

Figure 6.6-12 SPILL/DISPOSAL SITES IDENTIFIED BY IAS TEAM AT NFD JACKSONVILLE.

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TABLE 6.6-4
Potential Contamination Sites at NFD Jacksonville

Site No.	Description
1	Sludge Weathering Area and Slurry Pit
2	Slurry Pit/Sludge Trench Tank #21
3	Slurry Pit Tank #20
4	Slurry and Burn Pit
5	Old Oil Pond and Land Disposal Area

Photo 6.6-8

Site 1 - Sludge Weathering Area and Slurry Pit

from 1976 to 1979 with approximately 10 bbls of TEL (tetraethyl lead) contaminated sludge from the aviation gasoline storage tanks disposed of in this area. The types of fuels that were stored in these tanks included, AVGAS, JP 4,5, and 8 and Navy Special. This is approximately 40 feet wide by 80 feet long and approximately 3 to 5 feet deep. The sludge weathering area is completely covered with vegetation. The slurry pit area is nearly void of vegetation. Due to the small quantities of waste involved, this site is not recommended for a Confirmation Study.

6.6.38 Slurry Pit/Sludge Trench Tank #21, Site No. 2

This site is located southeast of facility 6 inside the dike area surrounding Tank #21 (see photograph 6.6-9). A slurry pit and sludge trench, were excavated and all bottom sludge, rust and washwater generated by tank cleaning was pumped into them. This practice was conducted from September 1954 to October 1954. Approximately 6 bbls of TEL contaminated rust and sludge from an aviation gasoline storage tank was disposed of in these areas. The slurry pit was approximately 10 feet wide by 10 feet long. The sludge trench is approximately 3 feet wide by 20 feet long. Due to the small quantities of waste involved, a Confirmation Study is not recommended.

6.6.39 Slurry Pit Tank #20, Site No. 3

This site is located northeast of facility 5 inside the dike area surrounding tank #20 (see photograph 6.6-10). The slurry pit was excavated and all bottom sludge, rust and washwater generated by tank cleaning was pumped into the pit. This practice was conducted from September 1954 to October 1954. Approximately 8 bbls of TEL contaminated rust and sludge from an aviation gasoline storage tank was disposed of. The slurry pit was approximately 10 feet wide by 10 feet long. Due to the small quantities of waste involved, Confirmation Study is not recommended.

6.6.40 Slurry and Burn Pit, Site No. 4

This site is located due east of Fifth Street in the general vicinity of facility 3 (see photograph 6.6-11). The slurry pit was excavated and all bottom sludge, rust and washwater generated by tank cleaning was pumped into the pit. Occasionally, off-grade petroleum products were disposed of and burned in the pit. Station generated trash was also disposed of at this site and routinely burned in the burn kettle. This practice was conducted from 1965 to 1967. Approximately 8,000 bbls of Navy special fuel and water, from off-spec NSFO, 20 bbls of TEL contaminated sludge and rust from aviation gasoline storage tanks, and an unknown quantity of trash, cans, paper, etc., from the Naval Fuel Depot were disposed of at this site. The slurry and burn pit was approximately 30 feet wide by 50 feet long. Visual inspection revealed disturbed ground and the burn kettle. No visible evidence of waste oil, sludge, trash or hazardous materials was found therefore, a Confirmation Study is not recommended.

6.6.41 Old Oil Pond and Land Spreading Area, Site No. 5

This site is located due east of Fifth Street in the general vicinity of facilities 3 and 4, (see Photograph 6.6-12, Figure 6.6-13). The old pond area was excavated and diked in the 1950's. In 1964 a hurricane

Photo 6.6-9

Site 2 - Slurry Pit/Sludge Trench Tank #21

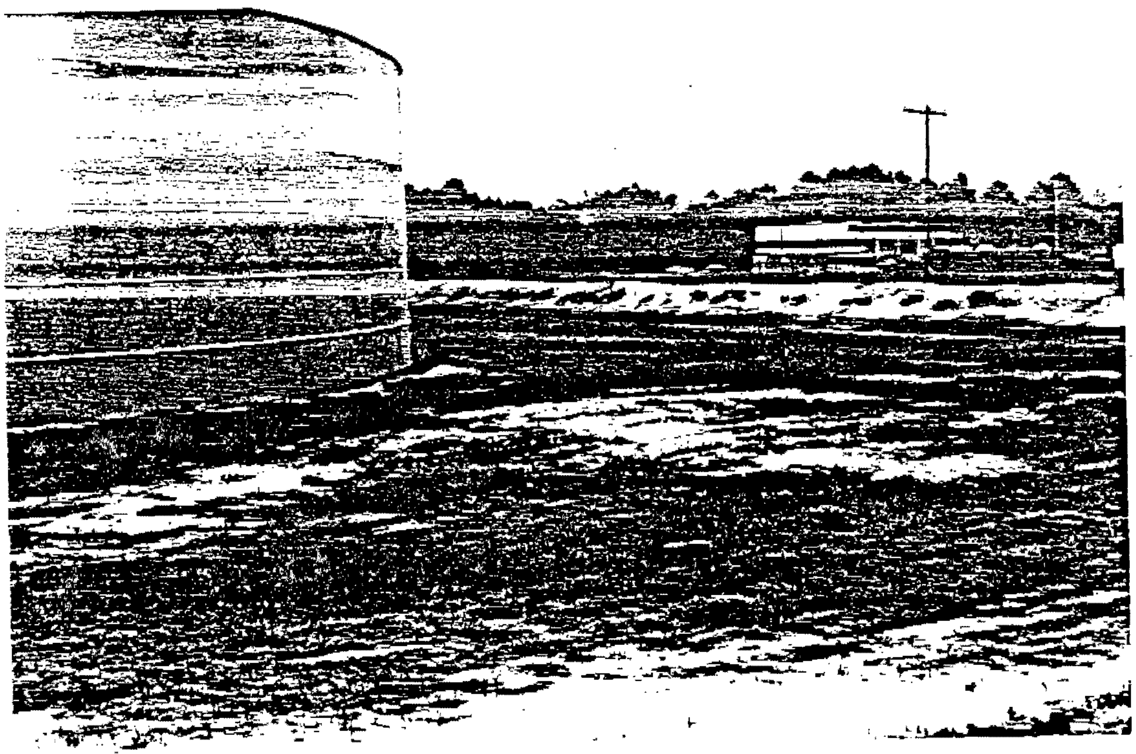


Photo 6.6-10

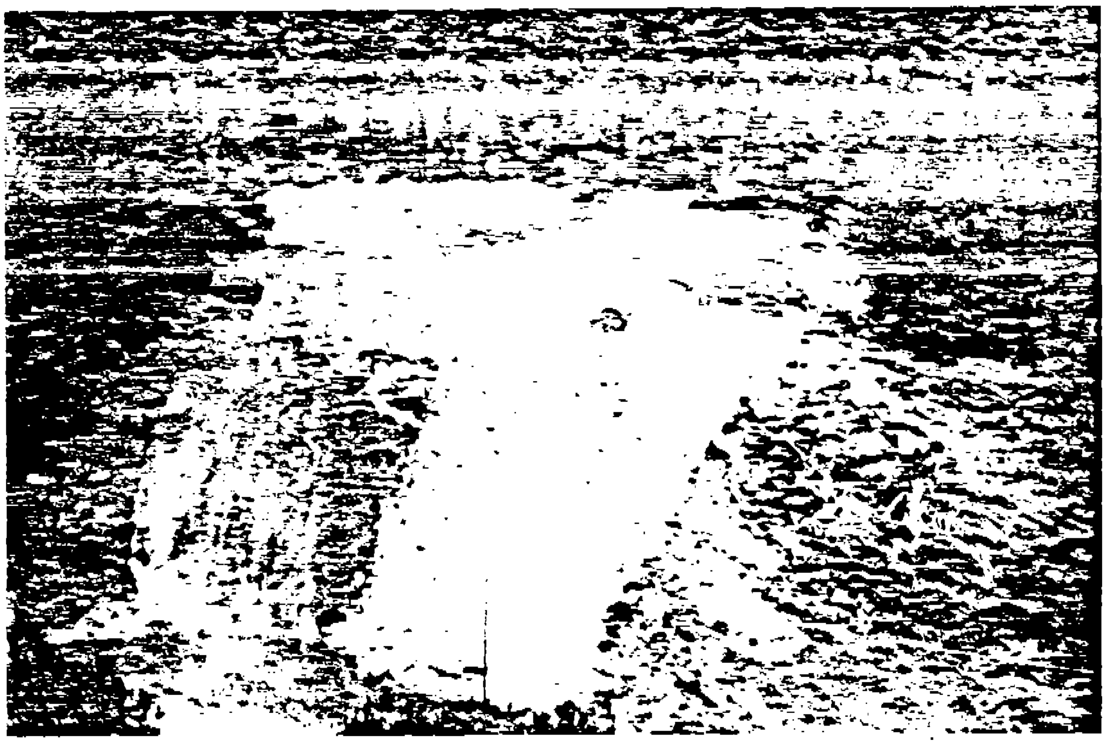
Site 3 - Slurry Pit Tank #20

Photo 6.6-11

Site 4 - Slurry and Burn Pit

Photo 6.6-12

Site 5 - Old Oil Pond and Land Spreading Area



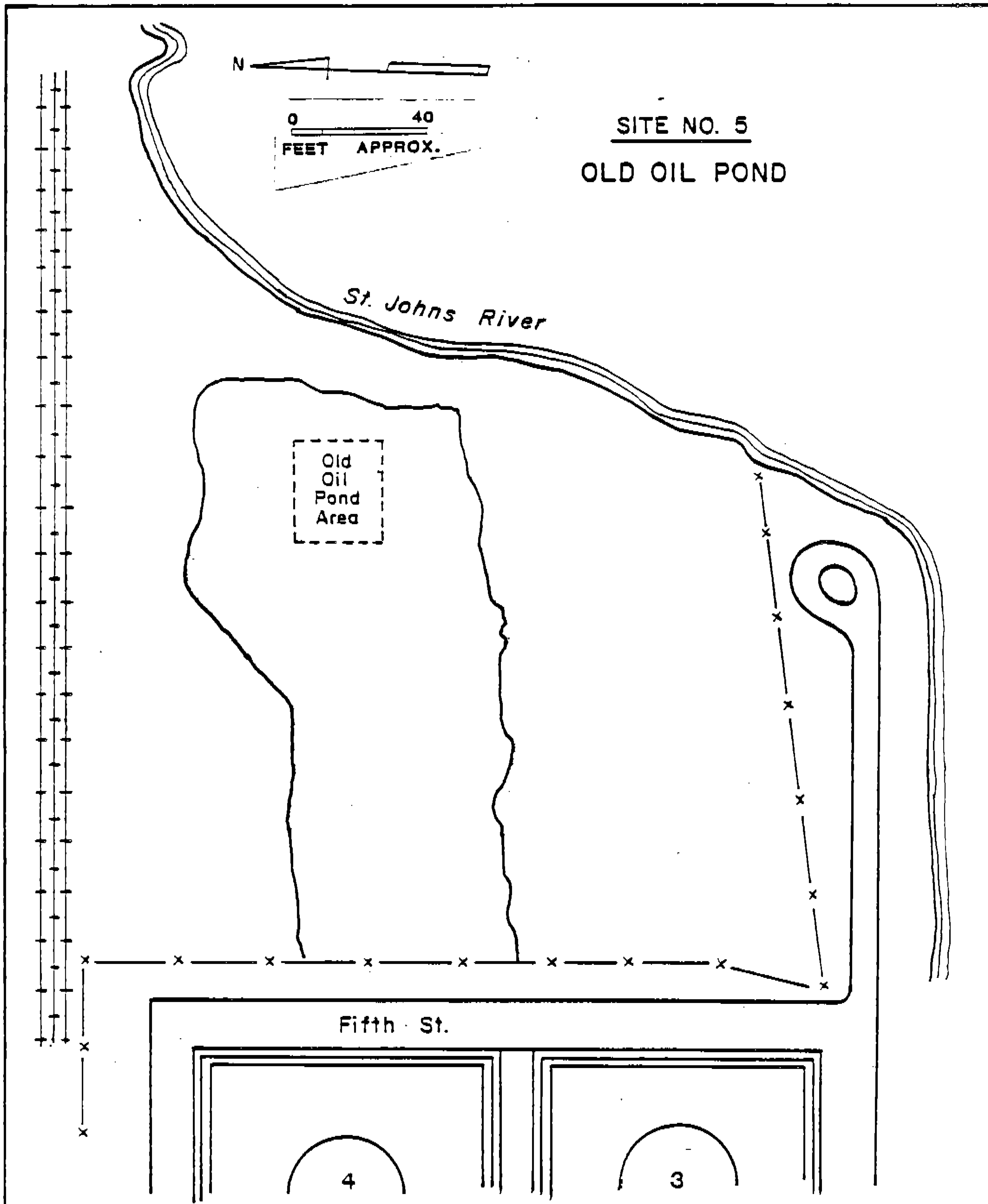


Figure 6.6-13 SITE 5 - OLD OIL POND.

damaged the dike and resulted in oil leaking out. Through 1967 approximately 8,000 bbls of contaminated fuel oil from an aircraft carrier were disposed of in this area along with garbage, wood, etc. In 1965 the pond was filled with soil using a bulldozer. Subsequent to 1967 approximately 5,000 gallons of JP-5 fuel mixed with TEL sludge from cleaning tanks was disposed of in this area. In 1971 the area was regraded with oil/sludge contaminated soils spread over a larger area. The dimensions of the site are approximately 100 feet wide by 500 feet long by 1 foot deep. Aerial photographs dated Nov. 3, 1960 show the oil pond. The pond was approximately 200 feet long by 100 feet wide. Due to the sandy dredge spoil materials located in this area fuels and oils may migrate to the St. John's River via groundwater. Therefore this site is recommended for Confirmation Study.

APPENDIX A

DOCUMENTATION IN SUPPORT OF GEOLOGY, SOILS AND HYDROGEOLOGY SECTIONS

APPENDIX 1.1

Preliminary Assessment

(The Initial Assessment Study serves as the Preliminary Assessment for the Site)

Appendix A-1

NAS Jacksonville
Air, Water Pollution Sampling Locations

RECEIVED 17 MAY 82

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) SAMPLING POINTS

1. Sampling point IT01 is located at the outfall where Birmingham Avenue crosses the creek southwest of Building 964.

2. Sampling point IT02 is located at the outfall where Birmingham Avenue crosses the creek southeast of Building 964.

3. Sampling point IT03 is located at the outfall where Birmingham Avenue crosses the storm sewer west of Building 127.

4. Sampling point IT04 is located in the west line of the storm sewers at Black Point Outfall.

5. Sampling point IT05 is located in the east line of the storm sewers at Black Point Outfall.

6. Sampling point IT06 is located in the boathouse outfall west of Building 121.

7. Sampling point IT07 is located at the outfall where Mustin Road crosses the creek south of Building 845.

8. Source sampling point IS01 is located in the discharge line coming from the oxidation pond.

Appendix A-2

Burns and McDonald Soils Report
Naval Air Rework Facility

B1356

Subsurface Information

Plating & Cleaning Facility

at

Naval Air Rework Facility, NAS

Jacksonville, Florida

FY 1982 MCON P-419

A-E Contract N62467-80-C-0246

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July, 1981

80-801-1

7

Burns & McDonnell

ENGINEERS - ARCHITECTS - CONSULTANTS

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LIST OF FIGURES AND DRAWINGS

INTRODUCTION

A subsurface investigation was performed for the proposed Plating and Cleaning Facility for the Naval Air Rework Facility, located on the Naval Air Station in Jacksonville, Florida as shown on the Boring Location Plan, Figure 1, (see back pocket).

The subsurface investigation was conducted in two phases. The first phase consisted of drilling five borings on August 8, 1980. In this initial phase the borings were located, drilled and logged by Pittsburgh Testing Laboratory personnel. The second phase, which consisted of three borings, began on March 13, 1981 and was completed on March 14, 1981. The borings for the second phase were located and logged by a Burns & McDonnell engineer. A duplicate set of logs for the three latter borings also was prepared by Pittsburgh Testing Laboratory personnel. A laboratory testing program was assigned by Burns & McDonnell for the soil samples obtained from the second phase borings. The laboratory tests were performed by Pittsburgh Testing Laboratory, between March 14 and April 14, 1981.

* * * * *

PART I

PURPOSE AND SCOPE

The purpose of the investigation was to obtain information about the composition, classification, and engineering characteristics of the subsurface materials at the site of the proposed facility. The investigation was conducted solely to provide data necessary for design purposes. Note, it should be recognized by the reader that the information contained herein may not be directly applicable to all types of construction activities. Therefore, it is recommended that a Geotechnical Engineer be consulted for advice in applying this data.

* * * * *

PART II

SITE CONDITIONS

A. FIELD INVESTIGATION

Eight soil borings were drilled at the approximate locations shown on the Boring Location Plan, Figure 1. In each boring, continuous sampling was performed from the ground surface to a depth of ten feet. Below a depth of ten feet, samples were taken at five foot intervals to the completed depth of the boring. These samples were taken using a Standard Penetration Test split-spoon sampler driven according to ASTM D1586.

The first phase of the subsurface investigation was conducted solely by Pittsburgh Testing Laboratory personnel. During this phase Borings B-1 through B-5 were drilled to depths ranging from 28 to 30 feet. Below a depth of ten feet, the borings were advanced between samples using a hollow stem auger with an outside diameter of six inches. The complete subsurface report for the first phase as prepared by Pittsburgh Testing Laboratory personnel is contained in Appendix A of this report.

The second phase of the subsurface investigation was drilled also by Pittsburgh Testing Laboratory, but an engineer of Burns & McDonnell observed the drilling and logged the borings. During this phase, borings B-6, B-7, and B-8 were drilled to depths ranging from 45 to 70 feet. Fifty-pound bag samples were taken from the auger cuttings from the ground surface to a depth of five feet. Below a depth of ten feet, the borings were advanced between samples using a 3-inch-diameter tricone roller bit and rotary wash methods. The complete subsurface report for the second phase as prepared by Pittsburgh Testing Laboratory personnel is contained in Appendix B of this report. The boring logs for the second phase of drilling as prepared by the Burns & McDonnell engineer are contained in Appendix C of this report. C.

The borings were located in the field by taping from existing structures. Elevations were estimated to the nearest 1/2-foot from a contour map prepared by Bennett R. Wattles and Associates, Inc. of Jacksonville, Florida. The location and elevation of the borings should be considered accurate only to the degree implied by the method used.

B. LABORATORY TESTING

The purpose of the laboratory testing program was to obtain engineering parameters and general soil classifications for design of the proposed Plating and Cleaning Facility.

Samples from the second exploration phase were selected by a Burns & McDonnell engineer for testing by Pittsburgh Testing Laboratory at their laboratory in Jacksonville, Florida between March 14, 1981 and April 14, 1981. The testing consisted of nine sieve analyses (perecent passing No. 200 sieve only), two California Bearing Ratio Tests, and one set of Atterberg limits (Plastic and Liquid Limits).

C. SOILS ENCOUNTERED

The site for the proposed facility lies in the coastal plain of northeastern Florida. Little topographic relief exists in the vicinity surrounding the site.

The soil materials encountered in the borings drilled for this investigation consist primarily of loose to very dense sand with some silt and clay. Generally, these soils are classified as SP to SM materials according to the Unified Soil Classification System. However, some silty clays and clayey sands, classified as SC and CL materials, were encountered. In Boring B-3 auger refusal was encountered by Pittsburgh Testing Laboratory personnel at a depth of 28.0 feet. Bedrock was not encountered in any of the borings observed by the Burns & McDonnell engineer, including Boring B-7 which penetrated to a depth of 70 feet.

Water level measurements at the completion of drilling were taken in each of the eight borings. Pittsburgh Testing Laboratory personnel found the water level to vary from 10.1 to 17.4 feet below the existing ground surface on August 8, 1980 (corresponding to a mean sea level elevation ranging from 0.1 to 3.9 feet). The Burns & McDonnell engineer measured the water level in Borings B-6, B-7, and B-8. The groundwater in these borings varied from 5.8 to 11.6 feet below the existing ground surface on March 13 and 14, 1981 (corresponding to a mean sea level elevation ranging from 6.4 to 11.7 feet).

* * * * *

PART III

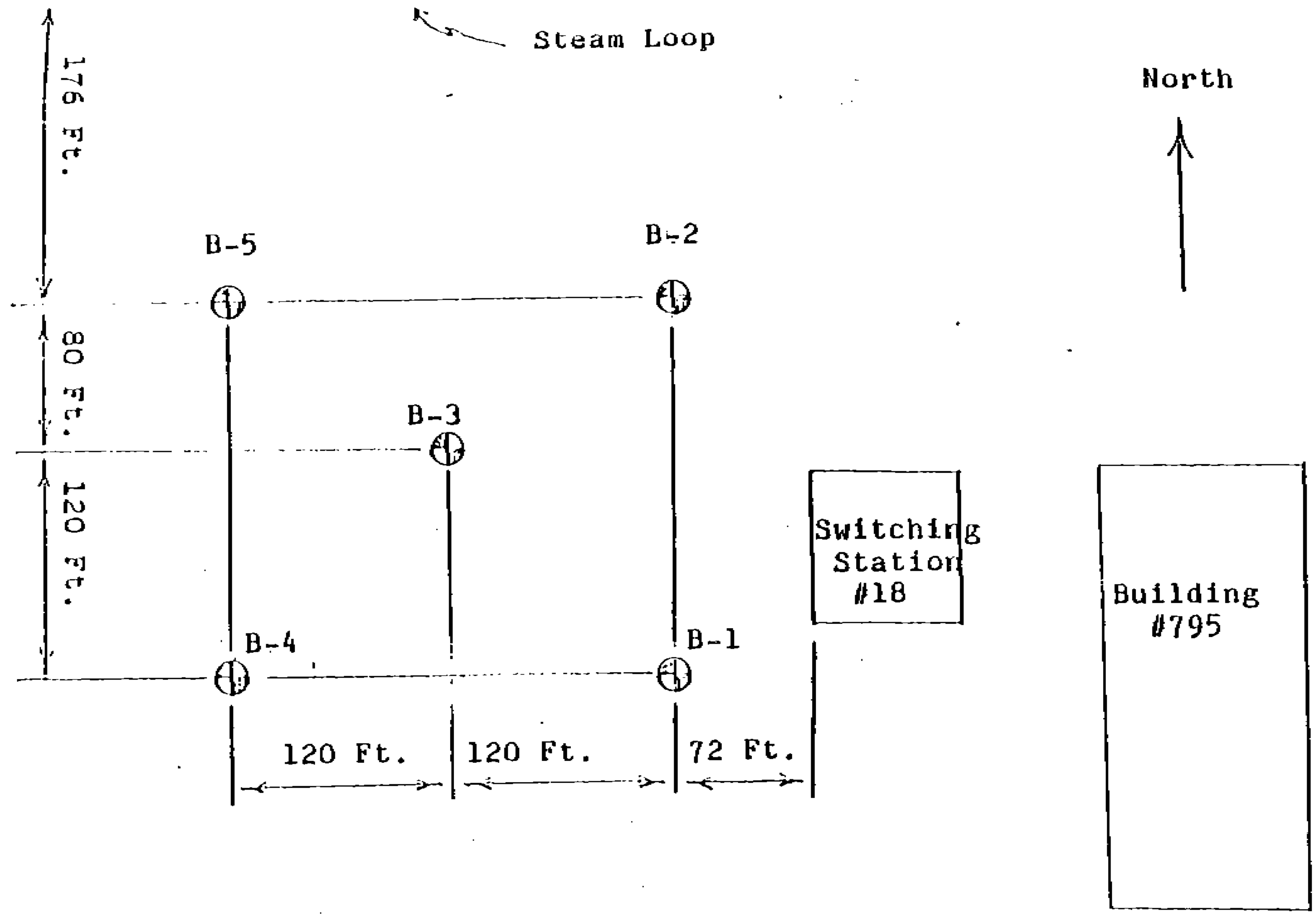
ADDITIONAL SUBSURFACE INFORMATION

A request was made to the Naval Air Rework Facility for existing subsurface information at or near the proposed Plating and Cleaning Facility. In response to this request the Naval Air Rework Facility then provided Burns & McDonnell with copies of nine soil boring logs which were made for the Jet Engine Test Cells. These borings were drilled in an area located approximately 1,200 feet southeast of the proposed Plating and Cleaning Facility. Copies of these logs are presented on Drawing No. 5021827, entitled "Test Boring Logs" prepared by Smith & Gillespie-Getter Associates, Joint Venture, and dated April 20, 1973 (see back pocket).

The design studies performed in conjunction with this report for the Plating and Cleaning Facility are available for review at Burns & McDonnell's office upon written request.

Burns & McDonnell is not aware of any other subsurface information in the near vicinity to the proposed facility. We recommend that requests for additional subsurface information pertaining to the proposed site be directed to the Naval Air Rework Facility.

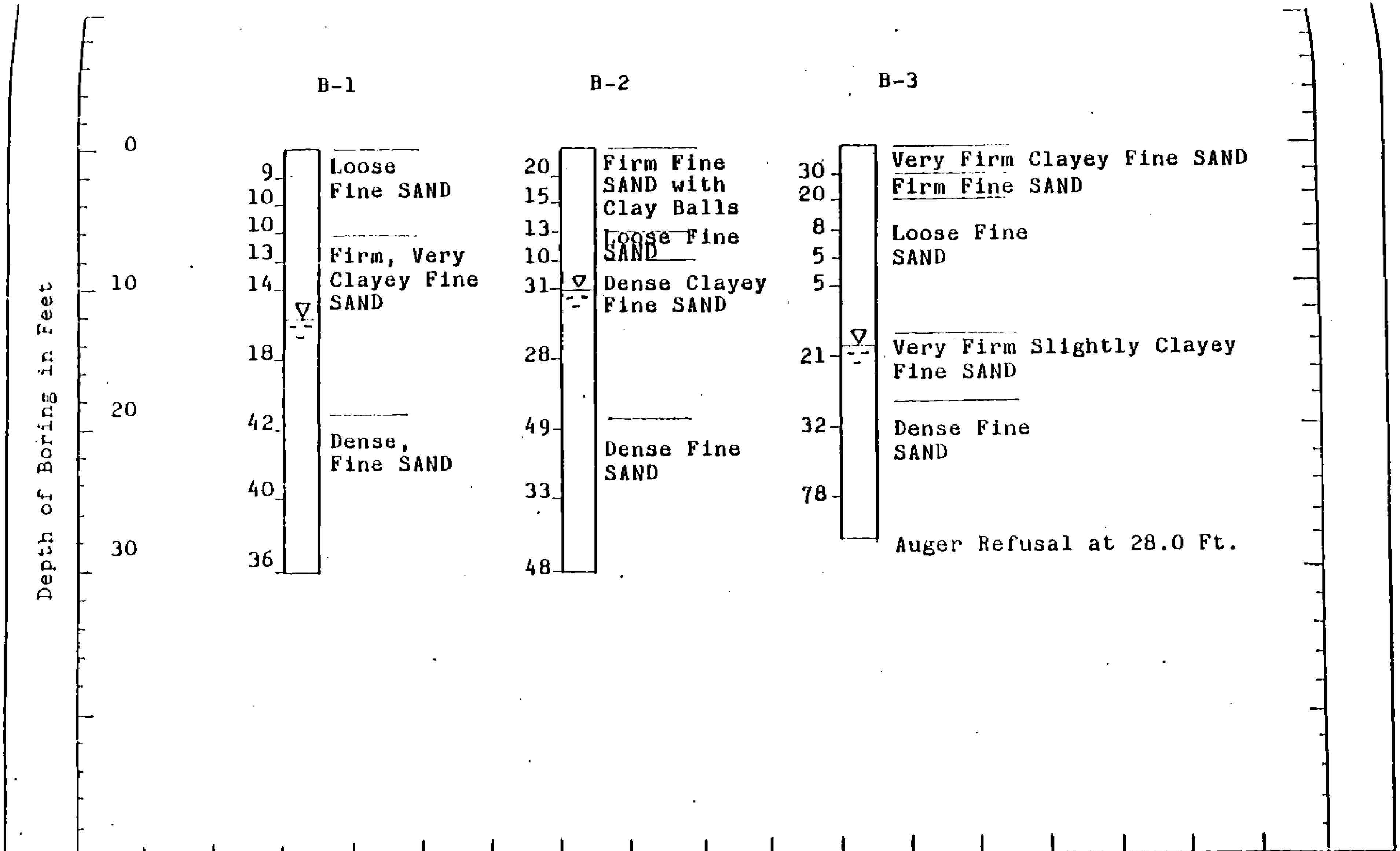
* * * * *



8-15-80

JA-2771

Boring Location Sketch
Plating & Cleaning Facility
NARF, Jacksonville, Fla.

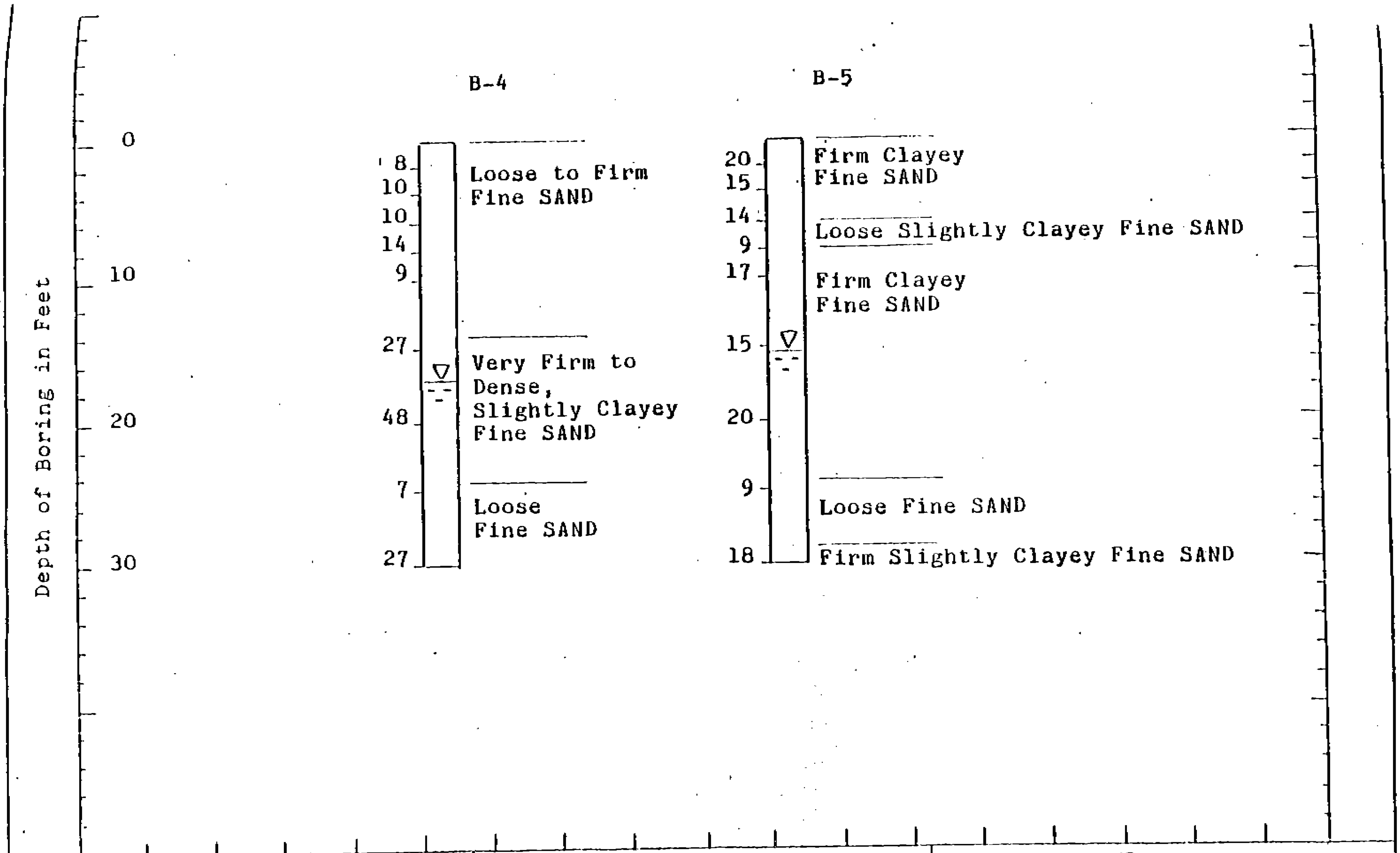


SCALE: 1 Inch = 10 Ft.

SOIL PROFILE

PROJECT
Plating & Cleaning Facility
NARF, Jacksonville, Fla.

JOB NO. JA-2758



SOIL PROFILE

SCALE: 1 Inch = 10 Ft

PROJECT
Plating & Cleaning Facility
NARF, Jacksonville, Fla.

JOB NO. JA-2758

B - 4 (CONT.)

84.5' - 100' VERY DENSE gray fine SAND (SP)

GROUND SURFACE EL. 8.66

B - 5

- 0" - 6" Concrete
- 6" - 1.5' FIRM gray fine SAND with small soft gray fine slightly sandy clay seams (SP - SC)
- ▼ GW. EL. 5.5 (10 - 25 - 72)
- 1.5' - 4' LOOSE to FIRM gray fine SAND (SP)
- 4' - 5.5' FIRM gray slightly silty fine SAND (SP)
- 5.5' - 11.5' VERY FIRM to FIRM gray fine SAND (SP)
- 11.5' - 13' FIRM light gray fine SAND with soft fine sandy clay seams (SP - SC)
- 13' - 14.5' VERY LOOSE dark brown slightly clayey silty fine SAND (SC)
- 14.5' - 19' VERY LOOSE to LOOSE gray slightly silty slightly clayey to slightly silty fine SAND (SM)
- 19' - 24' VERY LOOSE to LOOSE gray fine SAND (SP)
- 24' - 37' FIRM to LOOSE gray fine SAND (SP)
- 37' - 41.5' FIRM tan fine SAND (SP)
- 41.5' - 47.5' VERY FIRM to DENSE gray and tan fine SAND (SP)
- 47.5' - 52' LOOSE gray fine SAND and SOFT dark brown clayey silt layers (SP - SM)
- 52' - 58' VERY SOFT to FIRM dark brown clayey SILT (MH)
- 58' - 63' FIRM to STIFF dark brown organic SILT (MH)
- 63' - 74' DENSE to VERY DENSE gray fine SAND (SP)
- 74' - 78.5' VERY DENSE gray fine SAND (SP)
- 78.5' - 83' VERY FIRM gray slightly clayey fine SAND with silty clay seams (SC)

B - 5 (CONT.)

- 83' - 100' VERY DENSE light gray fine SAND (SP)

GROUND SURFACE EL. 7.30

B - 6

- 0" - 1' Concrete
- 1' - 6' VERY DENSE to DENSE tan fine SAND (SP)
- ▼ GW. EL. 6.4 (10 - 26 - 72)
- 6' - 11.5' DENSE to VERY DENSE light gray fine SAND (SP)
- 11.5' - 12.5' FIRM light gray fine SAND (SP)
- 12.5' - 14' VERY LOOSE light gray slightly clayey silty fine SAND with dark brown clayey silt seams (SP - SM)
- 14' - 26' FIRM to LOOSE gray slightly silty fine SAND (SM)
- 26' - 31' FIRM to VERY FIRM light gray fine SAND (SP)
- 31' - 37' DENSE gray fine SAND (SP)
- 37' - 46' FIRM gray fine SAND with dark brown silty fine sand lenses (SP)
- 46' - 53' VERY LOOSE dark gray slightly clayey silty fine SAND with soft dark brown silty clay seams (SC)
- 53' - 58' VERY SOFT dark brown silty CLAY with fine sand lenses (CH)
- 58' - 60' FIRM to VERY FIRM gray slightly silty fine SAND (SM)

GROUND SURFACE EL. 8.06

B - 7

- 0" - 1' Concrete
- 1' - 3' VERY FIRM to DENSE tan fine SAND (SP)
- 3' - 6' VERY FIRM red-brown slightly clayey fine SAND to gray fine SAND with small fine sandy clay seams (SC)
- 6' - 8' VERY FIRM light gray fine SAND (SP)
- ▼ GW. EL. 7.0 (10 - 30 - 72)
- 8' - 10.5' LOOSE light gray fine SAND (SP)
- 10.5' - 13' VERY LOOSE dark gray slightly silty fine SAND (SM)
- 13' - 33.5' FIRM to VERY FIRM light gray fine SAND (SP)

B - 7 (CONT.)

- 13' - 33.5' FIRM to VERY FIRM light gray fine SAND (SP)
- 33.5' - 44' LOOSE to FIRM gray fine SAND with small dark gray slightly silty fine sand seams (SP - SM)
- 44' - 53' DENSE gray fine SAND (SP)
- 53' - 58' VERY FIRM gray fine SAND with silty clay seams (SP - SC)
- 58' - 62.5' SOFT to FIRM blue - gray silty CLAY (CH)
- 62.5' - 74' STIFF blue - gray silty CLAY (CH)
- 74' - 86' VERY DENSE gray fine SAND (SP)
- 86' - 86.5' SOFT blue - gray slightly silty fine sandy CLAY (CL)
- 86.5' - 107.5' VERY DENSE light gray fine SAND (SP)
- 107.5' - 113.5' VERY STIFF blue - gray silty fine sandy CLAY with fine sand lenses (CL)
- 113.5' - 115' VERY FIRM gray fine SAND (SP)
- 115' - 125' HARD to VERY STIFF blue - gray silty slightly sandy CLAY (CL) with some fine sand layers (CL)

GROUND SURFACE EL. 7.370

B -

REV	DESCRIPTION	PREP'D BY	DATE	APPROVED

B - 6

- Concrete
- Firm gray-brown clayey fine SAND (SC)
- Loose gray fine SAND with some small clay fragments (SP)
- Firm gray ... (SP-SC)
- GW. EL. ... (10-24-72)
- Blue silty slightly clayey fine SAND (SC)
- 5.5' - 13' Firm to loose gray fine SAND with clay seams (SP-SC)
- 13' - 15.5' Very firm light gray fine SAND (SP)
- 15.5' - 24' Firm light gray slightly clayey fine SAND (SC)
- 24' - 32' Very firm light gray fine SAND with small silty clay lenses (SC)
- 32' - 35' Firm gray tan fine SAND with sandy silty clay lenses (SP-SC)
- 35' - 36' Dense light gray fine SAND (SP)
- 36' - 44.5' Dense light gray fine SAND with clayey fine sand seams (SP)
- 44.5' - 57' Very dense tan fine SAND (SP)
- 57' - 58.5' Firm gray fine SAND with silty clay seams (SP-SC)
- 58.5' - 61' Soft blue-gray silty CLAY (CH)
- 61' - 64' Firm blue-gray silty CLAY (CH)
- 64' - 67' Stiff blue-gray silty CLAY (CH)
- 67' - 68.5' Very stiff blue-gray fine sandy silty CLAY (CH)
- 68.5' - 70' Firm gray fine SAND (SP)
- 70' - 74.5' Soft to firm blue-gray silty CLAY (CH)
- 74.5' - 77.5' Stiff dark brown organic slightly clayey, slightly sandy silt (OH)
- 77.5' - 82' Very dense dark brown fine SAND (SP)
- 82' - 88.5' Very dense light gray fine SAND (SP)
- 88.5' - 89.5' Firm blue-gray fine sandy silty CLAY (CH)
- 89.5' - 100' Very dense light gray fine SAND (SP)

GROUND SURFACE EL. 8.24

B - 9

- Concrete
- 6" - 3.5' Very firm light gray fine SAND (SP)
- 3.5' - 4' Very soft dark gray loose clayey silt
- GW. EL. 6 (10-25-72)
- 4' - 5' Loose gray - tan slightly clayey fine SAND (SC)
- 5' - 8.5' Very firm to dense gray fine SAND (SP)
- 8.5' - 10.5' Firm to loose gray fine SAND (SP)
- 10.5' - 12.5' Very loose dark gray silty fine sand with silty clay layers (SM)
- 12.5' - 28' Firm to very firm gray fine SAND (SP)
- 28' - 40' Loose to firm gray fine SAND with silty clayey fine sand lenses (SP - SC)
- 40' - 43' Loose to very loose gray fine SAND with silty clayey fine sand lenses (SP-SC)
- 43' - 54' Dense to very dense light gray fine SAND (SP)

B - 9 (CONT.)

- 43' - 54' Dense to very dense light gray fine SAND (SP)
- 54' - 65.5' Soft to firm blue-gray silty CLAY (CH)
- 65.5' - 66' Stiff blue-gray silty CLAY (CH)
- 66' - 68.5' Dense light gray fine SAND (SP)
- 68.5' - 74' Stiff blue-gray silty CLAY with fine sand seams (CH)
- 74' - 79' Firm dark brown fine SAND (SP)
- 79' - 100' Very dense gray fine SAND (SP)

GROUND SURFACE EL. 6.83

SUBSURFACE EXPLORATION NOTES

1. Exploration was performed during October 1972.
2. Boring holes (3) were accomplished by standard penetration test procedures using a 1 3/8" I.D. split spoon sampler. Sample spoon was advanced by a 140# hammer falling 30".
3. The blow count in a given length of drive is for 0.5' unless otherwise noted.
4. Blow counts required to advance the spoon 6" are shown in "a" (see note 3).
5. Depth below ground and soil description are shown in "b".
6. Soil descriptions are based on visual identification and by laboratory tests on selective samples. Descriptions given are on the Unified Soil Classification System (ASTM - D-2487).
7. Ground water notations are indicated on the logs as GW. with the depth below the ground surface given. Dates where shown on the logs are the dates when ground water was encountered.
8. Elevations shown on the boring logs are ground surface elevations at the time of exploration.
9. Borings were taken in the field by Law Engineering Testing Company.
10. For location of borings see NAVFAC DWG. NO. 8021776

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

SOUTHERN DIVISION

NAVAL AIR REWORK FACILITY JACKSONVILLE, FLA

JET ENGINE TEST CELLS

TEST BORING LOGS

CIVIL

SIZE F — CODE IDENT NO. 80091 — NAVFAC DRAWING NO. 3021827

CONSTR. CONTR. NO. N62467-72-C-0141

SPEC 05-72-0141 — SHEET 42 OF 129

B - 1

FT	a*	b
		0' - 1.5' gray sandy topsoil
		1.5' - 6' LOOSE gray fine SAND (FILL) ▽ GW. EL. 4.0' (10-28-68)
		6' - 8.5' MEDIUM DENSE gray fine SAND
		8.5' - 17' LOOSE gray fine SAND with thin clay lenses
		17' - 22.5' MEDIUM DENSE gray fine SAND
		22.5' - 27.5' MEDIUM DENSE tan fine SAND
		27.5' - 28.5' SOFT gray CLAY
		28.5' - 38' MEDIUM DENSE gray fine SAND
		38' - 43.5' MEDIUM DENSE gray and tan fine SAND with traces of SILT
		43.5' - 48' MEDIUM DENSE gray fine sand with traces of CLAY
		48' - 58' DENSE gray and tan fine SAND
		58' - 80' MEDIUM to STIFF blue CLAY
		GROUND SURFACE

B - 2

FT	a*	b
		0' - 6' MEDIUM DENSE gray fine SAND (FILL) ▽ GW. EL. 4.0' (10-29-68)
		6' - 8' DENSE gray and tan fine SAND
		8' - 9.5' LOOSE gray fine SAND
		9.5' - 10' SOFT to MEDIUM STIFF gray CLAY
		10' - 33.5' MEDIUM DENSE gray fine SAND

* BLOW COUNTS REQUIRED TO ADVANCE THE SPOON 12"

B - 2 (CONT.)

FT	a*	b
		10' - 33.5' MEDIUM DENSE gray fine SAND
		33.5' - 38' DENSE gray fine SAND
		38' - 43.5' DENSE tan fine SAND
		43.5' - 48.5' DENSE gray fine SAND
		48.5' - 57' VERY DENSE gray and tan fine SAND
		57' - 60' MEDIUM to STIFF blue CLAY
		GROUND SURFACE

B - 3

FT	a*	b
		0' - 8' CONCRETE paving
		8' - 3.5' DENSE gray and tan SAND (FILL)
		3.5' - 5.5' MEDIUM DENSE gray and tan SAND (FILL) ▽ GW. EL. 3.2 (10-31-68)
		5.5' - 8.5' MEDIUM DENSE gray and tan fine SAND with thin clay lenses
		8.5' - 11.5' MEDIUM DENSE gray fine SAND
		11.5' - 17' MEDIUM DENSE gray and dark gray fine SAND
		17' - 36' MEDIUM DENSE gray fine SAND
		36' - 42.5' VERY DENSE dark gray fine SAND with very thin clay lenses
		42.5' - 47' DENSE gray fine SAND with traces of very thin clay lenses
		47' - 56.5' DENSE gray fine SAND

B - 3 (CONT.)

FT	a*	b
		47' - 56.5' DENSE gray fine SAND
		56.5' - 60' MEDIUM STIFF blue CLAY
		GROUND SURFACE EL.

B - 4

FT	a	b
		0' - 1' Concrete
		1' - 8' FIRM to DENSE tan fine SAND with a few clayey sand seams (SP) ▽ GW. EL. 7.0 (10-31-72)
		8' - 12.5' LOOSE light gray fine SAND with clayey silt lenses (SP - SM)
		12.5' - 14' VERY LOOSE dark gray silty fine SAND with decayed roots (SP-SM)
		14' - 22' FIRM light gray fine SAND (SP)
		22' - 39' VERY FIRM to DENSE light gray fine SAND (SP)
		39' - 40' LOOSE to FIRM light gray fine SAND with small dark gray slightly silty fine sand seams (SP)
		43' - 44' LOOSE to FIRM light gray fine SAND with small dark gray slightly silty fine sand seams (SP)
		44' - 48' VERY LOOSE gray slightly silty slightly clayey fine SAND with dark gray silty seams (SP-SM)
		48' - 50' VERY SOFT dark gray silty CLAY with fine sand seams (CL-ML)
		50' - 54' FIRM to STIFF dark brown organic clayey SILT (MH)
		54' - 59.5' LOOSE gray fine SAND (SP)
		59.5' - 69' LOOSE to FIRM gray slightly silty slightly clayey fine SAND (SM)
		69' - 70' LOOSE dark gray silty fine SAND (SM)
		70' - 72' VERY FIRM gray fine SAND (SP)
		72' - 83.5' VERY DENSE gray fine SAND (SP)
		83.5' - 84.5' SOFT blue-gray silty CLAY (CH)
		84.5' - 90' VERY DENSE gray fine SAND (SP)

B - 4 (

Appendix A-3

Test Boring Logs
NFD Jacksonville

2, 43, 46, 47

BORING LOG

DATE 5-20-75

DEPTH — TYPE — MATERIAL DESCRIPTION

HA 6 (SIDE OF DIKE)
HAND AUGER

0-0.5 — 8" OF SOIL CEMENT
0.5-3.5 — FINE TO MEDIUM SAND, TRACE SILT, LIGHT GRAYISH BROWN, MOIST TO WET, (SP)

WATER LEVEL - 3.00
END OF BORING

HA 7 (TOP OF DIKE)
HAND AUGER

0-0.5 — 3" OF CRUSHED STONE, APPROXIMATELY 3/4" TO 1 1/2", WHITE, (GW)
0.5-6.0 — FINE SAND, TRACE SILT, GRAYISH BROWN, MOIST, (SP)

WATER LEVEL NOT ENCOUNTERED
END OF BORING

HA 8 (FLOOR OF DIKE)
HAND AUGER

0-2.5 — FINE TO MEDIUM SAND, TRACE SILT, BROWN TO WHITE, MOIST TO WET, (SP)

WATER LEVEL - 2.00
END OF BORING

HA 9 (SIDE OF DIKE)
HAND AUGER

0-0.5 — CRUSHED STONE (SW)
0.5-6.0 — FINE SAND, TRACE SILT, LIGHT GRAYISH BROWN, MOIST, (SP)

PERFORMED BY EXPOSING SOIL ON OUTSIDE OF BERM
END OF BORING

HA 10 (TOP OF DIKE)
HAND AUGER

0-0.5 — 3" OF CRUSHED STONE, (SW)
0.5-7.0 — FINE SAND, TRACE SILT, LIGHT GRAY, MOIST, (SP)

WATER LEVEL NOT ENCOUNTERED
END OF BORING

HA 11 (FLOOR OF DIKE)
HAND AUGER

0-0.5 — 8" OF SOIL CEMENT
0.5-4.5 — FINE SAND, TRACE SILT, LIGHT GRAY, MOIST TO WET, (SP)

END OF BORING.

HA 12 (TOP OF DIKE)
HAND AUGER

0-6.0 — FINE SAND, TRACE SILT, LIGHT BROWN TO LIGHT GRAY, MOIST, (SP)

WATER LEVEL NOT ENCOUNTERED
END OF BORING

HA 13 (TOP OF DIKE)
HAND AUGER

0-6.0 — FINE TO COARSE SAND, TRACE SILT, SOME CLAYEY SAND NOTED FROM 4.5' TO 5.0', LIGHT BROWN TO LIGHT GRAY, MOIST, (SW)

WATER LEVEL NOT ENCOUNTERED
END OF BORING

SOIL BORINGS PROVIDED BY SOIL & MATERIALS ENGINEERS OF FLORIDA, INC., ALTAMONTE SPRINGS, FLORIDA.

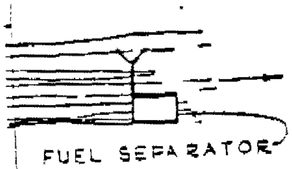
0' 40' 80' 160'

NO'S
41 44 + 45

BORING LOG — DATE 5-20-75

DEPTH	TYPE	MATERIAL DESCRIPTION
	HA 1 (TOP OF DIKE) HAND AUGER	
0-0.5		6" OF SOIL CEMENT
0.5-8.0		FINE TO FINE TO MEDIUM SAND, LIGHT GRAY TO WHITE, MOIST, MOIST TO WET FROM 7' TO 8', (SP)
	WATER LEVEL - 8.00	
	END OF BORING	
	HA 2 [illegible] HAND AUGER	
0-0.5		6" OF SOIL CEMENT
[illegible]		FINE SAND, LIGHT GRAYISH BROWN, MOIST, SP
	END OF BORING	
	HA 3 (FLOOR OF DIKE) HAND AUGER	
0-1.0		12" OF SOIL CEMENT
1.0-4.0		COARSE TO FINE SAND, LIGHT GRAYISH BROWN, MOIST TO WET, (SW)
	WATER LEVEL - 3.50	
	END OF BORING	
	HA 4 (FLOOR OF DIKE) HAND AUGER	
0-1.0		10" OF SOIL CEMENT
1.0-3.0		FINE TO COARSE SAND, LIGHT GRAYISH BROWN, MOIST TO WET, (SW)
	WATER LEVEL - 2.50	
	END OF BORING	
	HA 5 (TOP OF DIKE) HAND AUGER	
0-6.0		COARSE TO FINE SAND, TRACE SHELL FRAGMENTS, LIGHT GRAYISH BROWN, MOIST, (SW)
	WATER LEVEL NOT ENCOUNTERED	
	END OF BORING	
	HA 14 (FLOOR OF DIKE) HAND AUGER	
0-1.0		8" OF SOIL CEMENT
1.0-3.5		FINE TO MEDIUM SAND, LIGHT TAN, MOIST TO WET, (SP)
	WATER LEVEL - 3.08	
	END OF BORING	
	HA 15 (FLOOR OF DIKE) HAND AUGER	
0-0.5		6" OF SOIL CEMENT
0.5-3.5		FINE TO MEDIUM SAND, TRACE SILT, LIGHT BROWN, MOIST TO WET, (SP)
	WATER LEVEL - 3.17	
	END OF BORING	
	HA 16 (TOP OF DIKE) HAND AUGER	
0-0.5		FINE SAND, TRACE SILT, LIGHT BROWN, MOIST, (SP)
0.5-6.0		COARSE TO FINE SAND, TRACE SILT, LIGHT BROWNISH GRAY, MOIST, (SW)
	WATER LEVEL NOT ENCOUNTERED	
	END OF BORING	

SOIL BORINGS PROVIDED BY SOIL & MATERIALS ENGINEERS OF FLORIDA, INC., ALTAMONTE SPRINGS, FLORIDA.



SCALE: 1"=40'

0' 40' 80' 160'
GRAPHIC SCALE

BREVARD ENGINEERING
CAPE CANAVERAL

SOUTHERN DIVISION

Appendix A-4

Report on Landfill Leachate in
Drummond Creek Area

Discussion Of Landfill Leachate In The Drummond Creek Area,
Excerpted From Fairchild and Leve, (1973).

In addition to investigation of hydrologic and geologic conditions at landfill sites, the Geological Survey is monitoring the quality of water near the active municipal landfill at Imeson Airport (fig. 11). The municipal landfill is at the edge of a large pond which is hydraulically connected to the regional surficial aquifer. Some of the solid waste is deposited below the water table and leachate from the landfill directly enters the surficial aquifer, the pond, or through the pond into the surficial aquifer. Water samples were collected both from shallow wells that penetrate the surficial aquifer in the vicinity of the landfill and from the pond. The samples were analyzed for bacteriological content, common chemical constituents and various trace metals to determine the type of leachate from the landfill and the distribution of the leachate in the receiving waters.

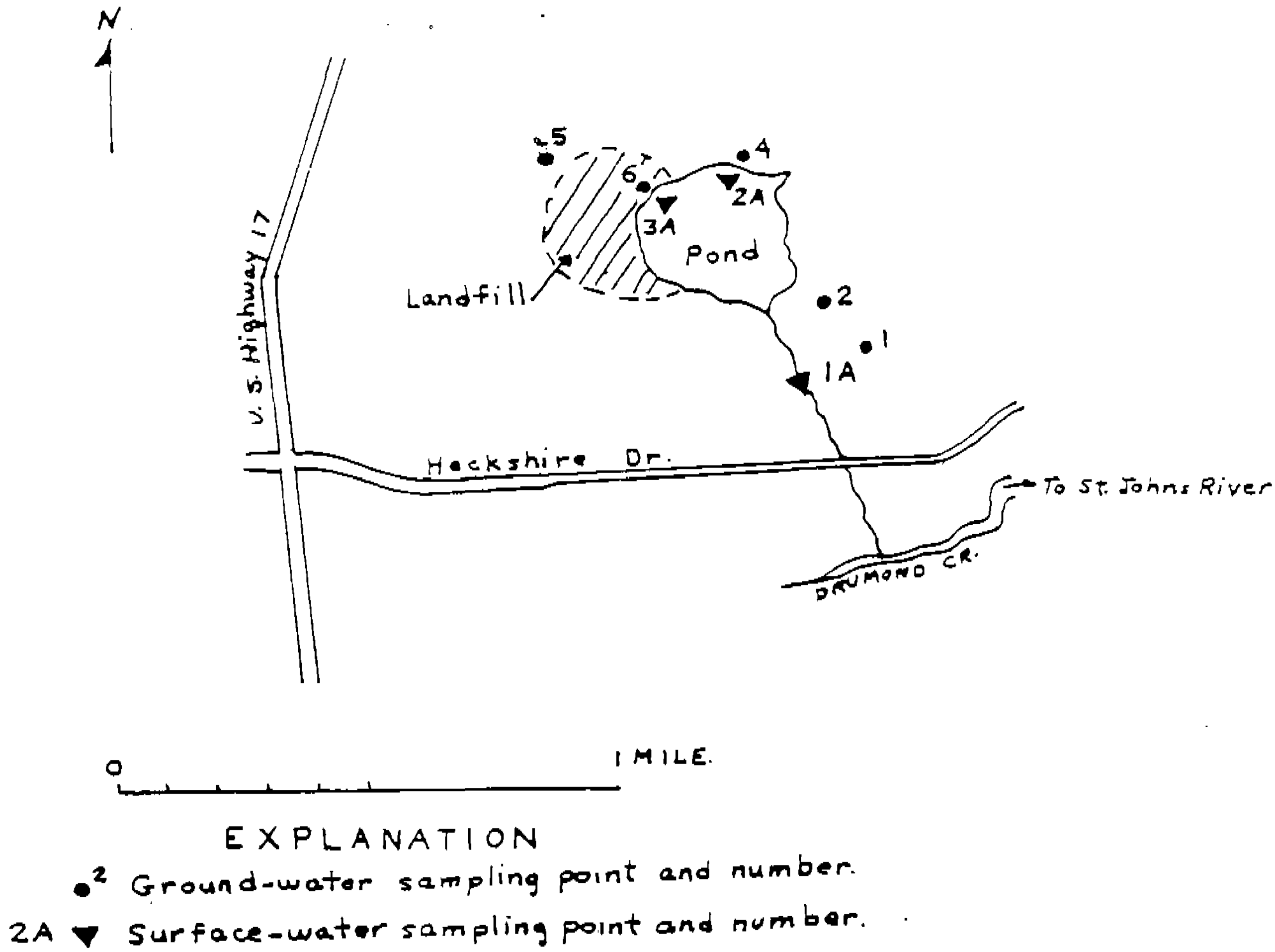


Figure 11. Map showing location of quality of water sampling points at the municipal sanitary landfill at Jacksonville.

Table 4. Analyses of Samples from the Municipal Sanitary Landfill, January 11, 1972
(Quantities in milligrams per liter (mg/l) except where noted)

	Sample Location							
	1A	2A	3A	Well #1	Well #2	Well #4	Well #5	Well #6
Temperature, degrees Celsius	19	22	21	13	22	21	21	20
pH units	7.2	6.6	7.1	5.8	7.2	5.4	6.5	5.8
COD	98	157	108	225	372	265	88	49
BOD	7.7	< 7.5	< 8.4	4.1	< 5.8	< 5.4	3.2	12
Coliform, most probable number	3300	3300	35000	240000	3100	240000	160000	92000
Coliform-Fecal, most probable number	790	790	7900	4900	1300	2300	13000	3300
Ortho-phosphate	0	.6	0	.6	.6	1.2	1.2	0.6
Total phosphate	1.8	3.0	1.8	5.9	2.4	1.8	1.8	2.4
Ammonia nitrogen (NH_3-N)	5.8	18.6	7.3	0	0	4.3	0	0
Organic nitrogen	0	1.2	1.5	1.8	.7	2.2	0	2.6
Nitrate nitrogen (NO_3-N)	.18	.13	.26	.33	.56	.18	2.20	.19
Total Solids	531	810	627	7094	4362	3312	31656	11701
Suspended Solids	44	98	102	2980	4020	2952	9918	10606
Dissolved Solids	487	712	525	4114	342	360	21738	1095
Hardness ($CaCO_3$)	250	370	270	125	55	293	135	550
Specific Conductivity-micromhos	231	131	610	234	1040	730	1080	798
Alkalinity	269	495	350	380	60	354	145	2270
Acidity	14	68	19	87	64	150	60	528
Calcium (Ca)	66.1	106.2	78.2	38.1	20.0	88.2	42.1	126.3
Sodium (Na)	60.0	76.0	60.0	10.0	5.0	20.8	2.3	15.5
Potassium (K)	44.5	74.0	48.5	6.0	3.6	22.0	2.0	8.0
Magnesium (Mg)	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*
Chloride (Cl)	135	140	125	50	45	75	45	60
Color-APHA units	100	200	100	100	200	200	200	250
Turbidity - J.T.U.	18	68	26	25	237	130	180	284
Cadmium (Cd)				<.02	<.02	<.02	<.02	<.20
Chromium (Cr)				<.02	.02	.03	<.02	<.02
Copper (Cu)				<.0005	<.0005	.0006	.0005	<.00[illegible]
Zinc (Zn)				.001	.04	.004	.026	.001
Lead (Pb)				<.02	<.02	.9	.02	<.02

*BDL = Below Detectable Limits

< = Less than

Analyses of water from both the shallow aquifer and the pond collected on January 11, 1972 (table 4) showed a higher bacteriological and mineral content than normally would be found in these waters in this area. This indicates that both the ground water and surface water in the vicinity of the landfill are being affected by leachate. However, some of the analyses are anomalous. For example, the coliform count and mineral constituents were lower in water from some of the wells close to the landfills than in water from some wells farther away. In addition, most of the constituents whose presence commonly indicate the existence of leachate were low in all samples. The landfill has been in operation for only 3 years, not long enough for the leachate to completely saturate the subsurface material and it is possible that none of the constituents of diagnostic value will be detected for years.

Collecting additional samples of water from these wells, particularly the ones farthest away from the landfill, over a period of many years may help in determining the extent and nature of the leachate and also in determining the average long-term chemical composition of natural ground water.

Appendix A-5

Technical Report No. 10
Annual Water Use Survey

Technical Report No. 10

ANNUAL WATER USE SURVEY: 1979

by

Richard Marella

Agricultural Data Compiled by: Phil Leary

Water Resources Department

St. Johns River Water Management District

Palatka, Florida

July 1981

Project Number
2002303
1502303

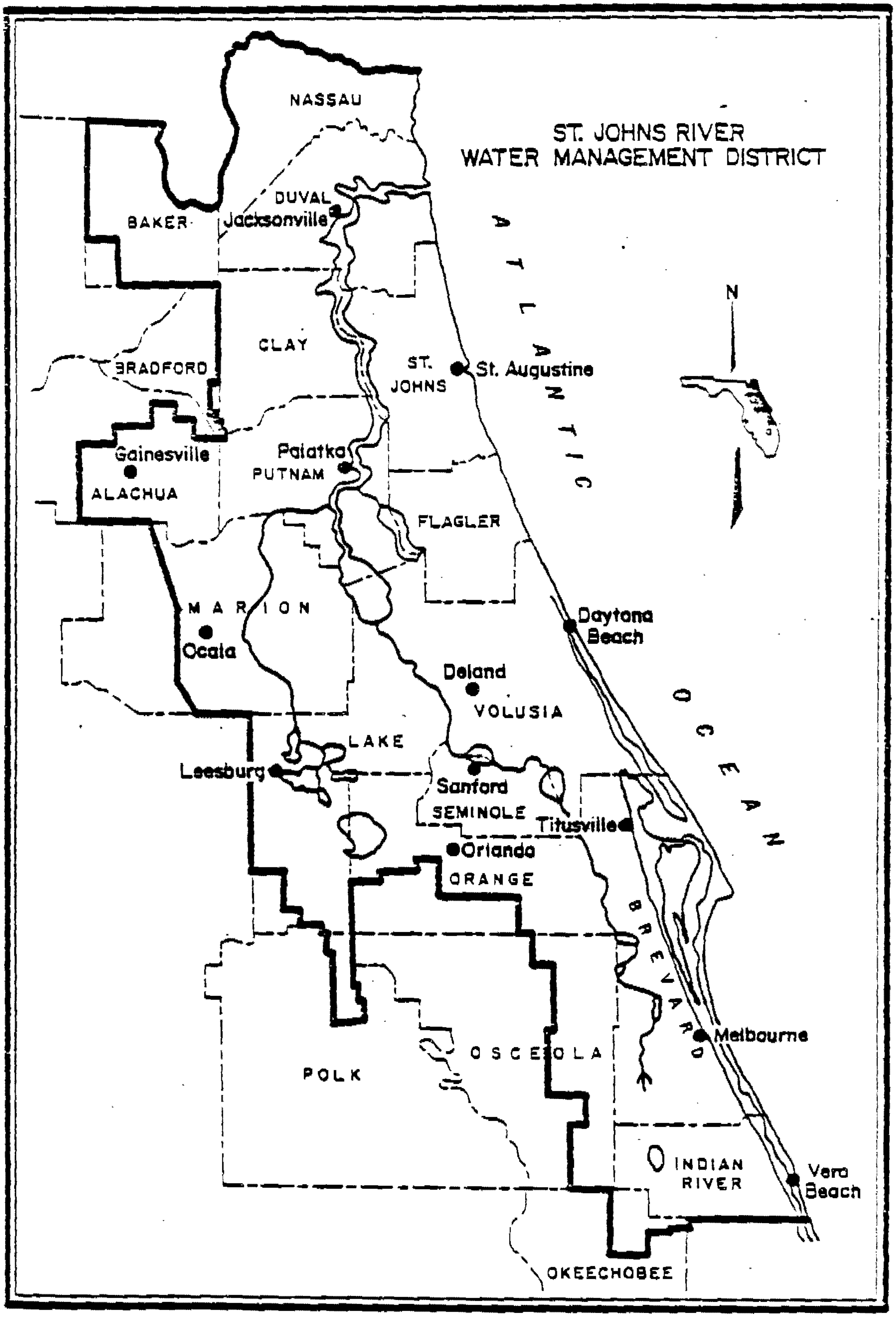


Figure 1.--St. Johns River Water Management District

TABLE 1 PUBLIC WATER USE BY COUNTY 1979

COUNTY	WATER WITHDRAWN (MGD) FRESH WATER GROUND	FRESH WATER SURFACE	FRESH WATER TOTAL	FRESH WATER PERCENT	SALINE WATER GROUND	SALINE WATER SURFACE	SALINE WATER TOTAL	1979 TOTALS (MGD)	1979 TOTALS PERCENT
ALACHUA (1)	15.04	0.0	15.04	6	0.0	0.0	0.0	15.04	6
BAKER	0.61	0.0	0.61	0 (2)	0.0	0.0	0.0	0.61	0 (2)
BREVARD	6.54	11.88	18.42	7	0.0	0.0	0.0	18.42	7
CLAY	5.24	0.0	5.24	2	0.0	0.0	0.0	5.24	2
DUVAL	63.67	0.0	63.67	25	0.0	0.0	0.0	63.67	25
FLAGLER	1.37	0.0	1.37	0 (2)	0.0	0.0	0.0	1.37	0 (2)
INDIAN RIVER	6.23	0.0	6.23	2	0.0	0.0	0.0	6.23	2
LAKE (1)	10.59	0.0	10.59	4	0.0	0.0	0.0	10.59	4
MARION (1)	5.07	0.0	5.07	2	0.0	0.0	0.0	5.07	2
NASSAU	2.32	0.0	2.32	0 (2)	0.0	0.0	0.0	2.32	0 (2)
OKEECHOBEE (1)	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0
ORANGE (1)	76.29	0.0	76.29	30	0.0	0.0	0.0	76.29	30
OSCEOLA (1)	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0
POLK (1)	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0
PUTNAM	2.55	0.0	2.55	1	0.0	0.0	0.0	2.55	1
SEMINOLE	18.78	0.0	18.78	7	0.0	0.0	0.0	18.78	7
ST.JOHNS	2.83	0.0	2.83	1	0.0	0.0	0.0	2.83	1
VOLUSIA	28.26	0.0	28.26	11	0.08	0.0	0.08	28.34	11
DISTRICT TOTAL	245.39	11.88	257.27		0.08	0.0	0.08	257.35	

1 THESE COUNTIES ARE PARTIALLY WITHIN THE SJRWMD. THE DATA GIVEN IS FOR THAT PART OF THE COUNTY WITHIN THE SJRWMD.
2 HAS A VALUE OF LESS THAN 1.0 PERCENT

TABLE 2 DOMESTIC SELF-SUPPLIED WATER USE BY COUNTY 1979

COUNTY	WATER WITHDRAWN (MGD) FRESH WATER GROUND	FRESH WATER SURFACE	FRESH WATER TOTAL	FRESH WATER PERCENT	SALINE WATER GROUND	SALINE WATER SURFACE	SALINE WATER TOTAL	1979 TOTALS (MGD)	1979 TOTALS PERCENT
ALACHUA (1)	0.82	0.0	0.82	0 (2)	0.0	0.0	0.0	0.82	0 (2)
BAKER	1.33	0.0	1.33	1	0.0	0.0	0.0	1.33	1
BREVARD	3.3	0.0	3.3	3	0.0	0.0	0.0	3.3	3
CLAY	2.49	0.0	2.49	2	0.0	0.0	0.0	2.49	2
DUVAL	46.17	0.0	46.17	42	0.0	0.0	0.0	46.17	42
FLAGLER	0.33	0.0	0.33	0 (2)	0.0	0.0	0.0	0.33	0 (2)
INDIAN RIVER	7.96	0.0	7.96	7	0.0	0.0	0.0	7.96	7
LAKE (1)	5.64	0.0	5.64	5	0.0	0.0	0.0	5.64	5
MARION (1)	7.89	0.0	7.89	7	0.0	0.0	0.0	7.89	7
NASSAU	4.09	0.0	4.09	4	0.0	0.0	0.0	4.09	4
OKEECHOBEE (1)	0.04	0.0	0.04	0 (2)	0.0	0.0	0.0	0.04	0 (2)
ORANGE (1)	5.47	0.0	5.47	5	0.0	0.0	0.0	5.47	5
OSCEOLA (1)	0.03	0.0	0.03	0 (2)	0.0	0.0	0.0	0.03	0 (2)
POLK (1)	0.71	0.0	0.71	0 (2)	0.0	0.0	0.0	0.71	0 (2)
PUTNAM	7.16	0.0	7.16	7	0.0	0.0	0.0	7.16	7
SEMINOLE	7.57	0.0	7.57	7	0.0	0.0	0.0	7.57	7
ST.JOHNS	2.73	0.0	2.73	2	0.0	0.0	0.0	2.73	2
VOLUSIA	5.94	0.0	5.94	5	0.0	0.0	0.0	5.94	5
DISTRICT TOTAL	109.67	0.0	109.67		0.0	0.0	0.0	109.67	

1 THESE COUNTIES ARE PARTIALLY WITHIN THE SJRWMD. THE DATA GIVEN IS FOR THAT PART OF THE COUNTY WITHIN THE SJRWMD.
2 HAS A VALUE OF LESS THAN 1.0 PERCENT

Appendix A-6

NAS Jacksonville
Water Well Permit Information

Joe & Jim

CONSOLIDATED CITY OF JACKSONVILLE
STATE OF FLORIDA
BIO-ENVIRONMENTAL SERVICES DIVISION
AIR, WATER, NOISE POLLUTION CONTROL AND
WATER CONSERVATION ACTIVITY
515 W. 6th STREET TEL: 633-3318

NOTICE TO CORRECT SOURCE OF POLLUTION/VIOLATION

TO: U. S. Navy
N. A. S.
Jacksonville Fla.

This Notice Is to Inform You That On Or About The 6 of June, 1979 An Inspection Was Made By This Department And A Violation of Section(s)

625.302

OF CITY ORDINANCE(S) AND/OR STATE RULES 74-867-523 Sec 1; 76-186-153, Sec. 6

Was Found to be in Existence On or From Your Premises For the Following Reason(s)

construction of well without a permit

You Are Hereby Notified To Correct This Violation No Later Than The 20th day of June, 1979. Legal Action May Be Instituted Against You For Failure To Comply.

Correction of This Source Of Pollution/Violation And Compliance With the Terms of This Notice Does Not Relieve You Of Any Liability To Civil Or Criminal Actions That May Accrue Or Have Accrued Against You For The Alleged Acts Sought To Be Corrected By This Notice.

FOR THE CITY OF JACKSONVILLE, FLORIDA
BIO-ENVIRONMENTAL SERVICES DIVISION
AIR, WATER, NOISE POLLUTION CONTROL AND
WATER CONSERVATION ACTIVITY

Samuel R. Alberti, Engr. Tech.
Name and Title

Received by William P. Rorle Date: 6 June 1979

B135 B
1C-1)

WATER SUPPLY SOURCE, NAS Jacksonville, Fla.

March 1971

Well #	Location	Dia."	Depth-ft.	Freeflow,GPM	Remarks
1.	Wtr.Plt.#1,Bldg.#127	8	708	613 - 150	Original Well(Not in Use)
2.	Wtr.Plt.#1,Bldg.#127	12	1005	3500 - 600	Flow with Booster Pump 2000 GPM
3.	Wtr.Plt.#1,Bldg.#127	12	998	3300	Flow with Booster Pump 1950 GPM
4.	Wtr.Plt.#2,Bldg.#640	12	1015	3800 - 400	Flow with Booster Pump 2000 GPM
5.	Wtr.Plt.#3,Bldg.#3900	12	988	1250	-
6.	Hosp.Wtr.Plt.Bldg.#H-2050	12	646	1200	-
7.	Strhse #164(Ck.to Sys)Pump Hse.1913	10	1096	1700	-
8.	CasaLindaLake(Aux)	6	500	500	-
9.	Hosp.Mustin Rd.(Sprinklers)	6	498	1000	-
10.	W.S.Sew.Plt,Bldg.#150	6	120	50	Pump
11.	Salvage Yd.(Area)	8	400	800	Height Approx. 10'
12.	Radio Tower (Area)	4	407	300	-
13.	Cold Strg.,Bldg.#135	6	144	45	Pump
14.	S.Boundary(Not Used)(Not Located)	6	400	300	-
15.	C.P.O.Club (Not Used)	4	400	300	-
16.	Yukon (Not in Sys.)	4	400	300	-
17.	Highway (Not Used)	3	400	300	-
18.	Hosp.(Capped)	6	400	300	-
19.	Rawin Bldg.#201	2	101	575 - 600 GPH	With Pump

WATER CONSERVATION PROGRAM
WATER WELL FIELD INSPECTION REPORT

10957 Complaint No. | TWUP No. | 78-157 Construction/Plugging Permit No. | 1-1872 Well Inventory No.

Is Well Free Flowing? Yes ___ No ✓

Owner Robert Hancock Phone

Owner's Address 4316 Lucera Rd

Well Location Address 4316 Lucera Rd.

Well Drilling Contractor Partridge Well Drilling Co. License/Bond No. 1005

Site Identification: 30 14 36 081 47 44 01 Lat/Long (if different) 30 ___ 081 ___ 01

NW 1/4 SW 1/4 NW 1/4 15 Section 3S TWP 26E Range ORANGE PARK Quad Map Name

Depth of Hole Drilled 504 Depth of Well 504 How Measured BW 2

Diameter/Cross Section 3" x 2" Depth of Casing 405

Depth and Diameter of Well Segments: 5 " from LSD to 137

3 " Dia. from 137 ' to 405 ' 2 " Dia. from 405 ' to 504 '

Depth and Diameter of Casing Segments: 3 " Dia. from 0 ' Above Below LSD

To: 137 ' 2 " Dia. from 132 ' to 425 .

Type and Quantity of Grouting Used Cement 6 bags Well Centered in Grout?

Use of Well Irrigation No. of People Served

Water Level ___ Above Below LSD Measuring Pt. ___ ' Above Below LSD

How Measured ___ Measured by ___ Date ___

Method of Construction Hydraulic Rotary Date of Construction 6/12/78

Condition of Casing/Liner Pipes (wall thickness 0.125" min. new, used, etc.)

New

Casing Material Used Galv. Steel

Altitude 5 Interval 5

Topo Setting FLAT

Distance to Closest Well of 3" Diameter or Over and/or Depth of 250' or Deeper if Closer than 300' ______

Distance to nearest Contaminant - Septic Tank, etc., if Less than 100' ______

Maximum Well Yield ______ GPM Average Well Yield ______ GPM

Free Flowing Well Yield ______ GPM How Yield Determined ______

Frequency of Well Use 24 Hrs/Day 365 Days/Year

Pump Data - Type and Make ______ HP ______

Pump Capacity ______ GPM No. Bowls or Stages ______

Type of Power ______ Static Water Level ______

Production Water Level ______ Pump Intake Setting ______
= Depth of Section Line

Water Sampled for: Dissolved Solids ______ Conductivity ______

Hardness ______ Chlorides ______ PH= ______ Temperature ______

General Rating: Poor ______ Average ______ Good ______ Excellent ______

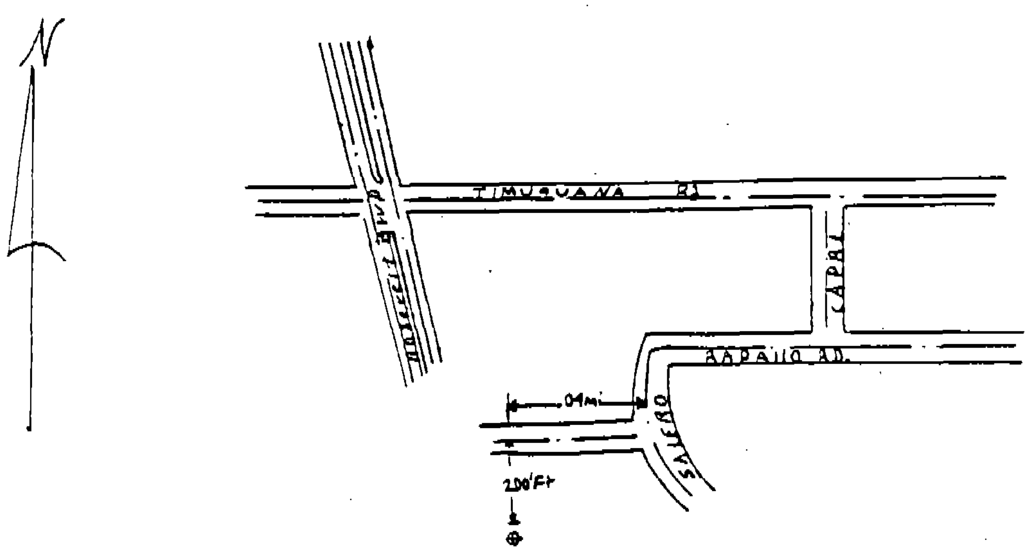
Action Taken/Comments ______

______

______

Follow Up Needed ______

Inspector's Name S. L. Alberti Field Inspection Date 7/27/78



DEPARTMENT OF ENVIRONMENTAL REGULATION

WELL COMPLETION REPORT

TYPE OF WORK: [ ] Construction [ ] Repair [ ] Deepening [ ] Plugging [ ] Other

PERMIT NUMBER:

WELL NUMBER

OWNER: Last Name / First Name / Initial

Number / Street

City / State

Area Code / Phone Number / Zip Code

WELL LOCATION: ¼ ¼ ¼ of Section

Township (N-S) Range (E-W)

Latitude Deg. Min. Sec. N

Longitude Deg. Min. Sec. W

Locate in Section

Number / Street-Road

Lot No. / Subdivision

City / County

OWNER WELL NUMBER OR NAME:

DRILL METHOD: [ ] Rotary [ ] Cable Tool [ ] Jet [ ] Auger [ ] Other:

SURFACE CASING, CASING, AND LINER MATERIAL:

Steel Dia. (In.) Black	Galv.	S. Steel	Steel Wt. lb./ft.	Dia. (In.) PVC	Other	From (Ft.)	To (Ft.)	Schedule No.	Joints*

† Describe Material:

* TC = Threaded and Coupled, TCW = Threaded, Coupled, and Welded, W = Welded, B = Bonded (PVC), O = Other:

GROUT: [ ] None [ ] Neat Cement [ ] Other:

Type and Percent of Additives and Grout Volume or Number of 94 lb. Sacks	From (Ft.)	To (Ft.)

FINISH: [ ] Open Hole [ ] Perforated or Slotted Casing [ ] Gravel Pack [ ] Sandpoint or Screen Attached to Well Casing [ ] Sandpoint or Screen Telescoped with Packer Inside Casing (Packer Material:)

Sandpoint/Screen Material	Dia. (In.)	Slot Size (In.)	From (Ft.)	To (Ft.)

[ ] Other Finish:

QUALITY TEST: [ ] None [ ] Bacteria Date [ ] Chemical Date

By: [ ] Health Dept. [ ] USGS [ ] Other

[ ] Clear [ ] Colored [ ] Sulphur [ ] Salty [ ] Iron [ ] Other

Conductance (Micromhos) Chloride ppm

Hardness ppm as calcium carbonate pH Temp °F

Well Disinfected: [ ] No [ ] Yes (Date)

WELL TEST, By: [ ] Natural Flow G.P.M. [ ] Airlift [ ] Bailer [ ] Permanent Pump [ ] Test Pump [ ] None

Discharge Measured By: [ ] Bailer [ ] Estimated [ ] Current Meter [ ] Orifice [ ] Trajectory [ ] Venturi [ ] Volumetric [ ] Other

Measured Static Water Level Ft.

Measured Pumping Water Level Ft.

After Hours At G.P.M.

Specific Capacity G.P.M./Ft. of Drawdown

Measuring Pt. (Describe):

Which is Ft. [ ] Above [ ] Below Land Surface

Elevation of Measuring Pt. = Ft. [ ] Above [ ] Below MSL

WELL EQUIPMENT: [ ] Open [ ] Capped [ ] Valved [ ] Permanent Pump [ ] Temporary Pump

Type Pump: [ ] Centrifugal [ ] Cylinder [ ] Jet [ ] Submersible [ ] Turbine [ ] Other

Power: [ ] Diesel [ ] Electric [ ] Gasoline [ ] Other

Horsepower Capacity G.P.M.

Intake/Injection Depth Ft.

TYPE OF WELL: [ ] Water Well [ ] Test Well [ ] Recharge Drainage [ ] Waste Disposal [ ] Observation [ ] Other

USE: [ ] Domestic [ ] Irrigation [ ] Industrial [ ] Livestock [ ] Public Supply [ ] Other

SKETCH LOCATION OF WELL in relation to local landmarks, giving distance and direction from nearest town, road, or other reference point.

North

GEOPHYSICAL LOGS: Type: By

WELL LOG

Bore Hole (In.)	Casing Size (In.)	Depth (Ft.) From	To	Examine cuttings at 20 ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
				6.3 lbs. psi

JUL 17 1978

Total Depth Ft. Producing Zone Material: [ ] Sand [ ] Shell [ ] Broken Shell [ ] Limestone [ ] Other:

Top of Producing Zone Ft., Bottom of Producing Zone Ft.

[ ] Drill Cuttings Sent to Bureau of Geology

License No. Contractor Signature Position

Completion Date Driller Signature

DER Form PERM 13-10 (Oct 77)

WATER WELL FIELD INSPECTION REPORT

11200 — Complaint No.
TWUP No.
79-11 — Construction/Plugging Permit No.
J-2636 — Well Inventory No.

Is Well Free Flowing? ____ Yes ✓ No

Owner John Everett Phone 264-7921

Owner's Address 8335 Malaga Ave

Well Location Address 8335 Malaga Ave

Well Drilling Contractor Partridge Well Co License/Bond No. 1665

Site Identification: 30 11 43 081 41 24 01 Lat/Long (if different) 30 11 43 081 41 24 01

LNE GRT ____ 1/4 1/4 1/4 Section; 3S TWP; 26E Range; Green Park Fl Quad Map Name

Depth of Hole Drilled 378 Depth of Well 378 How Measured BW2

Diameter/Cross Section 3x2 Depth of Casing 273

Depth and Diameter of Well Segments: 5 " from LSD to 26

3 " Dia. from 26 ' to 273 ' 2 " Dia. from 273 ' to 378 '

Depth and Diameter of Casing Segments: 3 " Dia. from .50 ' (Above) Below LSD

To: 42 ' 2 " Dia. from 35 ' to 273.

Type and Quantity of Grouting Used Cement Well Centered in Grout? ____

Use of Well Domestic No. of People Served ____

Water Level 24.95 (Above) Below LSD Measuring Pt. .50 ' (Above) Below LSD

How Measured Pressure Gage Measured by Albertie Date 1/30/79

Method of Construction Hydraulic Rotary Date of Construction ~~[illegible]~~ 79

Condition of Casing/Liner Pipes (wall thickness 0.125" min. new, used, etc.) 1/23/79

New

Casing Material Used Galv Steel

Altitude 40' Interval 5 [illegible]

Topo Setting Hillside

Distance to Closest Well of 3" Diameter or Over and/or Depth of 250' or Deeper if Clos than 300' ______

Distance to nearest Contaminant - Septic Tank, etc., if Less than 100' ______

Maximum Well Yield ______ GPM Average Well Yield ______ G

Free Flowing Well Yield 71.5 GPM How Yield Determined Traj

Frequency of Well Use 24 Hrs/Day 365 Days/Year

Pump Data - Type and Make Jacuzzi HP .5

Pump Capacity ______ GPM No. Bowls or Stages ______

Type of Power Electric Static Water Level ______

Production Water Level ______ Pump Intake Setting ______
= Depth of Section Line

Water Sampled for: Dissolved Solids ______ Conductivity ______

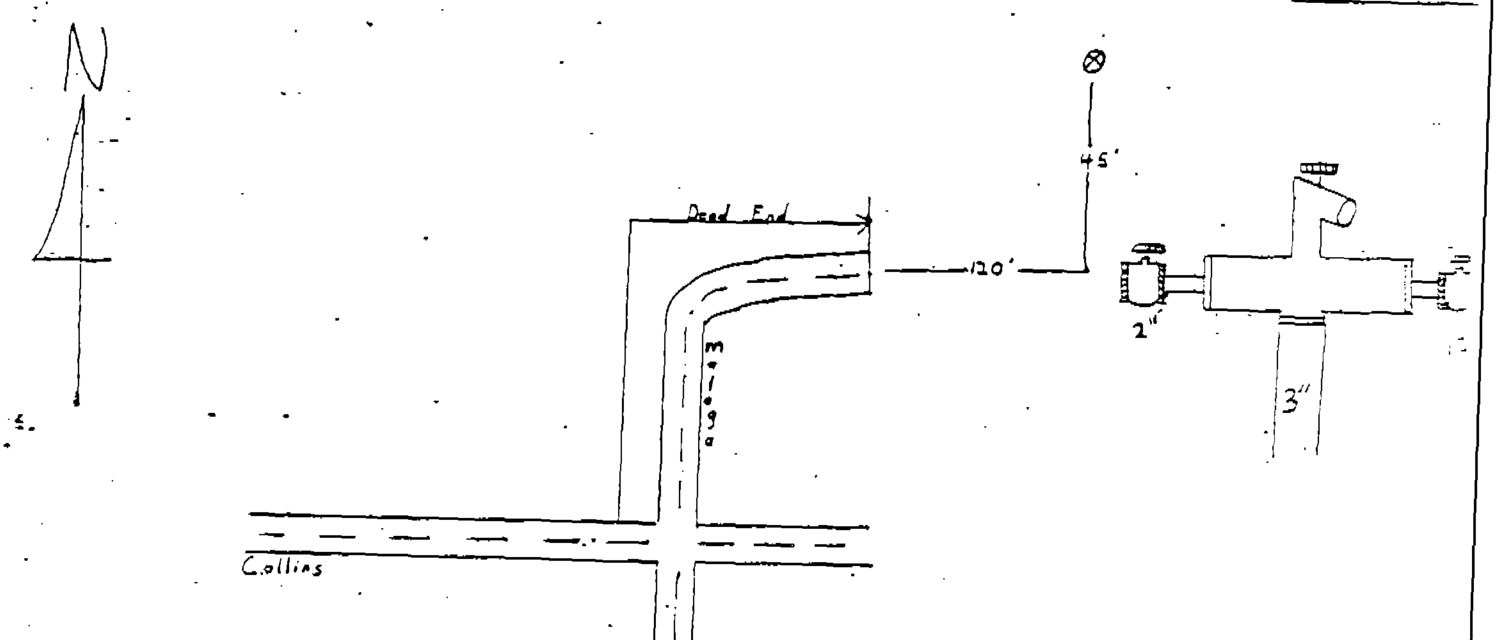
Hardness ______ Chlorides ______ PH= ______ Temperature ______

General Rating: Poor ______ Average ______ Good ______ Excellent ______

Action Taken/Comments ______

Follow Up Needed ______

Inspector's Name Sl Alberti Field Inspection Date 1/30/79



79-11

2036

WELL NUMBER

OWNER

Last Name | First Name | Initial

Number | Street

City | State

Area Code | Phone Number | Zip Code

WELL LOCATION:

¼ ¼ ¼ of Section

Township (N-S) Range (E-W)

Latitude Deg. Min. Sec. N

Longitude Deg. Min. Sec. W

Locate in Section

Number | Street/Road

Lot No. | Subdivision

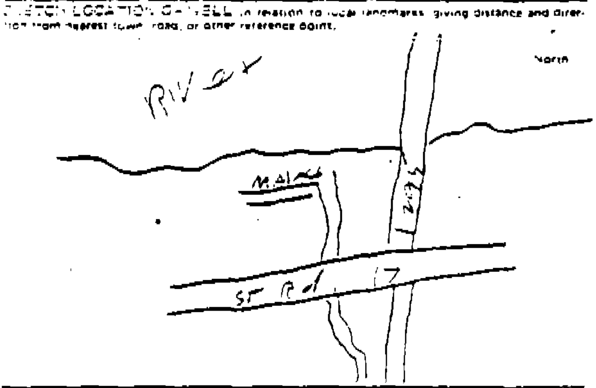
City | County

OWNER WELL NUMBER OR NAME:

TYPE OF WELL: [ ] Water Well [ ] Test Well [ ] Recharge [ ] Drainage [ ] Waste Disposal [ ] Observation [ ] Other

USE: [ ] Domestic [ ] Irrigation [ ] Industrial [ ] Livestock [ ] Public Supply [ ] Other

SKETCH LOCATION OF WELL in relation to local landmarks, giving distance and direction from nearest town, road, or other reference point.



DRILL METHOD: [ ] Rotary [ ] Cable Tool [ ] Jet [ ] Auger [ ] Other:

SURFACE CASING, CASING, AND LINER MATERIAL:

Steel Dia. (In.) Black	Galv.	S. Steel	Steel Wt. (lb./Ft.)	Dia. (In.) PVC	Other†	From (Ft.)	To (Ft.)	Schedule No.	Joints*
	3"					0	42		
	2"					39	273		

† Describe Material:

* TC = Threaded and Coupled, TCW = Threaded, Coupled, and Welded, W = Welded, B = Bonded (PVC), O = Other:

GROUT: [ ] None [ ] Neat Cement [ ] Other:

Type and Percent of Additives and Grout Volume or Number of 94 lb. Sacks	From (Ft.)	To (Ft.)
2 bags		

FINISH: [ ] Open Hole [ ] Perforated or Slotted Casing [ ] Gravel Pack [ ] Sandpoint or Screen Attached to Well Casing [ ] Sandpoint or Screen Telescoped with Packer Inside Casing (Packer Material):

Sandpoint/Screen Material	Dia. (In.)	Slot Size (In.)	From (Ft.)	To (Ft.)

[ ] Other Finish:

QUALITY TEST: [ ] None [ ] Bacteria Date [ ] Chemical Date

By [ ] Health Dept. [ ] USGS [ ] Other

[ ] Clear [ ] Colored [ ] Sulphur [ ] Salty [ ] Iron [ ] Other

Conductance (Micromhos) Chloride ppm

Hardness: ppm as calcium carbonate pH Temp °F

Well Disinfected: [ ] No [ ] Yes (Date)

WELL TEST, by: [ ] Natural Flow G.P.M. [ ] Airlift [ ] Bailer [ ] Permanent Pump [ ] Test Pump [ ] None

Discharge Measured By: [ ] Bailer [ ] Estimated [ ] Current Meter [ ] Orifice [ ] Trajectory [ ] Venturi [ ] Volumetric [ ] Other

Measured Static Water Level Ft.

Measured Pumping Water Level Ft.

After Hours At G.P.M.

Specific Capacity G.P.M./Ft. of Drawdown

Measuring Pt. (Describe):

Which is Ft. [ ] Above [ ] Below Land Surface

Elevation of Measuring Pt. = Ft. [ ] Above [ ] Below MSL

WELL EQUIPMENT: [ ] Open [ ] Capped [ ] Valved [ ] Permanent Pump [ ] Temporary Pump

Type Pump: [ ] Centrifugal [ ] Cylinder [ ] Jet [ ] Submersible [ ] Turbine [ ] Other:

Power [ ] Diesel [ ] Electric [ ] Gasoline [ ] Other

Horsepower Capacity G.P.M.

Intake/Injection Depth Ft.

DER Form PERM 13-10 (Oct 77)

GEOPHYSICAL LOGS: Type: By.

WELL LOG

Bore Hole (In.)	Casing Size (In.)	Depth (Ft.) From	To	Examine cuttings at 20 ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities, indicate producing zones. Attach additional sheets if necessary.
5"	3"	0	17	Sand
		17	26	Rock
5½"	3½"	26	87	white marl
		87	90	Green Rock
		90	178	Green Clay
		178	243	Greenish Sand
		243	270	sticky Green clay
		270	273	Tan Rock
		273		Lime Stone
1¾				
			328	Bottom

Total Depth 328 Ft. Producing Zone Material [ ] Sand [ ] Shell [ ] Broken Shell [ ] Limestone [ ] Other

Top of Producing Zone 273 Ft., Bottom of Producing Zone 328 Ft.

[ ] Drill Cuttings Sent to Bureau of Geology

1065

License No. | Contractor Signature | Position

11 23 79

Completion Date | Driller Signature

WATER WELL FIELD INSPECTION REPORT

Complaint No. ______ TWUP No. ______ Construction/Plugging Permit No. ______ J-2523 Well Inventory

Is Well Free Flowing? ______ Yes ✓ No

Owner Mobile Living of Jacksonville (Azalea Terrace) Phone 772-6900

Owner's Address ______

Well Location Address 6301 Roosevelt Blvd

Well Drilling Contractor ______ License/Bond No. ______

Site Identification: 30 1405 081 4148 01 Lat./Long (if different) 30 ______ 081 ______ 01

SW 1/4 SW 1/4 SW 1/4 Section 15 TWP 3S Range 26E Quad Map Name Orange Park

Depth of Hole Drilled ______ Depth of Well ______ How measured ______

Diameter/Cross Section ______ Depth of Casing ______

Depth and Diameter of Well Segments: ______" from LSD to ______'

______" Dia. from ______' to ______' ______" Dia. from ______' to ______

Depth and Diameter of Casing Segments: ______" Dia. from ______' Above/Below LSD

To: ______' ______" Dia. from ______' to ______.

Type and Quantity of Grouting Used ______ Well centered in Grout? ______

Use of Well Public Supply Number of People Served ______

Water Level ______ Above/Below LSD Measuring Pt. ______' Above/Below LSD

How Measured ______ Measured by ______ Date ______

Method of Construction ______ Date of Construction ______

Condition of Casing/Liner Pipes (wall thickness 0.125" min. new, used; etc.)

______

Casing Material Used ______

Altitude 10 Interval 5

Topo Setting Flat

Distance to Closest Well of 3" Diameter or Over and/or Depth of 250' or Deeper if closer than 300' ______

Distance to nearest Contaminant - Septic Tank; etc., if less than 100' ______

Maximum Well Yield ______ GPM Average Well Yield ______ GPM

Well Yield ____________ GPM How Yield Determined ____________

Frequency of Well Use ____________ Hrs/Day ____________ Days/Year

Pump Data - Type and Make ____________ HP ____________

Pump Capacity ____________ GPM No. Bowls or Stages ____________

Type of Power ____________ Static Water Level ____________

Production Water Level ____________ Pump Intake Setting ____________
= Depth of Section Lif

Water Sampled for: Dissolved Solids ____________ Conductivity ____________

Hardness ________ Chlorides ____________ PH= ____________ Temperature ________

General Rating: Poor ______ Average ______ Good ______ Excellent ______

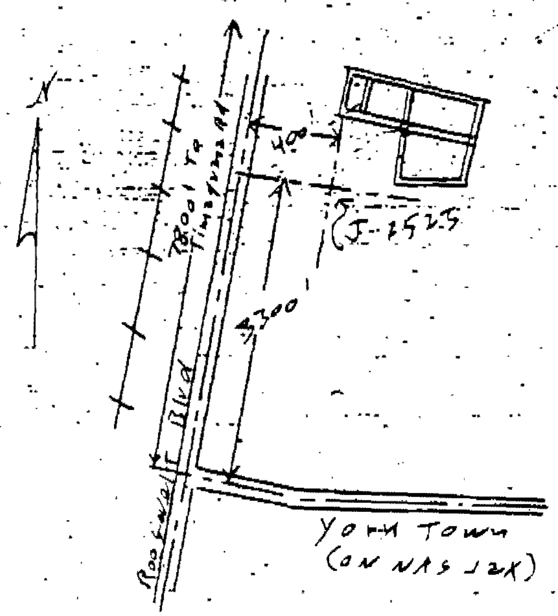
Action Taken/Comments ____________

____

____

Follow Up Needed ____________

Inspector's Name ____________ Field Inspection Date ____________



	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
BACT. SAMP.													
CHEM. ANAL													
MGR. REP.													
TOTAL Q		.422	.529		.804	.802	.787	.798	.744	.757	.708	.678	
DAILY Q MAX		.019	.021		.029	.030	.027	.028	.028	.029	.025	.026	
DAILY Q MIN		.010	.012		.022	.024	.025	.024	.022	.022	.021	.019	
DAILY Q AVG		.015	.017		.026	.027	.025	.026	.025	.025	.024	.023	
AVG pH		7.2	7.1		7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
LBS Cl_2		253	305		49.8	41.5	45.7	50	45.7	41.5	37.4	41.5	
Cl_2 PPM		7.2	8.4		7.5	6.2	7	7.5	7.4	6.6	6.4	7.4	
Cl_2 MAX		1.2	1.0		1.8	2.4	2.5	1.8	1.2	3.0	1.6	1.6	
Cl_2 MIN.		0.6	0.6		0.0[1]	0.6	0.0[2]	.02	0.2	0.0[3]	0.0[2]	0.6	
COMM SECC'D		[illegible]	[illegible]		40	40	45 [illegible]	EPO 40	EPO 40	EPO 40	EPO 40	EPO 40	

Azalia MHP

DATE 1981

EPA ID. No. 2161329

State of Florida
Department of Environmental Regulation
SANITARY SURVEY REPORT
for
Drinking Water Systems

Inspection date: 5/19/82

I. GENERAL

Plant name Azalea MHP County Duval

Plant owner Joel S. Heffron Person contacted

Plant address 5301 Roosevelt Blvd Operator certification no. Enviro Services

City Jacksonville Zip 32244 Phone no. 772-6900 Basin code 20

Population Served 240 No. of service connections 90

Type of Service community Type of meter at plant & capacity in-line

Percent or no. of meters -0- Plant designed by

Plant capacity (design) .084MGD Plant output, average (MGD)

Storage capacity (design) 4200 Maximum hour (1000's gals.)

Approval no. and date - Emergency water source none

Daily maximum (MGD) Standby equipment none

Emergency power source N/A Capacity N/A

TYPE OF SERVICE [XX] Community [ ] Non-community

[ ] Municipal
[ ] Recreation area
[XX] Trailer park
[ ] Restaurant
[ ] Subdivision
[ ] Institution
[ ] College or school
[ ] Industrial plant
[ ] Common carrier
[ ] Motel or hotel
[ ] Other

II. SOURCE(S) OF RAW WATER SUPPLY [XX] Ground; Number of wells [1] [ ] Surface; Purchased [ ]

A. Ground supplies; (Attach sketch of well(s) in relation to plant location on separate sheet.)

Well no. (if more than 5, attach extra sheets)	1	2	3	4	5
Year drilled					
Depth drilled	600+				
Length, outside casing					
Diameter, outside casing	6"				
Material, outside casing	steel				
Depth to static water level					
Normal suction lift (working level)					
Normal yield in GPM					
Test yield in GPM Free Flowing					
Type of strainer used					
Depth to top of strainer					
Is well subject to inundation?	no				
Is well protected against surface water?	yes				
Salt water infiltration problems in past?	no				
Latitude					
Longitude					
Check valve					
Grouted					
Has well ever been contaminated?	no				
Pump manufacturer's name	centrif.				
Date manufactured					
Model number					
Capacity	60gpm				
Last serviced (date)					
Comment HP	3				
Maint. schedule (day, week, month, etc.)					

RADIOCHEMICAL ANALYSIS OF DRINKING WATER

PWS ID	Public Water System: Name and Address	Send Results to: Name and Address
1 1 6 1 3 2 9	Azalea Mobile Home Park 6301 Roosevelt Blvd. Jax. Fla	Public Health Division Sanitary Engineering Branch 515 W. 6th St. Jax Fla.

Contaminant ID	CONTAMINANT NAME	ANALYSIS METHOD	ANALYSIS RESULTS	ANALYSIS ERROR	ANALYSIS DATE MO.	DAY	YR.	SAMPLE ANALYZED BY
4 0 0 0	Gross Alpha	4 0 1	< 1.0 *		0 9	0 4	8 0	K. Taylor

SAMPLE PRESERVATION	
HNO_3	X ← NONE
HCl	
Other Specify	
Lab Specify	

*ACID ADDED IN LAB

LAB #
612

One year composite

LOCATION CODE	LOCATION NAME	SAMPLE DATE MO.	DAY	YR.	SAMPLE TYPE	SAMPLE TIME	LAB ID	LAB NAME	SAMPLE COLLECTED BY:
							1 3 1 3 6	DHRS	

Prepared By ______________________ Date ___/___/___

Approved By ______________________ Date ___/___/___

SAMPLE TYPE KEY
C. Check Sample
D. Regular Distribution Sample
P. Plant Tap Sample
R. Raw Water Sample
S. Special Sample

HRS Form 1124 May 1979

(1)

Department of Health and Reh[illegible]itative Services
Office of Laboratory Services
P. O. Box 210
Jacksonville, Florida 32231

DRINKING WATER CHEMICAL ANALYSIS

Submitting Age[illegible]: ~~SOUTHERN GULF UTILITIES INC~~
Address: 5503 WESCONNETT BLVD.
~~P. O. BOX 7201~~
JACKSONVILLE, FLA. 32210

System Name: ORTEGA HILLS
County: DUVAL
Collector: [illegible]
Address: GREENWAY DR.
System I.D. No.: 216035[illegible]
DER District:
Sample Site: 5150 OAKSIDE DR
Raw or Treated: TREATED
Temperature:
Date and Time Collected: 4-20-82 - 9:00 AM
Field Chlorine, mg/l: 0.8
Field pH: 7.4

Circle one: 40. (Community public water system) 41. Non-community public water system 42. Other public water system 43. Private water system

Circle one: 1. (Compliance) 2. Recheck 3. Other (indicate below parameters to be tested for items 2 or 3).

PRIMARY STANDARDS			SECONDARY STANDARDS			GENERAL	
PARAMETER	METHOD†	RESULT**	PARAMETER	METHOD†	RESULT**	PARAMETER	RESULT**
Arsenic as As		BDL	Chloride as Cl		18	Total Hardness as $CaCO_3$ (c)	173
Barium as Ba		BDL	Color*		5 *	Total Alkalinity as $CaCO_3$	97 *
Cadmium as Cd		BDL	Copper as Cu		BDL	N.C.H. as $CaCO_3$ (c)	76
Chromium as Cr		BDL	Corrosivity*			Bicarbonate as HCO_3 (c)	118
Lead as Pb		BDL	Foaming Agents		BDL *	Calcium as Ca	38
Mercury as Hg		BDL	H_2S			Magnesium as Mg	19
Selenium as Se		BDL	Iron as Fe		.31	Carbon Dioxide as CO_2 (c)	3
Silver as Ag		BDL	Manganese as Mn		BDL	Bicarbonate as $CaCO_3$ (c)	97
Nitrate as N		.03	Odor*		BDL *	Carbonate as $CaCO_3$ (c)	0
Fluoride as F		.41	pH*		7.84*	Hydroxide as $CaCO_3$ (c)	0
Turbidity,* NTU		2.4	Sulfate as SO_4		54	Sodium as Na	BDL
			TDS		219		
Endrin			Zinc as Zn		BDL	pHs* (c)	7.95
Lindane						Stability Index* 2pHs-pH (c)	8.05
Methoxychlor						Saturation Index* pH-pHs (c)	-.10
Toxaphene						INTERPRETATION: (Stable)	
2, 4-D						Corrosive	
2, 4-5 TP Silvex						Scale Forming	
Trihalomethanes			DER reviewer:				
			Action required:				

Note: *All results in mg/liter except those denoted
†List of methods available on request

(c) = Calculated value
**BDL = Below detection limit, see reverse side

Date and Time Received: 4/20/82 3:55 PM

Laboratory I.D. No.: 12001

Date Reported: 6/1/82

Remarks: * These Parameters exceeded the 24 hour holding [illegible]

Analysts: Robert L. Sullivan

Received JUN 10 1982 Sanitary Engineering Branch

HRS Form 1125, May 79 (Obsoletes HRS(TEST) Form 32)

RADIOCHEMICAL ANALYSIS OF DRINKING WATER

PWS ID	Public Water System: Name and Address	Send Results to: Name and Address
	Ortega Hills WTP	

Contaminant ID	CONTAMINANT NAME	ANALYSIS METHOD	ANALYSIS RESULTS	ANALYSIS ERROR	ANALYSIS DATE MO.	DAY	YR.	SAMPLE ANALYZED BY
4000	gross Alpha	401	6 1.0					

SAMPLE PRESERVATION	
HNO₃	
HCl	
Other Specify	
Lab. Specify	

LAB #

LOCATION CODE	LOCATION NAME	SAMPLE DATE MO.	DAY	YR.	SAMPLE TYPE	SAMPLE TIME	LAB ID	LAB NAME	SAMPLE COLLECTED BY:

Prepared By ________________ Date __/__/__

Approved By ________________ Date __/__/__

SAMPLE TYPE KEY
- C. Check Sample
- D. Regular Distribution Sample
- P. Plant Tap Sample
- R. Raw Water Sample
- S. Special Sample

HRS Form 1124 May 1979

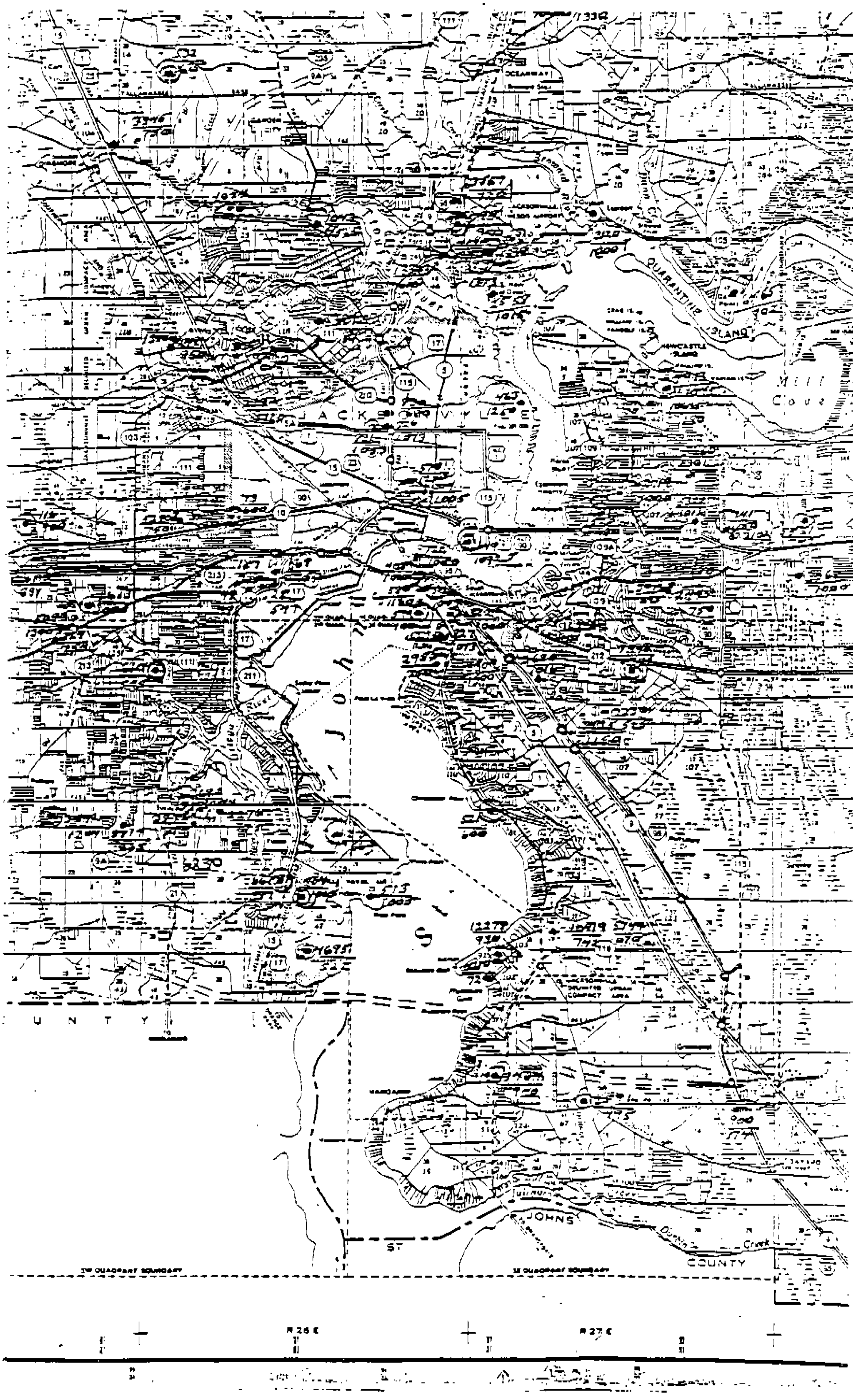
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
BACT. SAMP.													
CHEM. ANAL.													
MON. REP.													
TOTAL Q	[illegible]	2.903	2.888	2.671	4.327	5.852	3.798	3.839	5.768	3.760	2.880	2.654	
DAILY Q MAX	[illegible]	.145	.098	.094	.146	.201	.129	.129	.198	.126	.101	.091	
DAILY Q MIN	[illegible]	.134	.068	.085	.135	.181	.117	.119	.186	.116	.091	.081	
DAILY Q AVG	[illegible]	.140	.093	.089	.140	.195	.123	.124	.192	.121	.096	.086	
AVG pH	[illegible]	7.4	7.4	7.5	7.5	7.4	7.5	7.5	7.4	7.5	7.5	7.5	
LBS Cl_2	[illegible]	244	270	303	354	376	341	293	326	296	267	252	
Cl_2 PPM	[illegible]	8	11	14	10	8	10.8	9.2	6.8	9.5	11.2	11.4	
Cl_2 MAX	[illegible]	1.8	1.7	1.8	1.9	1.8	1.8	1.7	1.7	1.8	1.7	1.6	
Cl_2 MIN.	[illegible]	1.0	1.4	1.4	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.2	
CONN. SERV'D		[illegible]	[illegible]	[illegible]	[illegible]		453	454	452	407	445	446	

ORTEGA HILLS

DATE 1981

Appendix A-7

Florida Bureau of Geology Geologic Logs from Deep Wells in the Vicinity of NAS Jacksonville


JACKSONVILLE
QUARANTINE ISLAND
Mill Cove
JOHNS
COUNTY
SW QUADRANT BOUNDARY
SE QUADRANT BOUNDARY
R 26 E
R 27 E

INTER-OFFICE CORRESPONDENCE SHEET
SUN OIL COMPANY

W-27
(Monsour)

Subject:

Date: May 6, 1940

Office: Florida

From: Emil Monsour

To: Dr. F. H. Lahee
Box 2880 Sun Oil Company
Dallas, Texas

Dear Sir:

Samples from W-27 Timuquana Country Club, south of Ortega, Elev. 10', Duval County, Florida, have been examined. Determinations are as follows:

400	Cutting	Top Ocala
630-640		No sample (635' is being used as top Coskinolina Zone.)
640	"	Light to medium honey brown, fossiliferous, fine grained, crystalline dolomite. Coskinolina cookei, Dictyoconus codon, Lituonella.

The surveys files have been checked for wells in Pasco, Hernando, and Citrus counties. The only available well is 274, U. S. Dept. of Agriculture Chinsegut Hill Experiment Station, Elev. 256', Sec. 36, T21S, R19E, 5 miles north of Brooksville in Hernando County, Florida. Samples have been examined. Determinations are as follows:

197-200	Cutting	Top Ocala. Contains typical Ocala forams and Coskinolina cookei.
360-375	"	Top Coskinolina Zone. Light honey brown, fossiliferous very fine grained to compact, crystalline dolomite. Coskinolina Cookei, Lituonella, Dictyoconus codon.

Additional samples from W-3, Dundee Petroleum Co., Elev. 75', Sec. 36, T20S, R22E, 4 miles NE of Bushnell in Sumter County, Florida, have been examined. Determinations are as follows:

1027	Cutting	First Eponides of cf. yeguaensis noted.
1052	"	First Dictyoconus gunteri noted.
1787-1845		No samples
1845	"	Yellowish white to pale yellow, hard, non-fossiliferous, very fine grained dolomite. First appearance of small capsule-shaped, very fine grained concretions.
1865	"	Yellowish white to dark gray, hard, porous, non-fossiliferous very fine grained dolomite. Dark brown capsule-shaped concretions (Differs from above only in color).
2250	"	First Borelis noted. Grayish white to dark gray, hard fossiliferous dolomite.

OWNER: Timuquana Country Club
LOCATION: South of Ortega, Jacksonville Sec. 15, T3S, R26E, 2300' from E line, 2380' from S line
ELEVATION: 16.33 Gr.
COUNTY: Duval
STARTED: April, 1922
COMPLETED: June, 1922
CASING: 286' 2" of 8"
DEPTH: 669'
DRILLER: Ohio Well Drilling Company. H. H. Bailey
REMARKS: Pressure 18 pounds, 1500 gallons per minute. Driller's log and a lithologic log (Stubbs) 36 samples, from the surface to 669'. Interv. sheet made August 3, 1948.

0-70	Fine gray surface sand with broken shell. (Driller noted clay at 40 and 70, enough to color water.)
70-121	Gray sand, broken shell, phosphate pebbles. Probably Miocene.
121-198	Same as above.
198-233	Coarse, gray, siliceous sand, phosphate pebbles.
233-259	Same as above, with fragments shell.
259-270	Dark gray siliceous sand, some clay - phosphate pebbles.
270-291	Dark gray coarse siliceous sand - phosphate pebbles.
291-298	Gray sandy marl - small phosphate pebbles.
298-305	Same as above.
305-315	Gray, sandy, calcareous clay - phosphate pebbles.
315-320	Gray sandy, calcareous clay with fragments of dark crystalline quartz, phosphate pebbles.
320-330	Gray, sandy, calcareous clay - phosphate pebbles.
330-332	Same as above.
332-338	A coarse siliceous sand with minute phosphate pebbles - a layer of dark crystalline flint, (6 in. thick according to drillers log) also some calcareous phosphatic sand.
340-350	A greenish-gray calcareous sandy clay with phosphate pebbles.
350-375	Slightly more siliceous than the above.
375-382	A coarse siliceous sand with siliceous pebbles the size of a pea and phosphate pebbles. Also fragments of hard white calcareous matter - flow of water - 40 ga per minute.
382-393	A light colored sandy calcareous marl - minute phosphate pebbles.
383-400	Same as above.
400	Shell marl - large phosphate pebbles - strong flow.
420	White shell marl - increase flow.
440	White limestone - increase flow.
460	White limestone - probably Ocala - increase flow.
480	White limestone - many foraminifera - Ocala - no increase flow.
500	White porous limestone, foraminifera abundant.
500-520	White porous limestone, foraminifera abundant.
520-540	Light colored, porous, fossiliferous limestone.
540-560	Light colored, porous, fossiliferous limestone. Foraminifera abundant.
560-580	Light colored, porous, fossiliferous limestone. Foraminifera abundant.
580-600	Light colored, porous, fossiliferous limestone. Foraminifera abundant.
600-610	Light colored, porous, fossiliferous limestone. Foraminifera abundant. Hard from 604-608.
620	Light colored, porous, fossiliferous limestone. Foraminifera abundant.
630	Same as above. Conical foraminifera noted.
640	Same as above.
650	Light colored, porous, limestone.
660	Light colored, porous limestone. Foraminifera abundant.
669	Brownish limestone, few fossils noted.

W-27
(Stubbs)

OWNER: Timuquana Country Club
LOCATION: South of Ortega, Jacksonville, 2300' from
COUNTY: Duval line, 2380' from S line, Sec. 1
STARTED: April 1922. T3S, R26
COMPLETED: June 1922
CASING: 286' 2" of 8"
DRILLER: Ohio Well Drilling Co., H. H. Bailey
TOTAL DEPTH: 669'
REMARKS: Pressure 18 lbs. 1500 GPM, 36 samples, fr
the surface to 669'.
ELEVATION: 16.33 Grd.

393-400 Coarse clean quartz sand, phosphate pebbles and some tan colored calcareous, phosphatic sandstone.

Miocene - Hawthorn
Eocene - Ocala

400 Large fragments of very porous, fossiliferous white limestone *Lepidocyclina*, many large phosphate pebbles.

420 Friable white limestone largely composed of *Lepidocyclina*.

440-460, 480, 500, 520, 540 Same.

W- 27
DUVAL CO. T03S R26E SEC 15 30 14 50 N 81 41 0C W
TOTAL DEPTH- 669 FT. ELEV.- 16 FT. 36 SAMPLES- 0- 669
COMPLETED- 22.06. DEPTH WORKED 669 FT.

WELL NAME-
TIMUCUANA COUNTRY CLUB (OHIO WELL DRILLING CO.)
REMARKS-
WORKED BY H. SCHNEIDER DEC. 26, 1979

STRATIGRAPHIC FORMATIONS -

0.0-	70.0	UNDIFFERENTIATED SAND AND CLAY
70.0-	400.0	HAWTHORN FORMATION
400.0-	480.0	CRYSTAL RIVER FORMATION
480.0-	620.0	WILLISTON FORMATION
620.0-	660.0	AVON PARK LIMESTONE
660.0-	690.0	LAKE CITY LIMESTONE

LITHOLOGIC LOG
W- 27 . DUVAL CO. T03S, R26E, SEC 15

70.0 SAND , YL GY, 35 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- FINE- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 01 PCT. PHOS GRAV, 01 PCT. MICA, 02 PCT. LIMESTONE, 04 PCT. DOLOMITE,MOLLUSKS ,FOSS FRAG,

121.0 SAND , LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- FINE- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 03 PCT. PHOS SAND, 12 PCT. DOLOMITE, 04 PCT. PHOS GRAV, 01 PCT. FE STAIN,MOLLUSKS ,FOSS FRAG,

198.0 SAND , LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- FINE- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 02 PCT. PHOS SAND, 01 PCT. PHOS GRAV, 05 PCT. DOLOMITE, 01 PCT. FE STAIN,MOLLUSKS ,FOSS FRAG,

233.0 SAND ,MD LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- MED- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 03 PCT. PHOS SAND, 07 PCT. PHOS GRAV, 01 PCT. DOLOMITE,

259.0 SAND ,MD LT GY, 30 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- MED- V C, SUB-ANG, ROUNDED, MED SPH, POOR IND, DOLOM CMT, 02 PCT. PHOS SAND, 24 PCT. DOLOMITE,MOLLUSKS , FOSS FRAG,

270.0 SAND ,MD LT GY, 25 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- FINE- V C, SUB-ANG, ROUNDED, MED SPH, POOR IND, DOLOM CMT, 40 PCT. DOLOMITE, 06 PCT. PHOS SAND, 04 PCT. LIMESTONE,

291.0 SAND , LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE-CRSE, RANGE- MED- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 08 PCT. PHOS GRAV, 02 PCT. PHOS SAND, 08 PCT. DOLOMITE, SHARK TTH,

298.0 DOLOMITE , V LT GY, 04 PERCENT POROSITY-INTERGRAN, MOLDIC, 0-10 PCT. ALTERED ,SUBHEDRAL,SIZE-MICR, RANGE- CRYP- V F, GOOD IND,DOLOM CMT, 22 PCT. SAND(QTZ), 06 PCT. PHOS SAND, 02 PCT. PHOS GRAV,

305.0 DOLOMITE , LT GY, 09 PERCENT POROSITY-INTERGRAN, 0-10 PCT. ALTERED ,SUBHEDRAL,SIZE-MICR, RANGE- CRYP- V F, MOD IND, DOLOM CMT, 39 PCT. SAND(QTZ), 04 PCT. PHOS SAND, 05 PCT. PHOS GRAV, 01 PCT. FE STAIN,MOLLUSKS ,FOSS FRAG,

315.0 SAND ,MD LT GY, 25 PERCENT POROSITY-INTERGRAN,SIZE-FINE, RANGE- FINE- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 46 PCT. DOLOMITE, 03 PCT. PHOS SAND, 01 PCT. PHOS GRAV,

320.0 SAND , PK GY, 02 PERCENT POROSITY-INTERGRAN,SIZE-CRSE, RANGE- MED-CRSE, SUB-ANG, ROUNDED, MED SPH, GOOD IND, DOLOM CMT, 21 PCT. DOLOMITE, 02 PCT. PHOS SAND, 05 PCT. CHERT,

330.0 SAND , V LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE- MED, RANGE- MED-CRSE, SUB-ANG, ROUNDED, MED SPH, NON-IND, 12 PCT. PHOS GRAV, 24 PCT. DOLOMITE, 04 PCT. PHOS SAND,

332.0 SAND , V LT GY, 30 PERCENT POROSITY-INTERGRAN, NON-IND, 19 PCT. PHOS SAND, 24 PCT. DOLOMITE,

338.0 SAND ,GY BU GN, 33 PERCENT POROSITY-INTERGRAN,SIZE-CRSE, RANGE- MED- V C, SUB-ANG, ROUNDED, MED SPH, NON-IND, 04 PCT. PHOS SAND, 19 PCT. DOLOMITE, 03 PCT. PHOS GRAV,

LITHOLOGIC LOG
W- 27 . DUVAL CO. T03S, R26E, SEC 15

```
340.0 NO SAMPLE,
350.0 SAND      ,    LT GY, 30 PERCENT POROSITY-INTERGRAN,SIZE- MED,
          RANGE- MED- V C,  SUB-ANG,  ROUNDED,  MED SPH,  NON-INC,
        02 PCT. PHOS SAND,  06 PCT. PHOS GRAV,  42 PCT.  DOLOMITE,
      SHARK TTH,
375.0 SAND      ,  V LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE-CRSE,
          RANGE- CRSE- V C,  SUB-ANG,  ROUNDED,  MED SPH,  NON-INC,
        02 PCT. PHOS SAND,  12 PCT.  DOLOMITE,SHARK TTH,
382.0 SAND      ,  V LT GY, 35 PERCENT POROSITY-INTERGRAN,SIZE-CRSE,
          RANGE- CRSE- V C,  SUB-ANG,  ROUNDED,  MED SPH,  NON-INC,
        03 PCT. PHOS SAND,  01 PCT. PHOS GRAV,  14 PCT.  DOLOMITE,
      SHARK TTH,
393.0 DOLOMITE  ,   YL GY, 11 PERCENT POROSITY-INTERGRAN,  MOLDIC,
        0-10 PCT. ALTERED ,SUBHEDRAL,SIZE-MICR,   RANGE- CRYP-MICR,
        MOD IND,DOLOM CMT,  29 PCT. SAND(QTZ),  04 PCT. PHOS SAND,
        03 PCT. PHOS GRAV,
400.0 SAND      ,    LT GY, 30 PERCENT POROSITY-INTERGRAN,SIZE-CRSE,
          RANGE- MED- V C,  SUB-ANG,  ROUNDED,  MED SPH,  NON-INC,
        43 PCT.  DOLOMITE,  04 PCT. PHOS GRAV,  01 PCT. PHOS SAND,
        05 PCT.  FE STAIN,
420.0 LIMESTONE,    WHITE, 12 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  72 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-MICR,  MOD IND,MICRT CMT,FORAMINIF,
      MOLLUSKS ,FOSS MOLD,
440.0 LIMESTONE,    WHITE, 14 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  84 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-MICR, POOR IND,MICRT CMT,FORAMINIF,
        BRYOZOA,FOSS FRAG,
460.0 LIMESTONE,    WHITE, 15 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  72 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-CRSE, POOR IND,MICRT CMT,FORAMINIF,
      FOSS MOLD,  BRYOZOA,
480.0 AS ABOVE ,
500.0 LIMESTONE,    WHITE, 18 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  91 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP- MED,  MOD IND,MICRT CMT,  01 PCT.
      SAND(QTZ),  BRYOZOA,FORAMINIF,MOLLUSKS ,FOSS FRAG,
      OPERCULINOIDES ABUNDANT
520.0 LIMESTONE,    WHITE, 03 PERCENT POROSITY-INTERGRAN,   MOLDIC,
      GRAINTYPE- BIOGENIC,  MICRITE,  60 PCT. ALLOCHEMS,SIZE-MICR,
          RANGE- CRYP-CRSE, GOOD IND,MICRT CMT,FORAMINIF,  BRYOZOA,
      FOSS FRAG,
540.0 LIMESTONE,    WHITE, 17 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  84 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-FINE,  MOD IND,MICRT CMT,  02 PCT.
      SAND(QTZ),FORAMINIF,MOLLUSKS ,  BRYOZOA,
560.0 LIMESTONE,    WHITE, 10 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  72 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-CRSE, GOOD IND,MICRT CMT,FORAMINIF,
      MOLLUSKS ,ECHINOID ,
580.0 LIMESTONE,    WHITE, 14 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  79 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP- MED,  MOD IND,MICRT CMT,FORAMINIF,
        BRYOZOA,ECHINOID ,
600.0 LIMESTONE,    WHITE, 16 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  81 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-CRSE,  MOD IND,MICRT CMT,MOLLUSKS ,
610.0 LIMESTONE,    WHITE, 15 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  74 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-CRSE, GOOD IND,MICRT CMT,FORAMINIF,
620.0 LIMESTONE,    WHITE, 13 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  76 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-CRSE,  MOD IND,MICRT CMT,  02 PCT.
       FE STAIN,FORAMINIF,MOLLUSKS ,  BRYOZOA,
640.0 LIMESTONE,    WHITE, 16 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  75 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-MICR, POOR IND,MICRT CMT,  22 PCT.
       DOLOMITE,FORAMINIF,  BRYOZOA,MOLLUSKS ,
650.0 LIMESTONE,    WHITE, 16 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        VUGULAR,GRAINTYPE- BIOGENIC,  MICRITE,  75 PCT. ALLOCHEMS,
      SIZE-MICR,    RANGE- CRYP-MICR,  MOD IND,MICRT CMT,  18 PCT.
       DOLOMITE,FORAMINIF,  BRYOZOA,    CONES,MOLLUSKS ,
```

LITHOLOGIC LOG
W- 27 . DUVAL CO. T03S, R26E, SEC 15

```
  660.0 LIMESTONE,  WHITE, 12 PERCENT POROSITY-INTERGRAN,   MOLDIC,
        GRAINTYPE- BIOGENIC,  MICRITE,  60 PCT. ALLOCHEMS,SIZE-MICR,
          RANGE- CRYP-MICR,  MOD IND,MICRT CMT,  10 PCT.  DOLOMITE,
         01 PCT.  FE STAIN,  BRYOZOA,FORAMINIF,    CONES,
  669.0 DOLOMITE  ,   YL GY, 02 PERCENT POROSITY-INTERGRAN, 0-10 PCT.
         ALTERED ,SUBHEDRAL,SIZE-MICR,   RANGE- CRYP- V F,  MOD IND,
        DOLOM CMT,  23 PCT. LIMESTONE,  01 PCT.  FE STAIN,    CONES,
        FORAMINIF,  BRYOZOA,
        TD.
```

*** END OF DATA ***

W-514
(E. R. Applin)
(Sun Oil Company)

August 24, 1943
Paleontology
Duval County, Florida
U. S. Navy, Naval Air Base No. 2

3520' FWL, 350' FSL
Sec 22 (Sec 39, Wm. Traverse Gran
T3S, R26E (Coordinates Taken From
normal section)

Mr. J. A. Waters
Office

Dear Sir:

Cutting samples from 20-1015' from U. S. Navy, Naval Air Base No. 2, Duval County, Florida, have been examined.

Location: SW$\frac{1}{4}$ SE$\frac{1}{4}$ Sec. 22, T3S, R26E. 1 mile SE of Yukon P. O.
Elevation: 21' Surface: 12 cross-24, 26 above MSL.
Determinations are as follows:

SUMMARY

20	Pliocene. Fine clear quartz sand.
50-307	Miocene. Sandy clays and argillaceous sand with many phosphate nodules and some limestone lenses showing fragmentary fossil molds and impressions.
312-560	Ocala. Jackson-Upper Eocene. White highly fossiliferous limestone carrying a typical Ocala fauna. 500-560 Lower Ocala. Cream-colored limestone with some dolomite at the base of the section. *Amphistegina* cf. *cubensis* and other fossils typical of this zone of the Ocala present.
580	*Lituonella* zone of the Claiborne Middle Eocene. White and gray limestone carrying a sparse fauna characteristic of this zone of the Claiborne.
600-1015	*Dictyoconus americanus* zone of the Claiborne Eocene. Hard and soft, light brown to light cream-colored limestones irregularly somewhat dolomitic, carrying a fauna typical of this zone of the Claiborne. Two faunal units noted. I - Top 600' *Dictyoconus Fabularia* (?) unit. IV- Top 920' *Lepidocyclina* sp. unit, Large thick form.

20	Pliocene. Fine even grained clear quartz sand.
50	Miocene. Light cream-colored porous highly sandy limestone showing many fragmental molds and casts of macro-fossils.
60	Light gray, granular textured sandy and calcareous clay. Sand, quartz and phosphate nodules.
100	Light tan-gray, sandy clay as above.
120	No change.
140	Clay as above, sand of quartz and phosphate nodules, fine

140 (Cont'd)	to coarse in size of grain. Numerous calcareous and sandy clay nodules. A few shell fragments. (Ostrea? sp.)
160	Like the above.
180	Gray highly sandy clay. Sand averaging moderately fine, composed of clear quartz and many phosphate nodules.
200	Fine to coarse sand of quartz and phosphate nodules, and many sandy calcareous nodules in light tan-colored, finely granular textured calcareous soft clay matrix.
220	Like the above.
240	Argillaceous sand like the above, few calcareous nodules.
260	Like the above. A few chalky shell fragments in the sand.
280	Greenish-tan colored argillaceous sand, fine to coarse clear quartz sand and phosphate nodules, some sandy lime nodules.
290	Sand as above, also many fragments of a light brown, crystalline dolomitic sandy and phosphatic limestone showing some fragmental fossil molds and impressions.
298	Like the above.
307	Large calcareous nodular fragments of light cream-colored, sandy and phosphatic clay.
312	Upper Ocala. Cuttings of white moderately hard chalky limestone carrying many bryozoan fragments, fragments of a fossil bivalve (Ostrea? sp.) and a few fragments of Lepidocyclina ocalana.
340	Fragments of a water-worn, highly fossiliferous limestone. Fragments of Operculina ocalana, Lepidocyclina ocalana and Pseudophragmina floridana common.
360	Similar to preceding. Fauna better preserved, many bryozoan fragments also present.
400	Similar to above, more finely cut and water-worn.
420	No change.
440	Material more chalky, fauna better preserved, about 25% of sample fine clear quartz sand.
460	Finely cut fragments of the same.
480	Like the above.
500	Lower Ocala. Cuttings of a cream-colored limestone composed of water-worn micro-fossil molds and molds fragments, and showing calcite inclusions. Many specimens of Amphistegina cf. cubensis, some of Camerina cf. vanderstoki and Gypsina globula present.
520	Like the above.
540	Fragments of dense deep cream-colored somewhat dolomitic limestone. Some specimens of Amphistegina cf. cubensis as above.

560	Fragments of light brown finely granular dolomite and of white chalky finely nodular limestone. No change in fauna.
580	Lituonella zone. Chalky white and gray limestone. Many specimens of Coskinolina floridana. Lituonella floridana, and a few of Dictyoconus cookei and a few other foraminifera common to the Lituonella zone of the Claiborne Eocene.
600	Zone I. Dictyoconus americanus. Fabularia? zone. Cuttings of a hard nodular white and gray limestone and of a light brown chalky and dolomitic hard limestone showing many traces of fossils and carrying specimens of D. americanus and Fabularia (?) sp.
620	Fragments of a hard light brown chalky and dolomitic limestone. Major portion of fauna very poorly preserved. Some diagnostic fossils as in the preceding.
640	Similar to preceding. Small miliolids abundant in the limestone which is somewhat gray spotted.
660	Like the above.
680	No change.
700	Similar to the preceding but softer and more chalky. Fauna same.
720	Fragments of cream-colored hard chalky and dolomitic limestone. Molds of D. americanus common.
740	Fragments of a hard, coarsely nodular light cream-colored, somewhat dolomitic limestone. Many molds of Dictyoconus as above, some of Pseudorbitolina sp.
760	Like the above.
780	Sample composed mainly of small rolled molds and rolled mold fragments of fossils. Some poor specimens of smaller foraminifera common to the Dictyoconus zone.
800	Material as above and abundant specimens of Dictyoconus americanus.
820	Sample of small rolled molds and rolled mold fragments. Some smaller foraminifera common to the Dictyoconus americanus zone.
840	As above and many specimens of Dictyoconus americanus.
860	Chalky white and light cream-colored limestone, fauna as above.
880	Like the above, many large irregular shaped white limestone, concretions also present.
900	Small fragments of white limestone as above and about 75% fragments of a light brown hard dolomitic and irregularly porous limestone. Many sections and poor molds of fossils in this limestone. One fragment of Lepidocyclina sp.
920	Zone IV. Lepidocyclina sp. Fragments of a hard white and light gray limestone carrying many smoothly worn molds of a large and moderately thick Lepidocyclina sp. probably related to one found at 1190' below in well W-579 Duval County. (See slide).

940	Similar to above, more chalky.
960	Sample of hard cream-colored worn fossil molds and mold fragments. Molds of Dictyoconus americanus abundant.
980	Like the above.
1000	Material softer, otherwise as above.
1015	Fragments of a chalky and dolomitic limestone. Many bryozoan fragments, some fragments of macro-fossils and many specimens of Amphistegina lopeztrigoi. A few fragments of an Operculina sp., some poor specimens of the large Lepidocyclina first noted at 920'.

Yours truly,

/s/ E. R. Applin

ERA:vh

W-661
(E. R. Applin)
(Sun Oil Company)

August 27, 1943
Paleontology
Duval County, Florida
U. S. Naval Air Station
Jacksonville, Florida
Depth 987.5'

Mr. J. A. Waters
Office

Dear Sir:

Cutting samples from 0-987' from U. S. Naval Air Station, Jacksonville, Florida, have been examined.

Location: Dewey Park ½ mile S. E. of Yukon P. O. Sec. 21? T3S, R26E.
Elevation:
Determinations are as follows:

SUMMARY

0-40	Pliocene. Fine grained clear quartz sand.
40-400	Miocene. Argillaceous sand and sandy clays with many phosphatic nodules. Some limestone lenses showing fragments of fossil molds and casts, a few shell fragments in some sandy clay lenses.
400-660?	Ocala. Jackson Upper Eocene. Highly fossiliferous limestone showing a typical micro-fauna. 560-660 (?) Lower Ocala, cream-colored somewhat calcitic limestone carrying Amphistegina cf. cubensis and other characteristic foraminifera.
660-700(?)	Lituonella Zone. Claiborne Middle Eocene. Note: Samples in this part of section probably incorrectly labeled. 660-680 Sample shows fossils and lithology common to the lower Ocala zone.
700-987	Dictyoconus americanus Zone of the Claiborne Middle Eocene. Cream-colored, in part dolomitic limestone carrying Dictyoconus americanus and other foraminifera characteristic of this zone of the Claiborne. Two fauna units noted. I. 700' Top of Dictyoconus, Fabularia? unit. II. (?) 800' Top of Lepidocyclina cedarkeyensis unit (only a few specimens present.)

0-20	Fine clear quartz sand and a few particles of magnetite.
20-40	Like the above.
40-60	Fine to coarse quartz sand with many phosphatic nodules in grayish-tan calcareous granular textured clay matrix. Some calcareous sandy nodules also present.
60-80	Like the above, also some fragments of gray and brown porous limestone showing many casts and some mold of fragments of macro-fossils.
80-100	Fragments of gray limestone as above, and many fragments of a hard porous cream-colored limestone showing many fragments of molds and casts of macro-fossils. A mold of Archaias sp. also noted. Some sand and phosphatic nodules in sample.
100-120	Fine even grained clear quartz sand like that found (0-40'). Sample not correctly numbered (?).
120-140	Sample of small black phosphatic pebbles and fragments of white sandy and phosphatic calcareous granular textured clay.
140-160	Cuttings of a light cream-colored, sandy and phosphatic calcareous and in part chalky clay.
160-180	Moderately large cream-brown and gray, nodules limestone fragments somewhat sandy and phosphatic and showing many fragments of molds and cast of macro-fossils and some chalky shell fragments.
180-200	Like the above, some highly sandy and phosphatic moderately soft and calcareous nodules also present.
200-220	Like the above.
220-240	No change.
240-260	Fine to coarse quartz and phosphatic sand in light tan calcareous granular textured clay matrix, some inclusions of chalky cream-colored nodules and some chalky fragments of fossil bivalves.
260-280	Like the above. Sand averaging coarser grained.
280-300	Like the above.
300-320	Fragments of a hard finely granular textured gray and brownish gray finely sand and finely phosphatic limestone.
300-340	Like the above, some of the nodules cream-colored.
340-360	Like the above, some loose sand of quartz and phosphatic nodules.
360-380	Sample mainly fragments of nodular limestone as above. Some of the fragments showing fragments of fossil molds and casts, and some inclusions of chalky shell fragments.
380-400	No change.
400-420	Fragments of a hard white highly fossiliferous limestone carrying Operculina ocalana, Pseudophragmina floridana, many Bryozoan fragments, a few poor specimens of Lepidocyclina sp., many fragments of a bivalve resembling Ostrea sp.

420-440	Limestone similar to above, but more indurated _Lepidocyclina ocalana_ also fairly common.
440-460	Fragments of a gray and white limestone similar to above. No change in fauna.
460-480	Like the above, some specimens of _Heterostegina ocalana_ also present.
480-500	Like the above.
500-520, 520-540, 540-560, 560-580	No change.
580-600	Finely cut fragments of a finely fossiliferous light cream-colored limestone.
600-620	Like the above, some smaller foraminifera usually characteristic of the Lower Ocala present.
620-640	More coarsely cut fragments of a hard water-worn calcitic limestone. Many poor specimens of _Amphistegina_ cf. _cubensis_ and _Gypsina globula_ present. A few fragments of finely granular light brown dolomite.
640-660	Softer limestone similar to the above in lithology and fauna content.
660-680	Cuttings of a deep cream-colored dolomitic and chalky limestone carrying specimens of _Lituonella floridana_, worn fragments of _Operculina_ sp. _Coskinolina floridana_. Most of the fossil material fragmentary and very poorly preserved.
680-700	Fragments of a hard cream-colored limestone carrying many poor specimens of _Amphistegina_ cf. _cubensis Camerina_ sp. _Gypsina_ sp. and other forms common to the Lower Ocala.
700-720	Fragments of a soft deep cream-colored to light brown chalky and highly dolomitic limestone. Many dolomitized fragments of a large echinoid and some fossil bivalves present, also many specimens of _Fabularia_ (?) sp. and some poor specimen of _Dictyoconus_ sp.
720-740	Similar to above but harder and more dolomitized.
740-760	Like the above with many cavings of chalky limestone and fossils from higher depths.
760-780	Fragments of limestone as above and soft carbonaceous chalk.
780-800	Fragments of a deep cream-colored limestone composed mainly of water-worn molds of micro-fossils and fossil fragments. Many specimens of _Dictyoconus americanus_ and some other foraminifera characteristic of the _Dictyoconus americanus_ zone present.
800-820	Like the above. A few specimens of _Lepidocyclina cedarkeyensis_ also present.
820-840	Like the preceding, but no specimens of _Lepidocyclina_ noted.
840-860, 860-880, 880-890, 900-920	No change.
920-940	Like the above and some irregular shaped moderately large lime concretions.
940-960	Like the above. Many fragments of dark brown granular crystalline dense dolomite also present.

960-980	Like the above.
987	Large fragments of very hard dark brown dolomite.

Yours truly,

/s/ E. R. Applin

ERA:vh

Appendix A-8

Chas. T. Main Report on
Jacksonville Well Water Supply System

U. S. NAVAL AIR STATION

JACKSONVILLE, FLORIDA

STATION UTILITIES BETTERMENT STUDY

DEPARTMENT OF THE NAVY

BUREAU OF YARDS AND DOCKS

CHAS. T. MAIN, INC.

BOSTON, MASSACHUSETTS — CHARLOTTE, NORTH CAROLINA

417-18-1 — NOVEMBER 1954

THE WATER SYSTEM - DESCRIPTION

There are four main water treating plants on the Air Station. These are tied together by a pipe distribution system supplying domestic and process water. The total connected capacity available at the plants is 7300± gpm supplied as indicated below.

Water Plant No.	Location	Capacity
1	South side of Industrial Area	3000 gpm
2	South side of Training Area	2000
3	West side of Dewey Park Housing	1500
4	Southwest in Hospital Area	800
		7300 gpm

All of the fresh water used on the Station is obtained from artesian wells or driven wells; there are twenty of these wells on the station, of which six are capped or not in use.

On the Station area it has been found that most of the wells should be driven to about 1000 feet in order to get a sufficient quantity of water. The wells of this approximate depth are listed below with their general location.

Location	Well No.	Dia.	Depth	Free Flow gpm	Pumped Flow gpm	Status
Water Plant #1	1	8	708	150- 613	-	Not used
#1	2	12	1005	600-3500	2000	Used
#1	3	12	998	3300	1950	Used
#2	4	10	1015	400-3800	2000	Used
#3	5	12	998	2000-4900	2300	Used
Hospital Water Plant	6	12	646	2000-6000		Used
Building #164	7	10	1096	1700		Used

The temperature of this well water is about 70 degrees all year around. The water is corrosive. The piping recently installed has been coated inside for protection. The water going through the main water plants is at present aerated and chlorinated but the existing water softening equipment is not being used. It was designed to produce 5 grain water.

The Naval Air Station water system supplies all of the make-up water for the steam generating plants. This raw water is first passed through the make-up water treating plants in each of the power plants except the BOQ.

Power Plants No. 1, No. 2, and the Hospital Power Plant now use approximately 120 gpm maximum for make-up water during the coldest winter days and 27 gpm minimum during the summer.

WATER ANALYSES

	Typical Well Water Jan. 14, 1954	Typical Distribution Water
	ppm	ppm
Silica (SiO_2)	17.	
Iron (Fe) - dissolved	0.02	
- total	0.18	0.6 (over 3.0 at end of line)
Manganese (Mn) - dissolved	-	
- total	-	
Calcium (Ca)	43.	
Magnesium (Mg)	8.2	
Sodium (Na)) --- Potassium (k))	35.	
Bicarbonate (HCO_3)	137.	
Carbonate (CO_3)	-	
Sulfate (SO_4)	87.	
Chloride (Cl)	9.5	
Fluoride (F)	0.5	
Nitrate (NO_3)	0.1	
Dissolved solids - total	267.	
Residue on evaporation (180°C)	294.	
Hardness - as Ca CO_3	141.	226.
- as non carbonate	29.	
Specific conductance (micromhos at 25°C)	413.	
pH -	7.6	
- unsaturated		7.5
- saturated		7.7
Saturation index		-0.2
Color	7.	
Total Alkalinity as $CaCO_3$	112.	
Residual Chlorine		0.25 (Range 0.0 to 0.5)
Dissolved Oxygen (at end of line)		7.2

WATER USE

Total for Water Plants No. 1, 2, and 3

1953

January	97 million gallons
February	90
March	101
April	107
May	126
June	125
July	111
August	88
September	79
October	69
November	65
December	62
Total	1120 million gallons

Average gallons per day (24 hours): 3.1 million gallons

APPENDIX B

DOCUMENTATION IN SUPPORT OF BIOLOGY SECTIONS

TABLE B-1

Pine Flatwoods Community Vegetation

Common Name	Scientific Name
Saw palmetto	Seranoa repens
Shining sumac	Rhus copallina var. leucar
Greenbriar	Smilax spp.
Cat-claw vine	Bignonia unguis-cati
Muscadine vine	Vitis rotundifolia
Wire grass	Aristida stricta
Pignut hickory	Carya glabra
Mockernut hickory	Carya tomentosa
Sweet gum	Liquidambar styraciflua
Magnolia	Magnolia grandiflora
Blackberry	Rubus spp.
Slash pine	Pinus elliotti
Wild persimmon	Diospyros virginiana
Poison ivy	Rhus radicans
Virginia creeper	Parthenocissus quinquefolia
Stagger bush	Lyonia mariana
Fetter bush	Lyonia lucida

TABLE B-2

Hydrophytic Hardwood Community Vegetation

Common Name	Scientific Name
Shining sumac	*Rhus copallina* var. leucar
Greenbriar	*Smilax* spp.
Boston fern	*Nephrolepis exaltat*
Cinnamon fern	*Osmunda cinnamonea*
Wood fern	*Thelypteris normalis*
Chain fern	*Woodwardia virginica*
Cat-claw vine	*Bignonia unguis-cati*
Japanese honeysuckle	*Lonicera japonica*
Muscadine vine	*Vitis rotundifolia*
Jack-in-the Pulpit	*Arisaema triphyllum*
White-top sedge	*Dichromena* spp.
Box elder	*Acer negundo*
Red buckeye	*Aesculus pavia*
Pignut hickory	*Carya glabra*
Ash	*Fraxious* spp.
Virginia willow	*Itea virginica*
Sweet gum	*Liquidambar styraciflua*
Black tupelo	*Nyssa sylvatica*
Laurel oak	*Quercus laurifolia*
Slash pine	*Pinus elliotti*
Red maple	*Acer rubrum*
Buttonbush	*Cephalanthus occidentalis*
Arrow arum	*Peltandra virginica*
Poison ivy	*Rhus radicans*
Bladder wort	*Utricularia* spp.
Resurrection fern	*Polypodium polypoides*
Loblolly bay	*Gordonia lasianthus*
Spanish moss	*Dendropogon usnedides*
Lizard's tail	*Saururus cernuus*
Royal fern	*Osmunda regalis*
Red bay	*Persea burbonia*

TABLE B-3

Animals of the Pine Flatwoods Community

Common Name	Scientific Name
Florida Crowned Snake	Tantilla coronata
Florida Red-Bellied Snake	Storeria occipitomaculatus
Narrow-Mouthed Toad	Gastrophayne carolinensis
Pine Warbler	Dendroica pinus
Ruby-Crowned Kinglet	Regulus calendula
Golden-Crowned Kinglet	Regulus satrapa
Least Shrew	Cryptotis parva
Florida Chorus Frog	Pseudacris nigrita verrucosa
Frosted Flatwoods Salamander or "spring lizard"	Ambystoma c. cingulatum
Mole Salamander or "spring lizard"	Ambystoma talpoideum
Southern Cricket Frog	Bufo quercicus
Spring Peeter	Hyla crucifer
Piney Wood Treefrog	Hyla femoralis
Least Trefrog	Hyla ocularis
Gray Treefrog	Hyla versicolor
Barking Treefrog	Hyla gratiosa
Box Turtle	Terrapene carolina
Ground Skink	Lygosoma laterale
Eastern Garter Snake	Thamnophis sirtalis
Rough Earth Snake	Haldea striatula
White-tailed Deer	Odocoileus virginianus
Cottontail Rabbit	Sulvilagus floridanua
Ground Dove	Columbigallina passerina
Rufous-sided Towhee (Joree)	Pipilo erythropthalmus
Six-line Racerunner	Cnimidophorus sexlineatus
Black Racer	Coluber constrictor
Red-tailed Skink	Eumeces egregius
Eastern Fence Lizard	Sceloporus undulatus
Broad-headed Skink	Eumeces laticeps
Corn Snake	Elaphe guttata guttata
Eastern Kingsnake	Lampropeltis getulus
Mole Snake	Cemophora coccinea
Coral Snake	Micrurus fulvius
Black Vulture	Coragyps atratus
Cooper's Hawk	Accipiter cooperii
Red-tailed Hawk	Buteo jamaicensis
Red-shouldered Hawk	Buteo lineatus
Sparrow Hawk	Falco sparverius
Bobwhite	Colinus virginianus
Turkey Vulture	Cathartes aura
Mourning Dove	Xenaidura macrourn
Yellow-billed Cuckoo	Coccyzus americanus

Table B-3 (Continued)

Common Name	Scientific Name
Great Horned Owl	Bubo virginianus
Chuck-Will's-Widow	Caprimulgus carolinensis
Whip-Poor-Will	Caprimulgus vociferus
Common Nighthawk	Chordeiles minor
Yellow-shafted Flicker	Colaptes auratus
Red-bellied Woodpecker	Centurus carolinus
Yellow-bellied Sapsucker	Sphyrapicus varius
Downy Woodpecker	Dendrocopos pubescens
Eastern Kingbird	Tyrannus tyrannus
Western Kingbird	Tyrannus verticalis
Cedar Waxwing	Bobcilla cedrorum
Starling	Sturnus vulgaris
Worm-eating Warbler	Helmitheros vermivorus
Great Crested Flycatcher	Myianrchus crinitus
Eastern Phoebe	Sayornis phoebe
Eastern Wood Pewee	Contopus virens
Barn Swallow	Hirundo rustica
Purple Martin	Progne subis
Field Sparrow	Spizella pusilia
Green Tree or Bell Frog	Hyla cinerea
Florida Brown or Dekay's Snake	Storeria dekayi
Eastern Glass Lizard, Glass "Snake" or Joint "Snake"	Ophisaurus ventralis
Chipping Sparrow	Spizella passerina
Island Glass Lizard, Glass "Snake" or Joint "Snake"	Ophisaurus compressus
Hispid Cotton Rat	Sigmodon hispidus
Eastern Mole or "Ground Mole"	Scalopus aquaticus
Sharp-shinned Hawk or Little Blue Darter	Accipiter striatus
American Goldfinch	Spinus tristis
Southern Hognosed Snake, Puff Adder, or Spreading Adder	Heterodon simus
Oak Toad	Bufo quericus
Black Widow Spider	Latrodectus mactans
Southeastern Shrew	Sorex longirostris
Short Tail Shrew	Blarina brevicauda
Blue Jay	Cyanocitta cristata
Common Crow	Corvus brachyrhynchos
Fish Crow	Corvus ossifragus
House Wren	Troglodytes aedon
Cape May Warbler	Dendroica tigrina
Myrtle Warbler	Dendroica coronata
Slender Glass Lizard, Glass "Snake" or Joint "Snake"	Ophisaurus attenautus
Song Sparrow	Melospiza melodia
Black-throated Blue Warbler	Dendroica caerulescens

Table B-3 (Continued)

Common Name	Scientific Name
Blackpoll Warbler	Dendroica striata
Prairie Warbler	Denroica discolor
Mockingbird	Mimos polyglottos
Brown Thrasher	Toxostoma rufum
House Sparrow	Passer demosticus
Bobolink	Dolichonyx oryzivorus
Eastern Meadowlark	Sturnella magna
Boat-tailed Grackle	Cassidix mexicanus
Robin	Turdus migratorius
Indigo Bunting	Passerina cyanea
Painted Bunting	Passerina ciris
Pine Siskin	Spinus pinus
Savannah Sparrow	Passerculus sandwichensis
Vesper Sparrow	Pooecetes
Slate-colored Junco	Junco hyemalis
Nine-banded Armadillo	Dasypus novemcinctus
Spotted Skunk	Spilogale putorius
Marsh Rabbit	Sylvilagus palustris
Loggerhead Shrike (Butcher bird)	Lanius ludovicianus
Fox Squirrel	Sciurus niger
Screech Owl	Otus asio
Flying Squirrel	Glaucomys volans
Striped Skunk	Mephitis mephitis
Scarlet King Snake	Lampropeltis doliata
Gray Fox	Urcyon cinereoargenteus
Indigo Snake	Drymarchon corias couperi
Opossum	Didelphis virginiana
Eastern Harvest Mouse	Reithrodontomys humulis
Eastern Woodrat	Neotoma floridana
Norway Rat	Rattus norvegicus
Rusty Mud Salamander	Pseudotrition montanus
Barred Owl	Strix varia
Hoary Bat	Lasiurus cinereus
Eastern Pipistrel Bat	Pipistrellus subflavus
Oven Bird	Seiurus aurocapillus
Striped Newt	Diemictylus perstriatus
Carr's Dusky Salamander	Desmognathus fuscus
Southern Slimy Salamander	Plethodon glutinosus
Yellow Throat	Geothlypis trichas
Squirrel Tree Frog or Rain Frog	Thamnophis sauritus
Narrow-Striped Dwarf Siren	Pseudobranchus striatus
Two-toed Amphium or "Congo Eel"	Amphiuma means
Cardinal or Redbird	Richmondena cardinalis
Raccoon	Procyon lotor
Yellow Rat Snake or Four-Lined Chicken Snake	Elaphe obsoleta
Gray or Cat Squirrel	Sciurus carolinensis

Table B-3 (Continued)

Common Name	Scientific Name
Bobcat, Wildcat or Bay Lynx	Lynx rufus
Yellow-Throated Warbler	Dendroica dominica
Carolina Chickadee	Parus carolinensis
Razor Back, Wild Board, Wild Hog, or Pinewoods Rooter	Sus scrofa
Greater Five-Lined Skink	Eumeces inexpectatus
Southern Common or Gray Tree Frog	Hyla versicolor
Hermit Thrush	Hylocichla guttata
Cat Bird	Dumetella carolinesis
Carolina Anole or "Chameleon"	Anois carolinesis
Carolina Wren	Thryothorus ludovicianus
Florida Sandhill Crane	Grus canadensis practensis

TABLE B-4

Animals of the Hydrophytic Hardwood Community

Common Name	Scientific Name
Florida Crowned Snake	Tantilla coronata
Narrow-Mouthed Toad	Gastrophayne carolinensis
Southern Ring-Necked Snake	Diadophis punctatus
Pine Warbler	Dendroica pinus
Florida Chorus Frong	Pseudacris nigrita verrucosa
Little Grass Frog	Hyla occularis
Southern Leopard Frog	Ranapipiens sphenocephala
Frosted Flatwoods Salamander or "spring lizard"	Ambystoma cingulatum
Mole Salamander or "spring lizard"	Ambystoma talpoideum
Swamp Sparrow	Melospiza georgiana
Lesser Siren	Siren intermedia
Tiger Salamander	Ambystoma tigrinum
Central Newt	Notophthalmus viridescens
Southern Cricket Frog	Bufo quercicus
Spring Peeper	Hyla crucifer
Barking Tree Frog	Hyla gratiosa
Yellow-bellied Turtle	Pseudemys scripta
American Chaemeleon	Anolis carolinensis
Ground Skink	Lygosoma laterale
Red-Tailed Skink	Eumeces egregius
Red-Bellied Water Snake	Natrix erythroquster
White-tailed Deer	Odocoileus virginianus
Cottontail Rabbit	Sulvilagus floridanua
Eastern Garter Snake	Thamnophis sirtalis
Rough Earth Snake	Haldea striatula
Smooth Earth Snake	Haldea valeriae
Mud Snake	Farancia abacura
Corn Snake	Elaphe guttata guttata
Eastern King Snake	Lampropeltis getulus
Mole Snake	Cemophora coccinea
Coral Snake	Micrurus fulvius
Common Egret	Bubulcus ibis
Great Blue Heron	Ardea herodias
Louisiana Heron	Hydranassa tricolor
Little Blue Heron	Florida caerulea
Yellow-Billed Cuckoo	Coccyzus
Yellow-Shafted Flicker	Colaptes auratus
Red-Bellied Woodpecker	Centurus carolinus
Yellow-Bellied Sapsucker	Sphyrapicus varius
Downy Woodpecker	Dendrocopos pubescens
Diamond-Backed Rattlesnake	Crotalus adamanteus
Cedar Waxwing	Bobcilla cedrorum

TABLE B-4 (Continued)

Common Name	Scientific Name
Orange-Crowned Warbler	Vermivora celata
Prairie Warbler	Dendroica discolor
Palm Warbler	Dendroica palmarum
Red-eyed Vireo	Vireo olivaceus
Great Crested Flycatcher	Myianrchus crinitus
Eastern Wood Pewee	Contopus virens
Tree Swallow	Iridoprocne bicolor
Blue Jay	Cyanocitta cristata
Mockingbird	Minus polyglottos
Brown Thrasher	Toxostoma rufum
Northern Water Thrush	Seiurus noveboracensis
Yellowthroat	Geothlypis trichas
Boat-Tailed Grackle	Cassidix mexicanus
Nine-Banded Armadillo	Dasypus novemcinctus
Longtail Weasel	Mustela frenata
Spotted Skunk	Spilogale putorius
Marsh Rabbit	Sylvilagus palustris
Eastern Harvest Mouse	Reithrodontomys humulis
Rice Rat	Oryzomys palustris
Norway Rat	Rattus norvegicus
Green Tree or Bell Frog	Hyla cinerea
Florida Brown or Dekay's Snake	Storeria dekayi
Eastern Glass Lizard, Glass "Snake" or Joint "Snake"	Ophisaurus ventralis
Hispid Cotton Rat	Sigmodon hispidus
Southern Hognosed Snake, Puff Adder, or Spreading Adder	Heterodon simus
Oak Toad	Bufo quericus
Southeastern Shrew	Sorex longirostris
Flying Squirrel	Glaucomys volans
Striped Skunk	Mephitis mephitis
Scarlet King Snake	Lampropeltis triangulum elapsoides
Gray Fox	Urcyon cinereoargenteus
Indigo Snake	Drymarchon corias couperi
Opossum	Didelphis virginiana
Rusty Mud Salamander	Psuedotrition montanus
Barred Owl	Strix varia
Hoary Bat	Lasiurus cinereus
Eastern Pipistrel Bat	Pipistrellus subflavus
White Ibis or Spanish Curlew	Eudocimus albus
Florida Otter	Lutra canadensis
American Alligator	Alligator mississippiensis
Peninsular Turtle or Florida Cooter	Pseudemys floridana
Green Heron	Butorides virescens
Florida or Southern Softshell Turtle	Trionyx ferox
River-Swamp Frog	Rana heckscheri
Louisiana Water Thrush	Seiurus motacilla
Striped Newt	Diemictylus perstriatus

TABLE B-4 (Continued)

Common Name	Scientific Name
Carr's Dusky Salamander	Desmognathus fuscus
Dwarf Salamander	Sanculus quadridigitatus
Southern Slimy Salamander	Plethodon glutinosus
Squirrel Tree Frog or Rain Frog	Hyla squirella
Southern Ribbon Snake	Thamnophis sauritus
Black Swamp Snake	Seminatrix pygaea
Striped or Allens' Swamp Snake	Liodytes alleni
Narrow-Striped Dwarf Siren	Pseudobranchus striatus
Two-toed Amphium or "Congo Eel"	Amphiuma means
Greater Sirven	Sirven lacertina
Glossy Water or Striped Water Snake	Natrix rigida
Chicken Turtle	Dierochelys reticularia
Wood Ibis, Wood Stork, or Iron Head	Mycteria americana
Water Turkey, anhinga or Snake Bird	Anhinga anhinga
Wood Duck	Aix sponsa
Florida Banded Water Snake	Natrix sipedon
Green Water Snake	Natrix cyclopion
Cardinal or Redbird	Richmondena cardinalis
Keeled or Rough Green Snake	Opheodrys aestivus
Cottonmouth or Water Moccasin	Agkistrodon piscivorus
Brown Water Snake	Natrix taxispilota
Raccoon	Procyon lotor
Redstart	Setophaga ruticilla
Black and White Warbler	Mniotilta varia
Tufted Titmouse	Parus bicolor
Yellow Rat Snake or Four-Lined Chicken Snake	Elaphe obsoleta
Gray or Cat Squirrel	Sciurus carolinensis
Bobcat, Wildcat or Bay Lynx	Lynx rufus
Yellow-Throated Warbler	Dendroica dominica
Razor Back, Wild Board, Wild Hog, or Pinewoods Rooter	Sus scrofa
Southern Common or Gray Tree Frog	Hyla versicolor
Hermit Thrush	Hylocichla guttata
Cat Bird	Dumetella carolinesis
Yellow-Crowned Night Heron	Lyctanassa violacea
Black-Crowned Night Heron	Nycticorax nycticorax
Carolina Wren	Thryothorus ludovicianus
White-eyed Vireo	Vireo griseus
Gopher Turle	Gopherus polyphemus

TABLE B-5

Salt Marsh Vegetation

Common Name	Scientific Name
Salt bush	*Baccharis halimifolia*
Smooth cordgrass	*Spartina alterniflora*
Salt grass	*Distichlis spicata*
Salt meadow cordgrass	*Spartina patens*
Black needlerush	*Juncus roemerianus*
Hightidal bush	*Iva frutescens*

TABLE B-6

Animals of the Salt Marsh Community

Common Name	Scientific Name
Turkey Vulture	Cathartes aura
Diamondback Terrapin	Mala clemmys terrapin
Common Loon	Gavia immer
Red-Throated Loon	Gavia stellata
Horned Grebe	Podiceps auritus
Brown Pelican	Pelecanus occidentalis
Gannet	Morus bassanus
Double-Crested Cormorant	Phalacrocorax auritus
Mallard	Anas platyrhynchos
Pintail	Anas acuta
Gadwall	Anas strepera
Shoveller	Spatula clypeata
Blue-Winged Teal	Anas discors
Green-Winged Teal	Anas carolinensis
Marsh Hawk	Circus cyaneus
Redhead	Aythya americana
Canvasback	Aythya valisineria
Ring-Necked Duck	Aythya collaris
Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Common Golden Eye	Bucephala clangula
Least Shrew	Cryptotis parva
Buffle Head	Bucephala albeola
Red-Breasted Merganser	Mergus serrator
Black Vulture	Coragyps atratus
Common Egret	Casmerodius albus
Snowy Egret	Egretta thula
Cattle Egret	Bubulcus ibis
Great Blue Heron	Ardea herodias
Louisiana Heron	Hydranassa tricolor
Little Blue Heron	Florida caerulea
Virginia Rail	Rallus limicola
Pora	Porzana carolina
Clapper Rail	Rallus longitrostris
King Rail	Rallus elegans
American Coot	Fulica americana
American Oyster Catcher	Haematopus palliatus
American Avocet	Recurvirostra americana
Black-Necked Stilt	Himantopus mexicanus
Piping Plover	Charadrius melodus
Wilson's Plover	Charadrius wilsonia
Hispid Cotton Rat	Sigmodon hispidus
Whimbrel	Numenius phaeopus
Spotted Sandpiper	Actitis macularia

TABLE B-6 (Continued)

Common Name	Scientific Name
Greater Yellowlegs	Totanus melanoleucus
Lesser Yellowlegs	Totanus flavipes
Stilt Sandpiper	Micropalama himantopus
Short-Billed Dowitcher	Limnodromus griseus
Ruddy Turnstone	Arenaria interpres
Pectoral Sandpiper	Erolia melanotos
Knot	Calidris canutus
White-Rumped Sandpiper	Erolia fuscicollis
Common Snipe	Capella gallinago
Great Black-Backed Gull	Larus marinus
Herring Gull	Larus argentatus
Ring-Billed Gull	Larus argentatus
Laughing Gull	Larus atricilla
Bonaparte's Gull	Larus philadelphia
Least Tern	Sterna albifrons
Common Tern	Sterna hirundo
Forster's Tern	Sterna foresteri
Sandwich Tern	Thalasseus sandvicensis
Killdeer	Charadrius vociferus
Gull-Billed Tern	Gelochelidon nilotica
Caspian Tern	Hydroprogne caspia
Black Tern	Chlidonias niger
Black Skimmer	Rynchops nigra
Water Pipit	Anthus spinoletta
Tree Swallow	Tridoprocne bicolor
Common Crow	Corvus brachyrhynchos
Fish Crow	Corvus ossifragus
Short-Billed Marsh Wren	Cistothorus platensis
Red-Winged Blackbird	Agelaius phoeniceus
Boat-Tailed Grackle	Cassidix maxicanus
House Sparrow	Passer domesticus
Bobolink	Dolichonyx oryzivorus
Sharp-Tailed Sparrow	Ammospiza caudacuta
Rice Rat	Oryzomys palustris
Norway Rat	Rattus norvegicus
Hoary Rat	Lasiurus cinereus
Eastern Pipistrel Bat	Pipistrellus subflavus
White Ibis or Spanish Curlew	Eudocimus albus
Florida Otter	Lutra canadensis
Hooded Merganser or Fish Duck	Lophodytes cucullatus
American Alligator	Alligator mississippiensis
Green Heron	Butorides virescens
American Bittern	Botaurus lentiginosus
Wood Ibis, Wood Stork, or Iron Head	Mycteria americana
Water Turkey, Anhinga or Snake Bird	Anhinga anhinga
Wood Duck	Aix sponsa
Common Gallinule	Gallinula chloropus
Bald Pate or American Widgeon	Marceca americana

TABLE B-6 (Continued)

Common Name	Scientific Name
Ruddy Duck	Oxyura janaicensis
Pied-Billed Grebe or Didapper	Podilymbus podiceps
Least Bittern	Ixobrychus exilis
Cottonmouth or Water Moccasin	Agkistrodon piscivorus
Raccoon	Procyon lotor
Blue Gray Gratcatcher	Polioptila caerulea
Yellow-Crowned Night Heron	Lyctanassa violacea
Black-Crowned Night Heron	Nycticorax nycticorax
Atlantic Loggerhead Turtle	Caretta caretta caretta
Florida Manatee	Trichechus manatus latirostris

TABLE B-7

Selected Fish and Shellfish Species
of St. Johns River System

Common Name	Scientific Name
Short-nosed Sturgeon	Acipenser brevirostrum
Common Sturgeon	Acipenser oxyrhyachus
Tarpon	Tarpon atlantious
Bonefish	Albula vulpes
Hickory Shad	Pomolobus mediocris
Shad	Alosa sapidissima
Menhaden	Brevoortia tyrannus
Sea Catfish	Galeichthys felis
American Eel	Anguilla restrata
Striped Mullet	Mugil cephalus
Bluefish	Pomatomus saltatrix
Striped Bass	Roccus saxatilis
Common Sea Bass	Centropristes striatus
Black Drum	Pogonius cromis
Channel Bass	Sciaenops ocollatus
Southern Flounder	Paralichthys lethostigma
Pink Shrimp	Penaeus duorarum
Blue Crab	Callinectes sapidus
Oyster	Crassostrea virginica
Florida Gar	Lepisosteus platyrhincus
Redfin Pickerel	Esox americanus
Mud Pickerel	Esox vermiculatus
Carp	Cyprinus carpio
Yellow Bullhead	Ictalurus natalia
Green Bullhead	Ictalurus brunneus
Brown Bullhead	Ictalurus nebulosus
Largemouth Bass	Micropterus salmoides
Black Crappie	Pomoxis nigromaculatus
Mud Sunfish	Acantharchus pomotia
Blackbanded Sunfish	Enneacanthus chactodon
Banded Sunfish	Enneacanthus obesus
Redbreast Sunfish	Lepomis auritus
Bluegill	Lepomis macrochirus
Redear Sunfish	Lepomis mircrolophus
Tilapia	Tilapia mossambica

CONSERVATION/COASTAL ZONE PROTECTION ELEMENT

2005 COMPREHENSIVE PLAN

JACKSONVILLE, FLORIDA

JUNE, 1979

REVISED JANUARY, 1980

Section Adopted by City Council

AIR QUALITY

Goals and Objectives

Goal I

To protect the health and welfare of the residents of Jacksonville from any actual or potential adverse effects resulting from exposure to air pollutants.

Objective A. Encourage the reduction and prevention of air quality deterioration.

Objective B. Comply with federal standards for total suspended particulates (TSP's).

Objective C. Comply with federal standards for oxidants.

Objective D. Reduce undesirable odors in Jacksonville.

Objective E. Upgrade the Air Monitoring network to meet the standing Air Monitoring Work Group (SAMWG) guidelines.

Objective F. Insure that the Air Activity Quality Assurance (Control) Program meets federal EPA requirements for sampling techniques as well as laboratory analysis techniques.

Objective G. Initiate a hazardous and toxic substance inventory leading to development of an air ambient monitoring program to assume responsibilities under the Federal Toxic Substances Control Act.

Objective H. Promote and support efforts to obtain the federal, state and local commitments of resources necessary to operate an effective air quality planning and control program.

Goal II

To plan land use patterns and transportation systems in a manner which is compatible with desired air quality standards.

Objective A. Assist new industry in locating a site for development that will not lead to exceeding of air quality standards or to significant deterioration of the environment.

Objective B. Develop a computer model for Jacksonville to study the relationship between the location of emission points and ambient pollution levels.

Objective C. Encourage increased utilization of the mass transit system.

Air Quality Standards

The United States Environmental Protection Agency, as required by the Clean Air Act, established two standards for air quality; the primary standard designed to protect human health and the secondary standard designed to protect human welfare. Florida adopted the more stringent secondary standards (Florida Administrative Code - Chapter 17-2).

Ozone

Primary and Secondary (Florida) Standards:	120 parts per billion, maximum 1-hour concentration not to be exceeded more than once per year.

Total Suspended Particulates

Primary Standard:	260 micrograms per cubic meter; maximum 24-hour concentration not to be exceeded more than once per year.

Secondary (Florida) Standard:	60 micrograms per cubic meter; annual geometric mean. 150 micrograms per cubic meter; maximum 24-hours concentration not to be exceeded more than once per year.

<u>Sulfur Dioxide</u>

Primary Standard:	365 micrograms per cubic meter; maximum 24-hour concentration not to be exceeded more than once per year.
Secondary (Florida) Standard:	60 micrograms per cubic meter (0.02 ppm) - annual arithmetic mean. 260 micrograms per cubic meter; maximum 24-hour concentration not to be exceeded more than once per year. 1,300 micrograms per cubic meter (0.5 ppm) maximum 3-hour concentration, not be be exceeded more than once per year.

<u>Carbon Monoxide</u>

Primary and Secondary (Florida) Standards:	10 milligrams per cubic meter (9 ppm), maximum 8-hour concentration not to be exceeded more than once per year. 40 milligrams per cubic meter (35 ppm), maximum 1-hour concentration not to be exceeded more than once per year.

Nitrogen Dioxide

Primary and Secondary (Florida) Standards: 100 micrograms per cubic meter (0.05 ppm) annual arithmetic mean.

Air Quality Policies

A. The effective and efficient use of resources for the control of point sources of air pollution should be supported. If necessary, increased manpower and equipment for monitoring and enforcement should be available. Legislation requiring vehicle inspection and more stringent standards for both ambient conditions and source emissions may also be needed.

B. Atmospheric and topographic diffusion characteristics should be a factor in determing the location of major air pollution sources such as industrial sources, power plants, incinerators and airports, in that wind and air currents are used to minimize air pollution buildup.

C. Wherever possible, urban land uses should be buffered from stationary and line (thoroughfare) sources of emissions. The size of effective buffers around stationary sources can be determined on the basis of emission volume and meteorological conditions.

D. Facilitites which house or provide activities for sensitive individuals; i.e., the young, elderly and sick, should be kept as remote as possible from emission sources. Facilitites of concern include schools, hospitals, parks, elderly housing projects or activity centers, nursing homes, orphanages, etc.

E. Support should be given to actions which would divert trips from automobiles to public transit, thereby reducing traffic generated air emissions. Population and employment centers should be located on designated transit/development corridors.

F. Planned unit developments, multi-use centers and other innovative development forms should be promoted and encouraged as ways to reduce the need to travel and the average trip length.

G. Attention should be given to improvements to existing thoroughfares which would smooth the flow of traffic and reduce automotive pollution caused by bottlenecks, capacity overloads, on-street parking, poorly synchronized signals, rough pavement surfaces and pedestrian-vehicular conflicts.

H. Consideration should be given to reducing the concentration of auto traffic in activity centers, particularly at peak traffic hours, through the use of parking pricing policies and traffic-free zones, where adequate transit and traffic facilities are available.

I. The city should assist industries desiring to locate in Jacksonville in selecting a site where ambient air standards would not be violated.

Air Quality Proposals

- Adopt Air Quality Control Plan.
- Develop a computer model for Jacksonville to study the relationship between emission points and ambient pollution levels. Utilize this model to assist new industry in determining locations for development in Jacksonville that will not lead to exceeding of air quality standards or to a significant deterioration of the environment.
- Institute a more comprehensive air quality monitoring system to accurately measure air pollution.

NOISE CONTROL

Goals and Objectives

Goal I

To reduce noise levels to the minimum practical level.

Objective A. Promote the reduction of noise which is physically injurious to hearing or psychological health.

Objective B. Promote the elimination of unnecessary nuisance noises.

Objective C. Review new housing developments by reference to the noise guidelines set forth by the U.S. Department of Housing and Urban Development.

Objective D. Provide noise buffers between highways, commercial uses and noise generating developments and residential developments.

Standards for Noise Control

The U. S. Department of Housing and Urban Development has developed standards to encourage the reduction of noise levels. It is the purpose of departmental policy to call attention to the noise pollution threat, to encourage the control of noise at its source in cooperation with other federal departments and agencies, to encourage land utilization patterns for housing and other municipal needs that will separate uncontrollable noise sources from residential and other noise sensitive areas, and to prohibit HUD support to new construction on sites having unacceptable noise exposure.

The following standards were adopted by HUD to guide program decisions.

External Noise Exposure

Unacceptable. Exceeds 80 dB (A) 60 minutes per 24 hours.
Exceeds 75 dB (A) 8 hours per 24 hours.

Exceptions are strongly discouraged and require a 102(2)C environmental statement and the approval of the Secretary of Housing and Urban Development.

Discretionary. Normally Unacceptable: exceeds 65 dB(A) 8 hours per 24 hours. Loud repetitive sounds on site.

Approvals require noise attenuation measures, the Regional Administration concurrence and a 102(2) environmental Statement.

Discretionary. Normally Acceptable: does not exceed 65 dB(A) more than 8 hours per 24 hours.

Acceptable. Does not exceed 45 dB(A) more than 30 minutes per 24 hours.

Interior Noise Exposures. (for new and rehabilitated residen- construction)

The following standards are performance standards. The means for achieving them will depend on the external noise levels, the equipment and layout used in the building and the noise attentuation characteristics of the buildings floors and walls. These standards assume open windows unless other provision is made for adequate venilation.

Acceptable. Noise exposures for sleeping quarters are considered "acceptable" if interior noise levels resulting from exterior noise sources and interior building sources such as heating, plumbing and air conditioning:

- Do not exceed 55 dB(A) for more than an accumulation of 60 minutes in any 24 hour period, and

- Do not exceed 45 dB(A) for more than 30 minutes during night time sleeping hours from 11 p.m. to 7 a.m., and
- Do not exceed 45 dB(A) for more than an accumulation of eight hours in any 24 hour day.

Insulation Between Dwelling Units

Unacceptable: For multi-family structures, including attached single family units, floor and dividing walls between dwelling units having Sound Transmission Class (STC) of less than 45 are always unacceptable.

Policies

A. Potential noise generated by proposed developments and the existing noise levels at these sites should be a consideration in review and planning.

B. All planning and review should take cognizance of existing performance standards set by city ordinance and the noise guidelines set forth by the U.S. Department of Housing and Urban Development.

C. The use of buffer zones to curtail noise should be encouraged.

D. The planting and preservation of trees and vegetation and the construction of berms along highways and railroad rights-of-way should be encouraged as a method of noise abatement.

E. Strict land use controls and buffers and/or protective zones in and around airports should be encouraged.

Proposals

- Conduct a citywide study of existing noise levels in order to have a base line against which future increases in noise levels may be measured.

- Encourage new residential development to locate where noise levels from major highways, industrial sources or airports will be minimized.

WATER QUALITY

Goals and Objectives

Goal I

To protect the health and welfare of the residents of Jacksonville from actual or potential adverse effects resulting from surface water pollution.

Objective A. Meet and maintain the Class II and III water quality standards which have been adopted by the state and the city. (Chapter 17-3, Florida Administrative Code.)

Objective B. Upgrade and maintain the quality of streams, waterways, and the coastal zone so that the water may serve recreational, agricultural, industrial and other beneficial uses.

Objective C. Plan land use patterns and transportation systems in a manner which is compatible with desired water quality standards.

Objective D. Improve the quality of stormwater runoff to the receiving waters of Jacksonville.

Objective E. Support the legal, organizational, financial and technological changes necessary to achieve the desired water quality standards.

Objective F. Promote and support efforts to obtain the federal, state and local commitments of resources necessary to operate an effective water quality planning and control program.

Objective G. Retain the ecological, drainage and water storage role of the wetlands as much as possible.

Objective H. Monitor proposed modifications of the National Pollutant Discharge Elimination System permits issued by EPA.

Goal II

To maintain and replenish the quality and quantity of groundwater supplies within the county and region.

Objective A. Encourage the recycling of water, whenever possible.

Objective B. Encourage the use of non-potable water sources by business and industry wherever possible to conserve groundwater supplies.

Objective C. Establish effective water management programs to ensure that satisfactory levels of quantity and quality are maintained.

Objective D. Encourage provisions for induced groundwater recharge where necessary to the maintenance of groundwater supplies.

Objective E. Seek the establishment of additional deep monitoring wells, rules and standards for local well cnstruction and water use criteria.

Standards

The State of Florida Department of Environmental Regulation (DER) has promulgated rules by which the quality of the water is determined and the implementation of state and national water quality goals is achieved. Chapter 17-3 of the Florida Administrative Code establishes minimum criteria for all waters.

Within the territorial limits of the state, all waters shall be free from settleable, floating, deleterious and toxic substances. Specific water quality standards have also been established for various constituents classified as deleterious regardless of the use to which the surface water is put. These standards are set forth in Chapter 17-3, Florida Administrative Code.

In addition to the foregoing requirments, DER has established water quality criteria on the basis of surface water use. All waters in Duval County are Class III waters except for Pumpkin Hill Creek, the Fort George River, Sawpit, Simpson, Garden and Myrtle Creeks which are Class II waters.

Class II Waters - Shellfish Harvesting

The following selected criteria are for classification of waters in areas which either actually or potentially have the capability of supporting recreational or commercial shellfish propagation and harvesting. Harvesting may only occur in areas approved by the Division of Health, Florida Department of Health and Rehabilitative Services.

A. Bacteriological Quality -Coliform Group - areas classified for shellfish harvesting, the median coliform MPN (Most Probable Number) of water shall not exceed 70 per 100 ml., and not more than 10 percent of the samples shall exceed an MPN of 230 per 100 ml. The fecal coliform bacterial level shall not exceed a median value of 14 MPN per 100 ml. with not more than 10 percent of the samples exceeding 43 MPN per 100 ml.

B. pH - pH shall not be caused to vary more than one (1.0) unit above or below normal pH of coastal waters as defined in Section 17-3.021 and not more than two-tenths (0.2) unit above or below normal pH of open waters as defined in Section 17-3.021 and the lower value shall not be less than six and one-half (6.5) and the upper value not more than eight and one-half (8.5).

C. Dissolved Oxygen - the concentration in all waters shall not average less than 5 mg/l in a 24-hour period and shall never be less than 4 mg/l. Normal daily and seasonal fluctuations above these levels shall be maintained.

D. Odor - threshold odor number not to exceed 24 at 60 degrees C as a daily average.

Class III Waters - Recreation, Propagation and Management of Fish and Wildlife

The following selected criteria are for classification of waters to be used for recreational purposes, including such body contact activities as swimming and water skiing, and for the maintenance of a well-balanced fish and wildlife population. All surface waters within and coastal waters contiguous to these basins, including offshore waters, not otherwise classified shall be classified as Class III; however, waters of the open ocean shall be maintained at a dissolved oxygen level of not less than five (5.0) milligrams per litre (mg/l).

A. pH - ph of receiving waters shall not be caused to vary more than one (1.0) unit above or below normal pH of predominantly freshwaters and coastal waters as defined in Section 17-3.021; and not more than two-tenths (0.2) units above or below normal pH of open waters as defined in Section 17-3.021; the lower value shall not be less than six (6.0) in predominantly freshwaters or less than six and one-half (6.5) in predominantly marine waters; and the upper value not more than eight and one-half (8.5).

B. Dissolved oxygen - in predominantly freshwaters, the concentration shall not be less than 5 milligrams (mg)/l. In predominantly marine waters, the concentration shall not average less than 5 milligrams (mg)/l in a 24-hour period and never less than 4 milligrams (mg)/l. Normal daily and seasonal fluctuations above these levels shall be maintained in both predominantly freshwaters and predominantly marine waters.

C. Bacteriological Quality - fecal coliform bacteria shall not exceed a monthly average of 200 per 100 ml of sample, nor exceed 400 per 100 ml of sample in 10 percent of the samples, not exceed 800 per 100 ml on any one day, nor exceed a total coliform bacteria count of 1,000 per 100 ml as a monthly average, nor exceed 1,000 per 100 ml in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period. Either MPN or MF counts may be utilized.

Policies

Class II and Class III Waters

A. Any reduction, impedance or other hydrologic modification of stream flows should be considered from the standpoint of the effect upon the assimilative capacity of waterbodies.

B. Soil conservation practices such as runoff and erosion control measures to prevent pollution of the St. Johns River and/or its tributaries from upland construction activitites should be encouraged.

C. Conservation of natural vegetation and limitation on the amount of paved areas is encouraged to minimize stormwater runoff. The use of semi-pervious paving is encouraged.

Point Source Control

A. Local government should become the dominant provider of sewage collection and treatment services and should continue its program of developing a regional sewage system.

B. Private wastewater package treatment plants should be permitted only where public systems are inadequate or unavailable and private plants should be connected to the public system where the latter is adequate and available.

C. Permits should not be issued for any treatment facilities, the discharges from which may exceed the assimilative capacity of the receiving waters as determined by DER modeling programs.

D. All existing sewage treatment systems should be upgraded to the point that discharges are compatible with the assimilative capacity of receiving waters or lands, as determined on the basis of applicable standards and allowable waste loads.

E. Efforts should be made to reduce water quality damage caused in the St. Johns estuary by port activitites by prohibition of discharge of untreated waste from ships and smaller craft, and continued efforts to prevent oil spills.

F. Where economically feasible and necessary, storm drainage outfalls should be located where receiving waters are most capable of assimilating wastes.

G. Dredging except for approved maintenance dredging of existing public navigation channels should be discouraged adjacent to Class II waters. Dredge spoil areas should be properly designed to prevent their becoming mosquito breeding areas.

H. Discharge of effluent which will cause health hazards for the population engaging in water contact sports and propagation of fish and wildlife should be prohibited.

Non-Point Source Control

A. Efforts should be accelerated to reduce pollution caused by agricultural runoff and to identify and reduce other non-point pollution sources.

B. Impervious surfaces should be limited to the minimum possible. When impervious paving is used, natural drainage systems should be protected and stormwater runoff incorporated back into the natural system.

C. Storm drainage projects should simulate the natural drainage pattern as nearly as possible.

D. Where feasible stormwater runoff should be delayed with detention systems for dispersal and release at a rate of flow simulating the pre-development state.

Groundwater Supply

A. Groundwater resources should be managed on a long-term "self sustained yield" basis through management of withdrawal rates, well spacing, sources of contamination and leakage.

B. In order to protect the regional water supply, the drilling of all wells should be by permit for drilling and operation. The capping, filling and plugging of abandoned wells should be required. Valves on free flowing wells and the closing of such valves except when water is in use should be required.

C. Use of groundwater for industrial cooling purposes should be discouraged where suitable and adequate surface waters are available for that purpose.

Conservation and re-use of cooling water should be encouraged in all cases, as well as re-use of treated wastewater where economically feasible.

D. Groundwater recharge should be enhanced where feasible and desirable through artificial means; i.e., detention dams, retention ponds, pumping during high flow, and swales.

E. Deep well water quality tests should be conducted to determine the extent of saltwater intrusion.

F. Use of low volume water fixtures should be required for new construction by the City Building Code.

Proposals

- The St. Johns River is a valuable environmental resource; however, it is also a valuable economic resource due to the dependence of the city on port related activities. In order to recognize the dual uses of the river, the Department of Environmental Regulation should be encouraged to expand the definition of Class III waters in port areas so that the water quality standards do not unduly discourage or restrict economic activity.
- Review recommendations of the state regarding control of non-point sources of water pollution (208).
- Encourage and assist in the development of a plan which will consider the St. Johns River estuarine ecosystem and its reaction to an increase or decrease of freshwater introduction.
- Encourage the development by USGS and other concerned agencies of a computer model to predict changes in water quality and quantity for groundwater, surface water and estuarine systems.
- Encourage studies by USGS and other concerned agencies to determine source and rate of movement of saline water in the aquifer.
- Encourage studies by USGS and other concerned agencies on the effect of urbanization on surface and groundwater supplies.

- Encourage the St. Johns River Water Management District to help fund water management studies.

- Encourage greater cooperation between the St. Johns River Water Management District, the Corps of Engineers, USGS, DER and local agencies in development of water plans.

SENSITIVE AREAS

Areas of Jacksonville where measures should be taken to encourage conservation of important natural resources and the function that they provide should be designated sensitive areas. Sensitive areas may include:

1. Areas of unique, scarce, fragile or vulnerable natural habitat, physical feature, historical significance, cultural value and scenic importance.

2. Areas of high natural productivity or essential habitat for living resources, including fish, wildlife and the various tropic levels in the food web critical to their well-being.

3. Areas of substantial recreational value and/or opportunity.

4. Areas where developments and facilitites are dependent upon the utilization of or access to coastal waters. The impacts of port activitites are discussed in the Economic Element and Land Use Element of the 2005 Comprehensive Plan.

5. Areas of urban concentration where shoreline utilization and other water uses are highly competitive.

6. Areas of significant hazard if developed, due to such factors as storms, floods and erosion.

7. Areas needed to protect, maintain or replenish lands or resources, including flood hazard areas and sand dunes and beaches.

Goals and Objectives

Goal I

To enhance and conserve natural areas, wildlife habitats, fisheries resources, air and water quality and other renewable and non-renewable resources.

Objective A. Study the ecological character of Jacksonville and delineate Sensitive Areas in detail.

Objective B. Protect the valuable functions of wetlands, estuaries and submerged lands including the territorial sea, by maintaining the integrity of vegetation and hydrologic systems.

Objective C. Protect the valuable functions of beaches and dunes by maintaining the integrity of those systems.

Objective D. Reduce declines in and increase the productivity potential of environmental resources.

Goal II.

To encourage greater compatibility between the land development process and the natural environment.

Objective A. Enhance and conserve areas of environmental sensitivity, while permitting development that will hold ecological alterations to acceptable levels.

Objective B. Enhance the quality of development by controlling the encroachment of urbanization on lands poorly suited for development.

Objective C. Promote and support the establishment and maintenance of pleasant, healthful surroundings in which the man-made environment is compatible with natural resources and amenities.

Objective D. Utilize natural resources to define and shape urban development patterns at both the county and community neighborhood scales.

Objective E. Plan for and provide adequate opportunity for economic development consistent with resource limitations.

Objective F. Integrate environmental and economic consideration into Jacksonville's decision-making process in order to maximize the benefits derived from new development.

Objective G. Control erosion and sedimentation in development areas.

Objective H. Reduce or prevent loss of property and lives which may result from natural disaster.

Objective I. Encourage multiple uses of environmental resources wherever possible.

Objective J. Review all development proposals to insure that development occurs according to established criteria, such as the existing Floodplain Ordinance.

Objective K. Monitor public notices on application to the Corps of Engineers for permits.

Goal III

To increase citizen participation in decisions affecting environmental resources.

Objective A. Acquire and disseminate basic knowledge and information concerning the environment and the ways in which it may be used to benefit the citizens of Jacksonville.

Objective B. Provide measures for resolving conflicts and preventing potential conflicts which arise out of competition between uses and users of environmental resources.

General Policies

A. The environmental implications of a proposed development should be considered as part of the review process of the city.

B. New techniques should be developed to provide legal protection for the area's natural resources as designated within the Comprehensive Plan.

C. All costs for restoring environmentally damaged areas should be imposed, insofar as possible, upon those persons declared responsible.

The following are land and water areas included in the Sensitive Areas Category. See Maps 1, 2, 3 and 4 for general location of these areas.

Selected Coastal (Tidal) Marshes

Tidal marshes are low coastal wetland areas covered by grassy salt tolerant vegetation subject to tidal actions. These marshes occur generally in the northeastern one-fifth of the county. They also occur along the Nassau River, the Intracoastal Waterway (south of the St. Johns River) and at Mill Cove. Map 1 shows the location of these areas.

The state defines tidal marshes as those areas capable of supporting salt tolerant vegetation. Salt marshes may also be identified as the soil series Tisonia.

Suitable Activity/Use

Propagation of marine life; wildlife refuges; hurricane buffer and shoreline stabilization; runoff retention areas; scenic resources.

The coastal marshes should be maintained in their natural state except for critical uses from which the general public will receive benefit.

APPENDIX C

EP TOXICITY DATA

TECHNICAL SERVICES, INC.

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

Laboratory No. 37662 November 17, 1980

Sample of Sludge

Date Received October 8, 1980

For Commanding Officer, Southern Division, Naval Facilities Engineering Command, P.O. Box 10068, Charleston, South Carolina 29411

Marks:

Contract #N62467-80-C-0464

CERTIFICATE OF ANALYSIS OR TESTS

Dry sludge, Naval Air Station
Jacksonville, Florida

	EPA Extraction Procedure Toxicity Tests
Endrin, µg/l	< 1
Lindane, µg/l	< 1
Methoxychlor, µg/l	< 5
Toxaphene, µg/l	< 3
2,4-D, µg/l	< 1
2.4-5-TP Silvex, µg/l	< 0.5
Arsenic, mg/l	0.018
Barium, mg/l	0.24
Cadmium, mg/l	0.078
Chromium, mg/l	0.51
Lead, mg/l	0.051
Mercury, mg/l	< .0002
Selenium, mg/l	< 0.01
Silver, mg/l	0.022

Respectfully submitted.

TECHNICAL SERVICES, INC.

BY [signature]

Enclosure (2)

Table 2 - Total composition of NAS dry sewage sludge, 8/80

Factor	Tank Number				Mean
	835	836	837	838	
Water, %	21.4	21.8	14.1	92.1	
pH	5.8	6.8	7.2	7.3	7.0
Nitrogen, %	4.22	4.69	4.46	4.75	4.53
Cadmium, ppm	241	270	311	261	271
Chromium, ppm	18,900	21,300	17,000	18,000	18,800
Copper, ppm	585	555	628	510	570
Barium, ppm	1,100.	890	1,120	850	990
Mercury, ppm	2.8	3.1	2.4	2.2	2.6
Manganese, ppm	365	390	380	480	404
Nickel, ppm	105	112	100	117	109
Lead, ppm	975	1,030	1,030	1,240	1,070
Potassium, ppm	2,200	2,450	2,180	2,590	2,360
Selenium, ppm	0.43	0.72	0.31	0.17	0.41
Silver, ppm	72	73	82	83	79
Sodium, ppm	500	1,280	845	1,330	989
Zinc, ppm	939	780	938	804	865
Arsenic, ppm	3.4	4.0	4.0	2.9	4.6
Ignition loss, %	60.8	68.2	65.7	72.1	66.7

Analysis by J. G. A. Fiskell and Analytic Research Laboratory, Soil Science Department, University of Florida, Gainesville, 32611.